

Management Adviser

Volume 10 | Number 6

Article 11

11-1973

Management Adviser, Volume 10, Number 6, November-December 1973 (Whole Issue)

American Institute of Certified Public Accountants

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Recommended Citation

American Institute of Certified Public Accountants (1973) "Management Adviser, Volume 10, Number 6, November-December 1973 (Whole Issue)," *Management Adviser*. Vol. 10: No. 6, Article 11.
Available at: <https://egrove.olemiss.edu/mgmtadviser/vol10/iss6/11>

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management adviser

November-December, 1973

Reversing Financial Goals Overnight In an International Company

Leo G. Blatz



Collegium Radclivianum Cantabrigiae
*in Republica Massachusettsensium omnibus ad quos hae litterae
pervenerint salutem.*

Præses, Sodalesque Collegii Radcliviani in Comitibus sollemnibus

Annam Tolstoi

*alumnæ in cursu academico studiis
præstantem ad gradum Baccalauri in Artibus cum laude admisit eique
dederunt et concesserunt omnia insignia et iura quae ad hunc gradum spectant. In cuius
rei testimonium litteris Academicæ sigillo munitis die X.X.XI Junii anno Salutis
Humanæ MCMXXIII Collegii Radcliviani I.X.X. Præses
auctoritate rite commissa nomen suum subscripsit.*

W. K. Jordan Præses

*Collegio Radcliviano discipulam supra dictam ad gradum Baccalauri in Artibus ad-
mittenti Præses, Sociique Collegii Harvardiani ex lege de Collegio Radcliviano instituendo
postquam compererunt omnia ei esse ad implenda quae in Universitate Harvardiana
intinguuntur eiusdem gradus candidatis consenserunt.*

Jacobs Bryant Conant Præses

Congratulations.

**You just spent twelve thousand dollars
so she could join the typing pool.**

You've got this daughter and she's smart. Why not? She's yours. She's heard you talk about your work all her life. She had the same education as her brother. God knows she's brighter than those boys who come around.

Pity. When she goes job hunting she'll hear two questions over and over. What's your typing speed? Can you take dictation?

And those boys? They'll start at higher salaries, go into executive training, get raises and promotions faster, have more job freedom, and better expectations. They can make nearly twice the money for exactly the same job as your daughter.

It's not fair. But more important, it's just not sensible. When there's never enough talent to go around, why block half of it right at the beginning?

What's your company policy on hiring women? Where do they start? How far can they go? What opposition does a woman face that's not on the company books, but stays firmly in the company tradition?

This is one place you could help move the world a little. For your daughter and all the daughters and all the brains behind all their bright young faces.

After all, it doesn't always have to be "Jones & Son."

Womanpower. It's much too good to waste.

Think of what just one company can do to stop pollution. We have.

**WHAT
INDUSTRY
IS DOING
TO STOP
POLLUTION**



Keep America Beautiful, Inc.
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New York, New York 10016

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"What industry is doing to stop pollution."

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Twenty years ago some farsighted businessmen had an idea. To establish an organization to combat littering. They called it Keep America Beautiful, Inc.

Since then, KAB, Inc. has led a national movement to stop not just littering. But pollution as well. A movement that involves

almost 70 million Americans.

To show you what companies like yours are doing to fight pollution, we've put together this folder, "What industry is doing to stop pollution."

It's a special way to celebrate our first twenty years.

People start pollution. People can stop it.



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The Advertising Council

Keep America Beautiful
99 Park Avenue, New York, New York 10016



Leo G. Blatz • Reversing Financial Goals Overnight in an International Company p. 15

The Singer Company is a classic case of a decentralized, international company where each unit in the field has considerable autonomy. It is also a business that has been built over the years on the ex-

tension of credit to customers. The recent credit crunch forced Singer, like so many other companies, to improve its cash flow. This called for effective communication of its new goals to its overseas offices.

Hui-Chuan Chen and Russell C. Kick, Jr. • A Computer-Based Financial Management System for Small Business p. 20

There is no need for small businesses to be left out of the age of the computer. These authors present a financial management system which can be tailored to meet the needs of any small business. Its objectives are to:

perform routine accounting functions at a reasonable cost; improve long-range growth prospects through efficient resource allocation; and better the company's financial position and profitability.

Eugene H. Kramer and Edward A. Altshuler • A Universal Distribution Number System. . . p. 25

For nearly 50 years, businessmen have struggled with the problem of simplifying the catalog numbers which

identify products and their makers. Finally industry associations have come up with one code.

Barry E. Cushing and David H. Dial • Cost-Performance Trade Offs in Real-Time Systems Design p. 29

The trend toward more efficient and reliable computer hardware and software is likely to increase the number and variety of real-time applications. A def-

inition of real-time systems is offered and their essential elements reviewed. Cost-performance factors with respect to these elements are examined.

Lowell A. Baker and Monroe S. Kuttner • Management Consulting Education: Needs, Sources, and Voids p. 39

The most critical educational need of practicing consultants is a course in the preparation of management consulting reports, a survey conducted by

the AICPA's committee on management advisory services education has found. This article reports on what the committee is doing about it.

A publication of the American Institute of Certified Public Accountants. Opinions expressed in MANAGEMENT ADVISER are those of the editors or contributors, and may differ from policies of the AICPA and its committees.

Management Adviser, Nov.-Dec., 1973. Published bimonthly, Vol. 10, No. 6. Subscription rates: \$12.50 a year, \$2.25 a copy. Publication, editorial and business office: 666 Fifth Ave., New York, N.Y. 10019. Second-class postage paid at New York, N.Y.

Change of address notices and orders for subscriptions are to be sent to 666 Fifth Ave., New York, N.Y. 10019. Subscribers ordering an address change must give four weeks' notice and both old and new address, including ZIP code number. Copyright, ©,

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management adviser

(formerly *Management Services*)

Thad B. Green • Problem Definition—Key to Effective Problem Solving. p. 42

There is no substitute for formulating problems in the "proper" way. The appropriate formulation emanates from the systematic implementation of a simple process. But how do you do it?

Allen P. Vollen • Interactive Accounting on the Shared Computer p. 46

The shared computer interactive accounting service permits all users to draw, as required, upon the data processing resources of a large central computer to carry out accounting functions. Users can do their processing concurrently, functioning as though they were the only ones using the system.

Annual Index—1973 p. 62

Lists, by author and subject categories, all major articles published in MANAGEMENT ADVISER this year.

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How would you like to sign the work you do?

Would you be willing to tell the world, "I did this?"

After all, you're pretty good at what you do. Probably proud of it, too.

Well, most of us will never get to sign our work. And maybe that's a shame. Because as good as we are, it might make us better. And we can afford to be. Whether we're teachers or short-order cooks, farmers or steamfitters, sales managers or city managers.

We'll all have more to show for it.

More money, for one thing.

Because we'll be giving each other our money's worth

for the products, the services and even the government we pay for.

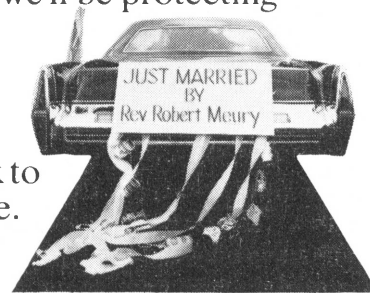
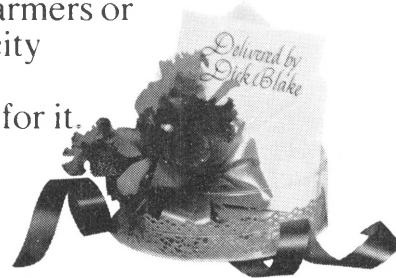
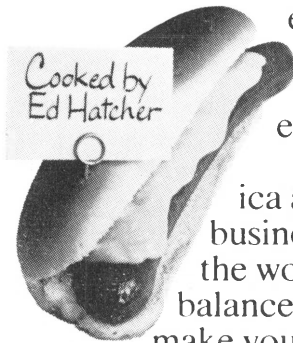
For another thing, we'll be giving America a better chance to take on our foreign business competitors. Not just here. All around the world. That would help bring the lopsided balance of payments back onto our side. And

make your dollar worth more.

Best of all, as we hit our stride, we'll be protecting jobs here at home. For ourselves and the future. And we'll have a deeper sense of satisfaction in the jobs we've got.

You don't have to sign your work to see all these things happen. And more.

Just do the kind of work you'd be proud to have carry your name.



**America. It only works
as well as we do.**

people, events, techniques

Race Discrimination Most Frequent Cause of EEOC Suits, But Sex Bias Fast Overtaking It, Reports Says

Reviewing the first 120 suits filed by the Equal Employment Opportunity Commission, over 75 per cent involve race and about half cite discrimination on the basis of sex, the first issue of *EEO Perspective* states.

The newsletter is a monthly publication of Equal Employment Opportunity Services, a division of Boyden International Group, Inc., New York. It advises, "Don't assume that your company is immune to EEOC confrontations because it is too small, too large, or that it is somehow unique by virtue of its industry, geography, work force make-up, and so forth. Every type

of company can be a target of EEOC confrontation."

Although more cases may to date involve discrimination on the basis of race, *EEO Perspective* points out that the percentage of cases dealing with sex is increasing most rapidly and warns that the consequences of these suits are often far more costly. The newsletter cites four reasons to be more wary of sex discrimination suits:

"Women are becoming increasingly aware of and militant about disparate treatment;

"They are better organized than most of their minority group counterparts;

"They tend to file class action instead of individual complaints; and, most importantly,

"Women represent a far greater proportion in most work forces than minorities—38% nationwide, and up to 70% in some industries."

Transfer and promotion practices are rapidly eclipsing hiring as the primary targets for EEOC investigation, the newsletter reports. Many of the complaints brought by women involve stereotyped positions in which transfer and promotion possibilities are the main issue.

EEO Perspective advises its readers that there is no way to ensure immunity to "EEOC attack." It

notes that the definition of "unlawful discrimination" is expanding and consequently absolute immunity is "virtually impossible."

Three types of relief have been demanded by the EEOC in the vast majority of its cases, the newsletter states:

"1. An order enjoining the defendant from engaging in the discriminatory employment practices cited;

"2. An order that the company institute affirmative action programs and provide equal employment opportunity to eradicate the present effects of past unlawful practices; and

"3. An order that the employer 'make whole' those persons adversely affected by such practices."

"Making whole" involves translating all denied wages, opportunities, and benefits into dollar damages and redressing *all* persons affected by the discriminatory practices, *EEO Perspective* explains. AT&T's payment of "delayed restitution" in the amount of \$15,000,000 at the beginning of this year attests to the magnitude of employer liability (see M/A March-April, '73, p. 9).

J. H. Cohn Newsletter Stresses Advantages Of Minicomputers

Small companies need proportionately, as much and as varied information as large companies do, J. H. Cohn and Company, a Newark, N.J., CPA firm maintains. The minicomputer may help to give small companies the information they need, the accountants say.

In a recent issue of its newsletter, *Time and Tide*, the firm calls the minicomputer "a new opportunity for improving the profitability of small firms." An especially important feature of these machines for the small company is that they do not require highly trained in-house EDP specialists and thus the oper-

ating costs of an installation are brought down.

"A small company that can use a general purpose computer should figure on spending for data processing between 1 and 2% of annual net sales up to \$10 million of net sales (on a declining scale as sales volume rises). Large companies are spending between 1½ to 2% for their data processing," the newsletter states.

The larger companies' higher costs stem mainly from a higher ratio of operating costs to the costs of buying or leasing a computer. The operating costs of more complex installations are around two and a half times the hardware costs, J. H. Cohn estimates.

Turnkey advantages

Turnkey contracts allow the businessman to know in advance what he is getting and how much it will cost, the firm observes. It suggests the following requirements be covered in turnkey contracts:

"1—*System design*. Someone who knows what is needed tells the vendor's system analyst of the firm's requirements. The analyst will then translate this into programming specifications and costs.

"2—*System sign-off*. The businessman approves proposed input and output as acceptable to his needs in the performances of the business. This is perhaps the one act most critical to success of the live operation and requires that you must be willing to spell out your needs so that program writing—a precise art bound by your system specifications—can begin.

"3—*Sample run*. After the vendor has written the program, the businessman should run some sample data through the system and verify the results.

"4—*Installation*. Once you accept the system as demonstrated it can be installed on your premises. This, too, has sometimes been an agonizing experience because of communication failures or changed or new desires. Most vendors are reasonable about making modifications up to 10% of the original program

cost quotation; beyond that, expect to pay for the extras."

Cohn believes the minicomputer can be used to *make* money not just to *save* it.

"Timing is critical. Managers who put the minicomputer to work reap the rewards; those who wait may be left in the dust," the newsletter states.

Nearly One-Third Of Chief Executives From Outside Company

Continuing their study of executives promoted to the positions of president, executive vice-president, and vice-president, the University of Michigan team of Dean Floyd A. Bond and Associate Dean Alfred W. Swinyard questioned 1,240 executives promoted during 1972 (see M/A, May-June, '72, p. 5 for their earlier findings).

The two deans from the graduate school of business administration, Ann Arbor, were aided in their work by the executive appraisal firm of R. M. Schmitz and Company, Incorporated, Chicago, Ill.

Some of the survey's key findings were: Nearly half of the promoted executives had less than ten years' experience with their companies. Of all new presidents and chief executive officers, 30 per cent had recently joined their companies. But over two-thirds of the newly promoted senior vice-presidents had been with their companies over ten years.

Deans Bond and Swinyard report that the average salary received by presidents who were also chief executive officers was \$68,000.

For presidents, who were not chief executive officers, the reported salary was \$82,000. Executive vice-presidents received \$77,000 and vice-presidents received \$57,000.

Nearly all the executives said they had received increases in their

base salaries at the time of promotion. In the case of presidents and chief executive officers the average increase for the total group was 23 per cent. For presidents of subsidiaries, the increase was only ten per cent.

The most important source of newly promoted executives was division management, particularly for presidents and group vice-presidents, the researchers learned. However, vice-presidents generally have more experience in specific functional areas such as finance, marketing, and administration, they observed.

According to the survey, the average age of presidents not chief executive officers was 49 and the average age of presidents who were chief executive officers was 47.

Eighty-six per cent of the newly promoted executives were college graduates, the University of Michigan educators state. About 39 per cent of the promoted executives had advanced degrees. Nearly 70 per cent of the first master's degrees reported were M.B.A.s. The second most frequently held advanced degree was a master's in engineering, the survey found.

Industrial Engineers in Consulting Groups Lead Field in Pay

Industrial engineers working in consulting organizations received the highest median income for members of their profession during 1972, states the American Institute of Industrial Engineers in its report *Compensation of Industrial Engineers 1972*.

The median salary for IEs in consulting organizations was \$23,250; for those working in colleges and universities it was \$19,961; for IEs employed in government organizations and in transportation and warehousing organizations it was \$19,500; and for those engineers working in textile mill products manufacturing organizations it was \$14,500.

According to the study, the total median income for industrial engineers with no academic degree was \$15,200; for those with a bachelor of science it was \$16,500; and for IEs holding a master of business administration degree it was \$19,000.

Industrial engineers working in organizations with less than 100 persons reported a higher median total income, \$20,121 (as compared to an overall median IE income of \$17,491).

Compensation of Industrial Engineers 1972 is available at \$25 per copy (\$15 for AIIE members) from AIIE Publications Sales, 25 Technology Park/Atlanta, Norcross, Ga. 30071.

Bell System Wants 'Moratorium' On Competing Proposals

The Bell System would like to have a "moratorium on further experiments in economics aimed at increasing competition in the telecommunications industry," AT&T Board Chairman John D. deButts told the annual meeting of the National Association of Regulatory Commissioners, September 20.

While competition in telecommunications is being promoted, no movement for deregulation has been evidenced, Mr. deButts observed.

"The prospect confronting us is not free and open competition as an alternative to monopoly, but rather a third alternative with the virtues of neither and the disadvantages of both—and that is regulated competition, a division of the marketplace arbitrarily imposed and artificially maintained," the AT&T executive stated.

He cited AT&T studies that show a rate of trouble reports on private lines equipped with customer-provided equipment that is at least 50 per cent higher than the rate of troubles reported by customers us-

ing equipment supplied by the telephone companies. Mr. deButts also pointed out that the trouble-report rate on regular message telephone lines interconnecting with customer-provided equipment is more than 25 per cent higher than on lines connected solely to telephone company terminal equipment.

No adequate alternatives

"No system of certification we can envision—and no interface requirement—can provide a fully adequate alternative to the unequivocal and undivided responsibility for service that the common carrier principle imposes," he told the commissioners.

Mr. deButts said that AT&T is convinced that the public is best served by "the concept of a universal system designed and configured to operate as a single integrated entity, its services available on equitable terms to all users, wherever they are, whoever they may be."

He said the Bell System is ready to defend its convictions on the legal, legislative, and regulatory fronts.

The annual Lester Witte Foundation award for the best article "promoting or exemplifying the practice of management services in a small or medium-size firm" was presented this year to Frank Schultz, of Price Waterhouse & Co., for his article "A Practical Marketing Model for Short- and Long-Range Planning," which appeared in the March-April, 1973, issue of *MANAGEMENT ADVISER*. The award, a plaque and a check for \$100, was made on October 15 at the AICPA annual meeting in Atlanta, Ga., by William O. Doherty, director of publications for the AICPA.

Further coverage of the conference will appear in the next issue of this magazine.

'Tory' County First In Nation To Use Facilities Management

Orange County, Calif., has a nationwide reputation for being a conservative stronghold. That might be true politically, but it is not true when it comes to managing county government data.

It is the first county in the nation to enter a seven-year facilities management contract for all of its data processing needs, reports Computer Sciences Corporation, El Segundo, Calif., the firm engaged for the project.

\$11 million savings

According to County Supervisor Ralph A. Diedrich, the facility management contract will enable Orange County to save \$11 million in tax dollars while materially improving the quality of services rendered.

CSC's bid was 30 per cent less than the \$37.8 million cost of the county's internal data processing center over the seven-year period, as projected by the county negotiating committee.

Computer Sciences and Orange County will have joint ownership of the software systems developed under the contract. An extensive campaign to market these systems to cities and counties throughout the country is planned by CSC.

Systems to be improved by CSC include: budgeting, administrative management, tax assessment and collection, land-use planning, jury selection, and probate. Further automation of municipal court procedures and expansion of the county's on-line criminal justice information system to increase its usefulness to local law enforcement agencies, the courts, and related departments are also planned.

More than a dozen analytical studies will be performed for the county under the agreement. One planned study will investigate the feasibility of developing an envi-



Pennsylvania Cows Double Milk Yield After Fifteen Years Of Computer Advice

Milk prices may be going up, but don't blame Elsie the Cow, or at least not her Pennsylvania cousins. During the past 15 years they have doubled their milk yield by teaming up with a Penn State University dairy herd management project and an IBM computer.

The herd-managed cows now produce, on the average, 12,965 pounds of milk a year each, compared to 6,562 pounds averaged by cows not in the program 15 years ago.

One Holstein made a whole-hearted effort and produced almost 17 tons of milk a year. That translates into 103 pounds of milk each day from the gallant Gladell Governor Bess.

Once a month each dairyman en-

rolled in the Penn State program tells the University how much feed each of his cows consumes, her milking record, and the butter fat content of her milk. This information is fed into an IBM System/370 Model 155.

Weight watcher

Besides comparing the cows' performance, the system also notes if the cow is being overfed in relation to the amount of milk she produces. The university specialists are able to choose the proper month for the cow to breed, decide if the cow's weight is affecting its productivity, and determine how heredity is likely to affect any given animal.

ronmental model of Orange County using data on land use and air, water, and noise pollution.

CSC will work with county officials to determine the need for new information in such areas as health services, county planning functions, flood control, and road construction and maintenance. If a system capable of meeting county specifications is available in the

public marketplace at a cost less than the estimated development cost, CSC will purchase or lease the system for the county. If no such package exists, CSC will develop one.

The facilities management firm will also seek out Federal assistance grants available to Orange County for the purpose of funding the development of county systems.

Business Cost Control Techniques, if Applied, Could Solve Most Colleges' Financial Troubles: Coopers & Lybrand

The financial crisis in most colleges can be met with proven business-oriented cost control techniques, including functional reports for internal management purposes, a monograph recently published by Coopers & Lybrand recommends.

Financial Management of Higher Education by Philip J. Taylor, partner, and Granville K. Thompson, principal, states that the generosity of outside benefactors can no longer keep pace with rising costs; consequently, a "modified profit philosophy" may be in order for the educational institutions.

Hospital precedent noted

"The concept of selectivity in education, i.e., limiting that which is undertaken to that which can be done well—thereby attracting students and support—has not yet been effectively applied," the authors say. Hospitals have already put this concept into practice, they observe.

"It is suggested, perhaps somewhat radically, that increased tuition and other fees for services can provide, at least in part, for future capital financial needs. However, substantial additional data and information are required before intelligent action can be taken on such a suggestion.

"Various collateral considerations need to be evaluated, such as the effect of a substantial increase in tuition on the number of applicants for admission, the quality of applicants, the mix of courses selected, the mix of living quarters selected, and the amounts realizable from the annual giving program—particularly from parents," the monograph states.

The authors caution that there is a point at which the college can price itself out of the market, and this is an important business policy decision.

"As part of an initial survey, a college should construct in advance an all-inclusive income statement for the year, and furnish enough per-student cost information by department and by residence hall, etc.," Messrs. Taylor and Thompson say.

Educators resist cost analysis

Although it is necessary for institutions of higher learning to maximize efficient and effective deployment of their resources, educators have resisted cost analyses. The authors cite the October, 1967, issue of the American Mathematical Society's *Notices* which called the use of "faculty time and effort reports" incompatible with academic life and work.

One of the areas, frequently overlooked, that holds great potential for cost reductions through improved scheduling is maintenance and housekeeping, the consultants say.

"In housekeeping, staff reductions and improved physical conditions can stem from better manpower utilization. Without planning, scheduling, and control, maintenance personnel have generally been found to be no more than 50 per cent effective.

Maintenance control fertile field

"A complete maintenance control system requires establishing preventive maintenance procedures, controlling the efforts of all maintenance department personnel by identifying backlogs, estimating the time required for specific jobs, and scheduling to achieve maximum productivity. The administrative centers for maintenance and some of the shops frequently can be combined and new controls over spare parts and maintenance materials in-

stituted. Management should be kept informed by regular control reports of maintenance activity and its effectiveness," they advise.

The 122-page monograph is available, without charge, upon written request to Granville K. Thompson, Principal, Coopers & Lybrand, 1251 Avenue of the Americas, New York, N.Y. 10020.

Sensitivity Training Helps Executive But May Make Him Dissatisfied

While sensitivity training may help an executive to better communicate with those around him, it may also make him dissatisfied with his job, observes Reeve Darling, president of Darling & Alsobrook, Los Angeles management consultants.

Sensitivity training (creating a greater empathy in the person receiving the training) "makes the executive more introspective and enhances his awareness of his own needs," Mr. Darling recently stated after conducting intensive interviews with personnel at all levels.

"The end result of this process may be that the executive seeks a similar position with another firm, or a different career, or openly shows signs of restlessness and frustration," the consultant discovered.

Employees for a variety of reasons are far more self-aware, Mr. Darling believes, and therefore create more severe management and motivation problems than existed in previous years.

"As a result of these changes, it is now quite common for the individual to face the trauma of a fundamental career decision, not when

he is just leaving college to enter work, but rather at the height of his success—usually in his mid-forties. . . . Each executive has had the experience of standing on at least one peak of success, but in the process of seeing other, higher peaks ahead of him, he senses that there is something within him that is unexpressed and unfulfilled,” Mr. Darling stated.

The chief executive officer often finds that while he encourages training which will lead to a better individual life for his employees; this same training may enhance the individual’s desire to “manage himself” and at times come into conflict with the company’s objectives, the consultant explains.

“While searching for new management tools, executives need to give more consideration to the implications of these human aspirations, and to the ways in which they affect the individual’s decision-making process,” Mr. Darling concluded.

Mergers Growth May Lead to Swollen Distribution Costs

Company growth via mergers and acquisitions can take a hidden toll from profits in the form of excessive physical distribution cost, observes the September issue of the William E. Hill & Company, Inc., newsletter.

The newsletter cites the case of a multi-divisional metalworking company that was operating two or more small divisional warehouses where a single facility would do a better job at less cost. A managerial-engineering staff of five was operating a 75,000 square foot facility when the same staff could manage 200,000 square feet or more, the consultants found. Orders would go from one warehouse to another to be filled, resulting in a time lag and customer complaints.

“In short, like an evolving or-

ganism, this company found itself with what biologists would call ‘vestigial structures’—organs like an appendix that had once served a useful purpose for a remote ancestor but were no longer needed—and in fact, were about to endanger the entire organism,” the New York management consultants maintain.

Signs of trouble

Hill says such cases are not unusual and outlines a number of symptoms that indicate to a company a physical distribution audit is in order:

“—A high proportion of small shipments moving to common destinations.

“—A pronounced differential between direct-ship costs and transportation costs of goods that move first to warehouses and then to customers.

“—Erratic performance and rate inconsistencies among common carriers serving different plants.

“—A large number of small warehouses.

“—Inefficient handling and storage practices.

“—Warehousing costs that are high when compared to public warehouse rates for comparable services.

“—Different warehousing costs at different locations.

“—High order costs.

“—Lack of uniformity in methods.”

A physical distribution audit covers transportation, warehousing, and order processing. When the metalworking company described began its physical distribution audit it anticipated savings of about \$1.2 million on a total physical distribution expenditure of \$40 million annually. The actual savings turned out to be closer to \$8 million, the newsletter reports.

“Identifying physical distribution costs and bringing them under rational control requires full commitment to the task and recognition that there will be some clashes along the way,” Hill states. “But where the potential for cost reduc-

tion can be as much as \$25 out of every \$100 now being spent, the ‘rigors’ of a *physical distribution audit* are not very uncomfortable, after all.”

Aetna Switches To Compact Company Cars To Conserve Energy

Aetna Life & Casualty expects to save \$1.4 million by using compact instead of intermediate size automobiles for its 3,500-car corporate fleet.

The company estimates that, over the 50,000 mile life of the cars, savings will be realized through lower fuel consumption and higher trade-in values. While the compact cars average 18 miles per gallon, the fuel demands of the intermediate cars are about 50 per cent more, Aetna explains.

Aetna representatives who are provided with fleet cars are being asked to choose between three popular compact models. Those representatives who still want an intermediate-sized car will have to pay an extra \$300 fee.

The changeover to the smaller cars should take about two and a half years to complete, Aetna says. The company expects that once the changeover is completed, its savings will conserve 1.5 million gallons of fuel annually.

Phillips-Van Heusen Announces Education Plan

The Phillips-Van Heusen Corporation, apparel manufacturer, has announced its educational assistance plan with a budget in excess of \$150,000 per year.

Included in the plan are scholarships for employees and their children, tuition refunds, management seminars, minority education, and co-op work study education.

EDP Documentation Guideline List

Developed, Issued by AICPA Committee

The importance of establishing and adhering to standards of documentation for computer systems is well understood by anyone who has ever had to learn about or review an existing system. Many have found the task to be difficult, if not impossible, because of inadequate documentation.

The AICPA's management advisory services committee on data processing reviewed material on the subject and its chairman, LeRoy Prall, George S. Olive & Co., asked committee member George Rittersbach to prepare a list of good published documentation guidelines. Those that are readily available to interested parties include the following:

—Two documents available from the U.S. Government Printing Office, Superintendent of Documents, Washington, D.C. 20402, are *National Aeronautics and Space Administration Computer Documentation Guideline*, July, 1971, 24 pp., 30¢ (Class # NAD 1.18:C73, Stock # S/N 3300-0400); and *Federal Information Processing Standards Publications*, U.S. Department of Commerce—National Bureau of Standards, various dates, \$12.00 for the continuing service and back numbers in effect (Class # C 13.52).

—*Manual of Computer Documentation Standards*, with forms, by Kuehne, Lindberg, and Baron, Prentice Hall, Englewood Cliffs, N.J., 1973, 192 pp. text and 100 pp. of reproducible (8½" x 11") forms, \$150.00. (Note: An edition with reduced size forms will be available at \$75.00.)

—*Documentation Manual* by Julia Van Duyn, Auerbach Publishers, 121 N. Broad St., Philadelphia, Pa. 19107, 192 pp., \$6.00.

—*Handbook of Data Processing Management*, by Marvin Rubin, Auerbach Publishers, 1971, six-volume set, \$140.00.

—*Documentation Standards Man-*

ual for Computer Systems by John P. Robinson and James D. Graviss, Association for Systems Management, 24587 Bagley Road, Cleveland, Ohio 44138, 1973, 98 pp., \$4.50.

—*NCR Documentation Standards Manual for Application Programming*, NCR Industry Systems Development, 5225 Spring Boro Pike, Dayton, Ohio, 45449, 1969, 100 pp., no charge.

—*IBM Management Planning Guide for a Manual of Data Processing Standards*, IBM, # GC 20-1670-2, 1971, 65 pp. Available through local IBM sales offices. (Note: A previous IBM publication, *System/360 Data Processing Standards*, contained additional valuable materials; however, it is no longer being distributed. Its number is UK Form 53-6506 or IBM World Trade Form F10-0001-0.)

—*GUIDE Data Processing Documentation Guide*, GUIDE International, Inc., 111 E. Wacker Drive, Chicago, Ill. 60601, 1972, no charge.

In addition, there are many CPA firms and others that have developed manuals on the subject of computer systems documentation and will make them available to their clients.

Manager's Ploys To Avoid Decisions Outlined by Advisers

Although decision making may be the key element of an executive's job, there are many managers who devise techniques to postpone the decision making process, observes Henry O. Golightly, Golightly & Co. International, Inc., New York management consultants.

Mr. Golightly has identified sev-

en commonly used decision postponing strategies:

1—*The time isn't right*—Mr. Golightly cites the case of an airline official whose consultants were trying to convince him to reorganize the line's information system. The executive kept saying, "The time isn't right; we're about to introduce a new airplane (or a new route, or new hostess uniforms)."

2—*Appoint a committee*—This is the wishy-washy executive's answer to the demand for a decision, Mr. Golightly believes. One executive who habitually used this tactic was finally fired for his lack of originality and true problem-solving ability, the management consultant recalls.

3—*Create a smokescreen*—Mr. Golightly remembers a situation where a president was confronted by his board with a demand to negotiate out of his company's overextended capital commitments. The president suggested an ambitious acquisition program and the directors responded by asking him for his resignation.

4—*Take a trip*—Some executives avoid decisions by coming up with reasons that they have to be out of town—to deliver a speech, attend a convention, or "measure the grass roots," the management consultant said.

5—*Hire a consultant*—This is a familiar trick. Mr. Golightly recalled one company which retained a consultant to determine the maximum age for board members, simply because the president wished to retire several and did not have the courage to tell them.

6—*Follow tradition*—Companies have slipped from leadership positions because they have avoided innovations by saying, "Well, we've always done it that way and it worked," the consultant observed.

7—*Adopt the cold feet approach*—An executive's backing away from a decision after he has made it is as bad as any decision-making delaying tactic, the consultant noted.

Not only are these tactics bad for business, Mr. Golightly warned, but they can be personally disastrous for the executives employing them.

Air Force Tries Electronic Transfer For Payrolls

The Federal Government is experimenting with a system that will substitute electronic funds transfer for paychecks to U.S. Air Force personnel, reports a recent issue of *ADP Newsletter*. The experiment is being conducted in Atlanta, Denver, Los Angeles, and San Francisco.

"Checks to Banks" is the name of the program. It entails the Air Force preparing a single magnetic tape with all deposit information for payments to participating personnel with accounts in all banks in an entire Federal Reserve District. The tape is sent to the Federal Reserve Bank where the information is electronically sorted and delivered to the individual banks involved. The commercial banks then credit the accounts of the military personnel.

"If this joint undertaking proves as successful as anticipated, it will likely form the basis for an eventual nationwide electronic funds transfer system for the Federal Government," the newsletter states.

ADP Newsletter is a biweekly publication of Management Science Publishing, a subsidiary of The Diebold Group, Inc., New York.

Systems Meeting Features Three CPA Firm Speakers

The First Annual Systems Engineering Conference, sponsored by the American Institute of Industrial Engineers, will be held November 28-30, 1973, at the Statler-Hilton Hotel in New York City. "Man and His Role in Systems" is the conference's theme.

Conference organizers have broken the main theme down into three parts: "Man and His Role in Information Systems"; "Man and His

Role in Physical Systems"; and "Man and His Role in Societal Systems."

Scheduled talks include:

—"The Industrial Engineer's Role in Data Base Management Systems," by Edward T. Shea, partner, Peat, Marwick, Mitchell & Co., New York, N.Y.;

—"Measuring the Effectiveness of New Systems," by John S. Storck, manager, management services, Touche, Ross & Co., New York, N.Y.;

—"Measuring Efficiency and Effectiveness in Governmental Activities," by Kenneth S. Caldwell, principal and director of government services, Ernst & Ernst, Cleveland, Ohio.

The "full conference" preregistered fee is \$75 for members and \$100 for non-members. A complete preview of the program is available from the American Institute of Industrial Engineers, 25 Technology Park/Atlanta, Norcross, Ga. 30071.

Most Modem Users Pleased With Units, Survey Reveals

Datapro Research has found that better than eight out of ten users of data communications modems are well pleased with the reliability, performance, and maintenance service of these devices.

The 216 modem users that responded to a *Datapro 70* questionnaire, had 11,474 installed modems, including 2,631 Bell System units and 8,843 from independent suppliers. Users of the Bell devices were no more nor less satisfied with them than were those using modems from independents.

Bell modems were rated slightly higher in hardware reliability, but independents scored higher on overall performance. The respondents rated maintenance service for all modems about equal.

All About Modems, a 36-page report which rates more than 70 popular devices and modem families

from 28 manufacturers, is available from Datapro at \$10 per copy.

Another new publication put out by the corporation is *Datapro Reports on Minicomputers*. It is an information service exclusively devoted to minicomputers. Reference reports, a monthly newsletter, quarterly supplements to the initial looseleaf reference reports, and an unlimited custom inquiry service are included in the new Datapro offering. Annual subscription to the service is set at \$250.

Datapro Research Corporation is located at One Corporate Center, Route 38, Moorestown, N.J.

Program Problems? It Pays to Advertise, California Firm Finds

Have you ever heard of a software manufacturer that freely admits its programs have bugs and lists the client companies that have found them? Now you have—Sider & Associates, Canoga Park, Calif.

"It is difficult or virtually impossible to eliminate every bug, in advance, from every new system," explained Joseph Sider, the software firm's president.

He said that in his shop every new package is thoroughly checked and tested before it goes out to the clients.

"Then, when we begin delivering the packages we utilize our customers as additional debugging programmers. This is done by offering to pay \$10 to any programmer who finds a bug of any kind in one of our products," Mr. Sider said.

When the bugs are reported back to Sider, they are corrected and other customers are notified, which helps in the packages' perfection. Mr. Sider also believes this offer to the clients' personnel gives the buyers confidence in the packages.

"It also assures customers that we think our programs are pretty nearly bug-free when we first come out with them," Mr. Sider com-

mented, "since even though the cash award is nominal, we obviously couldn't afford to do this unless we were convinced we were not going to have to pay the award too often."

Sider & Associates says it has paid out cash awards to programmers at USLIFE, American International Pictures, and Intellectron, all located in Los Angeles.

The reward sounds like a fine gimmick, but it does raise one ethical problem: since the programmer is probably working on the client company's time, should he turn the reward over to the company? In which case, it may be a very good gimmick because clients don't usually get anything but headaches for discovering their supplier's mistakes.

Drake Bakeries Finds Diskette Aids Inventory Control

Drake Bakeries, a subsidiary of Borden, Inc., is utilizing the IBM flexible diskette for its inventory control information.

Each day Drake salesmen deliver freshly baked items and remove unsold items from markets in 13 states. They analyze their stores' needs for the next day and their reports are delivered by messengers to Drake headquarters in Wayne, N. J.

At Drake headquarters, information from the salesmen's reports is recorded on the IBM 3740 data entry system's diskettes. The information is then transmitted over leased telephone lines to Borden, Inc.'s, computer center in Columbus, Ohio.

The central computer, an IBM System/370 Model 145, processes the information from 550 salesmen and composes financial and baking reports which are transmitted back to Drake headquarters. Planning, by customer and product, of what should be produced the next day is also done by the computer. It

prints the baking orders for Drake bakeries in Wayne and Irvington, N.J., and Long Island City and Brooklyn, N.Y.

Even the boxing and loading of the baked goods are directed by the system. Salesmen's orders are made up in the correct sequences for delivery to the company's sales distribution depots where the salesmen pick up their previous day's orders.

John Scagnelli, computer manager at Drake headquarters, said, "Soon we'll be able to supplement the salesmen's information with our own data, based on prior orders and sales for each market, and we will be baking to order more than ever. We expect this improved inventory control information will substantially cut the amount of unsold baked goods we must take back."

Government Bureau Issues Procurement Standards

The National Bureau of Standards has released the *Proceedings of the Fourth Users-Producers Conference*. The conference was designed to highlight the problems and advantages of the present procurement system when Government utilizes the services of professionals and professional service firms.

Copies of the proceedings can be ordered prepaid, \$2.10, from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Act of August 12, 1970; Section 3685, Title 39, United States Code)

1. Title of Publication: MANAGEMENT ADVISER.

2. Date of Filing: Sept. 28, 1973.

3. Frequency of issue: Bi-monthly.

4. Location of known office of publication: 666 Fifth Avenue, New York, N.Y. 10019.

5. Location of the headquarters or general business offices of the publishers: 666 Fifth Avenue, New York, N.Y. 10019.

6. Names and addresses of publisher, editor, and managing editor:

Publisher, The American Institute of Certified Public Accountants.

Editor, Robert M. Smith, 666 Fifth Avenue, New York, N.Y. 10019.

Managing Editor, None.

7. Owner (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given.)

Name, The American Institute of Certified Public Accountants, (a professional association organized as a nonprofit, non-stock corp.). Address, 666 Fifth Avenue, New York, N.Y. 10019.

8. Known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages or other securities (If there are none, so state): None.

10. For completion by nonprofit organizations authorized to mail at special rates (Section 132.122, Postal Manual). The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes:

Have not changed during preceding 12 months.

11. Extent and nature of circulation:

A. Total no. copies printed (Net Press Run). Average no. copies each issue during preceding 12 months: 18,489. Single issue nearest to filing date: 16,260.

B. Paid circulation

1. Sales through dealers and carriers, street vendors and counter sales. Average no. copies, each issue during preceding 12 months: 15. Single issue nearest to filing date: 5.

2. Mail subscriptions. Average no. copies each issue during preceding 12 months: 13,948. Single issues nearest to filing date: 13,600.

C. Total paid circulation. Average no. copies each issue during preceding 12 months: 13,963. Single issue nearest to filing date: 13,605.

D. Free distribution by mail, carrier or other means.

1. Samples, complimentary, and other free copies. Average no. copies each issue during preceding 12 months: 973. Single issue nearest to filing date: 1,101.

2. Copies distributed to news agents, but not sold. None.

E. Total distribution (Sum of C and D). Average no. copies each issue during preceding 12 months: 14,936. Single issue nearest to filing date: 14,706.

F. Office use, left-over, unaccounted, spoiled after printing. Average no. copies each issue during preceding 12 months: 3,553. Single issue nearest to filing date: 1,554.

G. Total (sum of E & F—should equal net press run shown in A): Average no. copies each issue during preceding 12 months: 18,489. Single issue nearest to filing date: 16,260.

I certify that the statements made by me above are correct and complete.

ROBERT M. SMITH

(Signature of the editor)

I give to the American Cancer Society, Inc. (or to its Division) the sum of dollars to be used for the general purposes of the Society.

There's such an easy way to help fight cancer. With a bequest in your will. All you have to do is ask your attorney to insert one simple sentence—like the one above. With those words you will have offered the next generation a precious legacy. The gift of hope. Thanks to medical science and research, that legacy could be a gift of life. Could anything be

Add us to your will.

easier—or more valuable? To know that your money will be used to help win the grinding battle against cancer. It only takes a few minutes to have us added to your will. Which just might be the most rewarding few minutes you've ever spent in your life.



Please.

Many companies, caught in the recent credit crunch, found it essential to improve cash flow. But what of companies operating overseas, companies moreover that had always concentrated on accounts receivable—

REVERSING FINANCIAL GOALS OVERNIGHT IN AN INTERNATIONAL COMPANY

by Leo G. Blatz

Singer Sewing Machine Company

THE SINGER COMPANY has come a long way since its organization as a sewing machine company in 1851. It has expanded both in size and in number of products produced. In recent years it has diversified so widely, its activities today cover five major business areas—consumer products, industrial products, aerospace and marine systems, business machines, and education and training products.

Total sales for all areas in 1972 exceeded \$2 billion.

To manage this broad range of business activities, the Company is organized into eight operating groups. Each of these groups is a

good size business in itself. The Company's planning process is directed by a Corporate Staff Department which has the responsibility of setting broad directions for the operating groups and for monitoring the planning processes of the groups to ensure that they are consistent with the Company objectives and in harmony with the planning of other groups.

The International Consumer Products Group, while principally concerned with household sewing machines, also sells industrial sewing machines, household knitting machines, and a variety of other consumer durable products depending on local business opportunities.

The International Consumer Products Group does business in some 100 countries. In many of these countries, Singer was the first American company to be there—80 to 100 years ago. The Company's products are bought by both consumers and artisans. The sewing machine has been a very vital product in the development of societies from primitive forms to the varying stages of civilization that we see today. Singer has helped to make this development possible. It has provided product distribution in areas of the world that were previously considered inaccessible, augmented by education and instruction so that people could bene-

. . . each local manager leaves . . . with an agreed set of targets for his budgeting practice

ficially use the Company's products. Perhaps most importantly, the Company has provided consumer financing in parts of the world that had known only a cash or barter economy. Needless to say, being a pioneer in installment-plan selling was both an opportunity and a risk. But the lessons have been learned well and Singer has grown proficient in managing the financial side of its business.

The International Consumer Products Group has annual sales of approximately \$250 million. There are some 22,000 employees in the 100 countries, and a staff organization in New York.

Certain of the smaller countries are combined for management purposes within regions so that one reporting location may comprise several countries, such as the islands that make up the Caribbean area. Each reporting location has a Controller/Treasurer who is responsible for the financial aspects of the local business. The consolidation process is done in New York from reports cabled in from the field one day of each month.

The Group is furnished with Corporate objectives by the Corporate Planning Department. Using a computer facility, projections are prepared covering five years of income statements for each reporting

location in the Group as well as a consolidated projection for the total Group. These projections are then compared with the Corporate objectives. When the Group projections indicate performance better than the Corporate objectives, it is an indication that the Group is on the right track. On the other hand, if Group projections fall short of the objectives, there is a planning gap. Then objectives must be re-examined. If it can be agreed that the objectives are realistic and attainable, it is up to the Group management to devise strategies and plans that will bring the attainment of these objectives.

Budget guidelines are compared to the business plan and if they are found to be acceptable, they are given to local management. It is possible to communicate with local managements in a series of three meetings at various locations around the world. This tends to minimize the amount of travel by local managers. It also permits dealing with people from fairly homogeneous areas of the world in each meeting. Well in advance of these planning meetings, each local Manager receives a copy of the budget guidelines for his country. He comes to the planning meeting prepared to give a brief presentation on how his management will

achieve budget guidelines. If he feels that he can not accept the budget guidelines, he must offer alternative targets for the coming year. Where disagreements exist, they are settled in private negotiations and each local manager leaves the meeting with an agreed set of targets for his budgeting process. In due course, the local budgets are prepared and sent to New York for the final consolidation and presentation to the corporation. This kind of a process ensures a minimum of last minute surprises and forced budget changes.

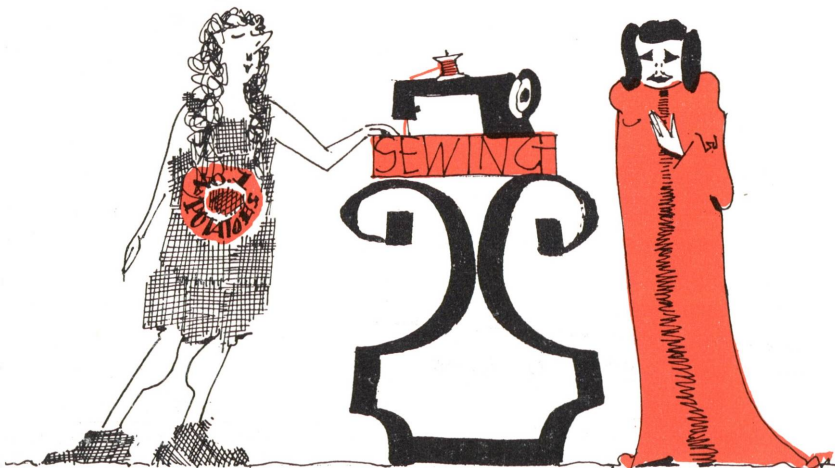
In other words, Singer is a classic case of a decentralized, international company where each unit in the field has considerable autonomy.

In addition to the five-year business plan and the annual budget, the Company employs a quarterly forecasting technique which is, in essence, an up-dating of the budget objectives for the current year. The Group also prepares each month a brief rolling forecast of the coming three months. This has proven to be a very valuable management tool at the local level and it enables management to react quickly to impending unfavorable developments.

On the philosophical aspects of budgeting, the Group has established certain basic rules:

- The budget must establish goals. These goals should be attainable but challenging.
- The budget should be realistic.
- Every location should budget for improvements.

On the other side of the coin, we recognize that a budget is sometimes more than a control and planning tool. There are times when a budget becomes a political document. The following are some of the types of budgets that have been identified as being unacceptable.



The Company's product has been vital in the development of societies from primitive forms to the stages of modern civilization we see today.

The "low-ball" budget is one where all of the targets are set unrealistically low and improvements are either understated or non-existent. The intent is to provide a comfortable assurance that when the actual results come in they will look good relative to budget. Submission of this kind of a budget is a good way of insuring that the budget will be done twice.

There is another type of budget that can be called an "impossible dream." This is the budget that predicts an unattainable performance. This kind of budget has obvious short-range benefits. It also can lead to a long-term disaster.

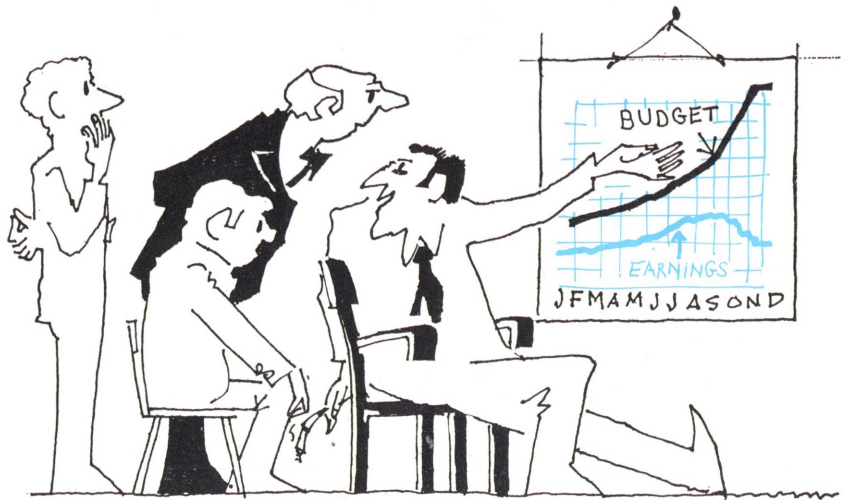
Now with this system, painstakingly worked out over nearly a hundred years, what happens when the entire process and approach has to be changed suddenly? That is exactly the situation we faced recently . . .

In setting Corporate objectives for a recent year, the management recognized that American business was experiencing a credit squeeze. Large, reputable companies were having serious problems of liquidity. Hence, the planning objectives given to the operating groups for that year called for vigorous efforts to reduce assets and improve cash flow, without jeopardizing income from operations. The results of the planning exercise within the International Consumer Products Group indicated that they would be barely able to meet the Corporate objectives by doing things as they had done them in the past. There was no margin for error and the management was not at all comfortable with the idea of running the business for a year on that basis.



LEO G. BLATZ is vice president of the Singer Sewing Machine Company and director of finance and accounting for the International Group of the Singer Company. Before joining Singer, he was corporate chief accountant for

Servel, Inc., defense accounting supervisor for Timex, Inc., and plant accounting supervisor for Sylvania Electric Products. Mr. Blatz received his B.B.A. from Niagara University, New York. He has been a speaker at the Planning Executives Institute.



The "low-ball" budget: Targets are set unrealistically low so that actual results will look good in comparison to forecasts—

Clearly, it had to achieve a very delicate balance between the kind of aggressive and expansive selling practices that would maintain sales growth on the one hand. And, on the other hand, management needed conservative, cash-oriented practices that would provide the desired reduction in consumer accounts receivable investment.

Obviously, the company had to guard its cash position by reducing investment in installment receivables. Equally obviously, this represented some change in direction in a business that had been built over the years on an extension of credit.

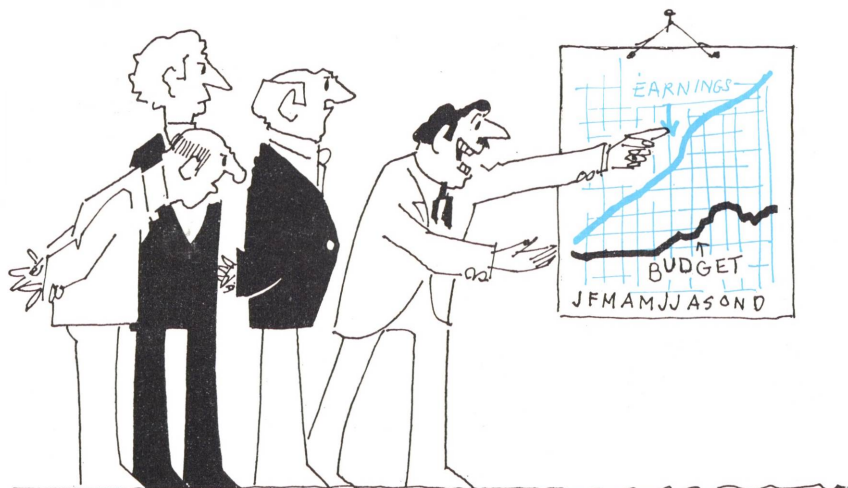
One thing was certain, the job could not be done in the Corporate offices in New York.

Here was a situation where the

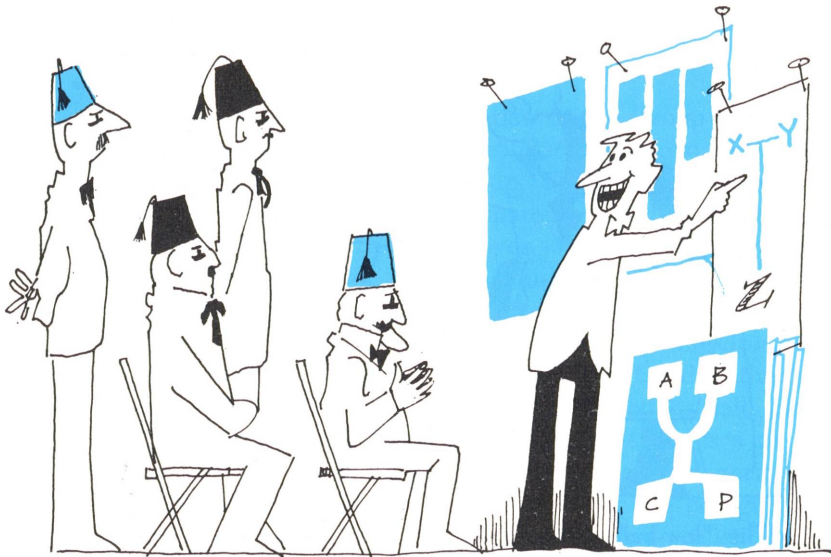
top level management of the Group knew what it wanted in terms of performance, asset utilization, return on capital, and so on. But on the firing line, where it really counted, that is, the clerk in the shop, the canvassing salesman visiting a prospect's home, things were not happening in ways that would bring about achievement.

After considering many different approaches to the problem, the Group management found what it believed to be the answer.

For many years the training of employees has been an integral part of the Company's business. Here was the perfect vehicle for getting the message to the employees. What was needed was a program to redirect and invigorate



—and the "impossible dream" budget that predicts an unattainable performance.



On the first day of a regional meeting, the country's receivable status was presented in the form of charts that had been prepared at Group headquarters—

the training activity. Hopefully, if this could be done, the employees themselves would carry out the new program.

One of the first requirements was a name for the program—one that would catch people's fancy and suggest something much more than the same old thing—even though that's what it really was. And so was born MMM—MODERN MERCHANDISING METHODS.

To be successful, a program must have goals. The Group defined its goals as the following, not necessarily in the order of importance:

- Reduce the absolute level of receivables.
- Improve the quality of receivables.
- Accomplish the foregoing without seriously impacting the level of sales.

To reach these goals, it was decided to deal with averages. In other words, the salesman would not turn away the customer who had to have 24 months to pay, but he would concentrate on those customers who could afford to pay in less than 24 months.

Thus, the terms of reference became:

- Average level of cash sales.
- Average per cent of down payment.
- Average length of contract.

Before assigning objectives to the individual countries, Group management tested the sensitivity of the various measurements agreed upon. The results of the sensitivity study brought out very clearly the size and difficulty of the task management had set out to accomplish. At the outset of any program to improve installment receivables, there is on the books a body of existing contracts which will be collected over a specified future time period. There is very little that

management can do to change this. Therefore, a change in the average length of contracts sold from 24 to 22 months results in a reduction of investment of only 2 per cent at the end of one year. It is only after two years that the mix changes significantly between new contracts and old contracts, and at that point the investment is reduced by 8.1 per cent. With down payments, the effect of a rather drastic change from an average 10 per cent to an average 15 per cent is to reduce investment by 3.6 per cent in one year and 4.0 per cent at the end of two years.

To carry this message to the field organizations, the Group organized a series of regional meetings. By holding meetings in Caracas, Mexico City, Singapore, and Istanbul, it was possible to bring the message to the people who had to do the work in a relatively short period of time. Each meeting was attended by a group that operated in roughly the same kinds of marketing conditions.

On the first day of a regional meeting, the country's receivable status was presented to the audience in the form of charts that had been prepared at Group headquarters. These charts depicted cash sales, average down payments, and average length of contract. The MMM training was presented by the Group's Training Director. It was a thorough review of all the basic rules of selling, including those that directly affect the level of receivables and those that do not.

The motivation portion of the first day's agenda was devoted to various types of salesmen's compensation plans. The basic aim of these compensation plans is to provide the salesmen with an incentive for doing what is best for the Company. Thus, a higher commission is paid on the sale of a sewing machine as opposed to a product that is not manufactured by Singer. A higher commission is paid on a cash sale than on a credit sale. A higher commission is paid on a sale with a short contract than on a sale



—on the second day, representatives of each country gave the Group an outline of detailed plans for achieving the goals presented to them.

with a long contract. In cases where variable commissions are not practical, bonuses are used to achieve the desired results.

Next, the program objectives and means of measurement were introduced to the people at the conference. The conference leaders outlined in a general way how they thought a typical MMM program should be organized at the country level. Essentially it is a pyramid-type training program where the training message is passed, starting at the very top of the organization, down the various levels by each supervisor to his subordinates.

On the second day of the meeting, representatives of each country presented to the Group an outline of their detailed program for accomplishing the objectives that had been set before them on the previous day. The level of enthusiasm generated in the first day's session was such that country representatives worked long into the night to prepare their program for presentation on Day 2. A real spirit of competition developed with each country endeavoring to present the most effective program.

After the conference, representatives from each country returned to their homes and began implementing their local MMM program. Each country was required to submit a progress report after 30 days. The results of the programs were monitored at Group headquarters.

The follow-up of MMM programs is a continuing function. In the second half of the year, the Group entered a stage that could be called "fine tuning." They found that some countries had gone too far with MMM with the result that their sales were affected adversely. In these countries they recommended some relaxation of the objectives, but only for a specified period of time and in the form of a sales promotion. For example, in one country, they authorized a 30-day promotion based on a 5 per cent down payment. However, the salesman was trained and motivated to point out the advantage to the customer of making a higher

down payment. As a result, the average down payment during the period of this promotion was 10.1 per cent.

Results

The program is now in its third phase, wherein Group management has analyzed a year's performance and identified those locations which exceeded their objectives and those locations that did not make their objectives.

It is now tailoring specific programs for the problem countries as a follow-up to the MMM program of the previous year.

The all important question is, of course, how did it all turn out? For last year, the Group came within 1 per cent of meeting its sales commitment. Management is convinced that the sales they did not get were the problem sales that they really did not want. Group net income commitment for the year was not only equaled: it was exceeded! The Group ended the year with a lower investment in receivables compared to the prior year despite higher sales. Receivable turnover ratio improved by 10 per cent over the year before and this was even better than the objective. Installment arrearage as a percentage of gross receivables improved by 2.4 points. The cash flow budget for the year was exceeded and turnover of capital employed increased significantly. These results were achieved because the management of the Group made the effort to direct its attention, in an organized way, to the basics of sensible selling and good management.

This then has been one experience in taking the steps that come after the planning process. They might be summarized as follows:

- 1—Develop the program.
- 2—Communicate the program to every level of the organization.
- 3—Follow up on the results.
- 4—Adjust the program when required.
- 5—Never lose sight of the basic objectives.

How did it all turn out?

For last year, the Group came within one per cent of meeting its sales commitment . . . Group net income commitment for the year was not only equaled: it was exceeded! The Group ended the year with a lower investment in receivables compared to the prior year despite higher sales.

As profits decline and competition increases, small businesses find computer technology increasingly necessary. But small businesses aren't too well versed in the art. Here's what they might do—

A COMPUTER-BASED FINANCIAL MANAGEMENT SYSTEM FOR SMALL BUSINESS

by Hui-Chuan Chen

University of Alabama

and Russell C. Kick, Jr.

University of North Florida

HOW CAN the small businessman survive in today's world of greater competition, narrower profit margins, and increasing volumes of work? While his giant competitors have relied more and more upon the computer for survival, the small businessman has virtually ignored the capabilities of computer technology. This has made it exceedingly difficult for him to develop the information necessary for effective planning and control; information vital for survival in today's world.

The purpose of this article is to present a computer-based financial management system which can be tailored to meet the needs of any small business. It is the authors' contention that more accurate information for decision-making through computer-based management systems will greatly contribute to the health and growth of

small business. The objectives of this system are: (1) to perform routine accounting functions at a reasonable cost; (2) to improve long-run growth prospects through efficient resource allocation; and (3) to improve the financial position and profitability of a firm.

System overview

The system is a *small business* information system and is called SMALBIS. SMALBIS is comprised of two subsystems: the planning subsystem and the reporting subsystem. Both subsystems rest conceptually upon the foundation of matrix accounting, a technique which reduces the need for the traditional double entry method of accounting. It is the authors' belief that matrix accounting significantly reduces the amount of work re-

quired to generate input data for a planning model and the workload required to collect and process accounting data. The matrix concept is used to illustrate the financial data base of the system in Exhibit 1, page 21.

Each cell in the matrix represents an account or item included in the data base. From Exhibit 1 it can be observed that any cell in the matrix is accessible by virtue of a column and row address. This permits the financial data base to be randomly updated, and puts a wealth of financial information at the fingertips of the manager.

The financial data base contains information which can produce the following statements: income statement, balance sheet, funds statement, and budget statement. In addition, a statement of financial analysis (significant financial ratios)

can be produced. These statements, or any portion thereof, can be produced periodically or upon demand through a terminal or via batch processing.

The data base can be used in two modes: the planning or simulation mode, and the accounting system mode. In the planning mode, the user inputs data which represents his judgment as to what future transactions will be (or should be) over the next fiscal year. These transactions working in conjunction with the data base will produce proforma financial statements. After a number of iterations, when the user is satisfied with the proforma statements, the data on the proforma statements is used as input to the data base as the forecasted values for the ensuing fiscal year.

In the accounting system mode, the matrix serves as the repository for accounting data. The data base is updated with transactions periodically and at the end of each period (or upon demand), financial statements are produced (income, balance sheet, funds, budget, financial analysis) which reflect: the period's data, year-to-date data, last year's comparable data, and the forecasted data. This is true for each item on every statement. Thus, the matrix takes on several new dimensions to reflect the different amounts carried for each account and item. This concept appears in Exhibit 2, this page.

The foundation of the system is a bridge which links the data base to the routine transactions of the firm. The bridge is built by defining the routine transactions, assigning a code to them, and developing a decision table which relates each transaction to the appropriate cells in the matrix. The decision-table is the heart of the system as it maps transactions to the data base. This concept appears in Exhibit 3, page 22.

With this decision-table, all the user need do in either mode, is to enter the appropriate transaction code and the amount of the transaction. The decision-table will specify what accounts are to be up-

EXHIBIT 1
Matrix Data Base Concept

	REVENUE AND EXPENSE ACCOUNTS	ASSET ACCOUNTS	LIABILITY AND EQUITY ACCOUNTS	FUND ITEMS	BUDGET UNIT ITEMS
SALES	X				
COST OF GOODS SOLD	X				
SELLING EXP.	X				
ADM. EXP.	X				
FEDERAL TAXES	X				
CASH		X			
ACCTS. REC.		X			
INVENTORIES		X			
LAND		X			
BUILDINGS		X			
DEPRECIATION		X			
ACCTS. PAYABLE			X		
LONG-TERM DEBT			X		
COMMON STOCK			X		
RETAINED EARNINGS			X		
INC. IN LONG-TERM DEBT				X	
SALE OF PROPERTY				X	
PAYMENT OF DEBT				X	
INC. IN INVENTORIES				X	
DEPT. A REVENUES					X
DEPT. A COST OF GOODS SOLD					X
DEPT. C COST OF GOODS SOLD					X
DEPT. C PAYROLL EXP.					X
DEPT. C SUPPLIES					X
DEPT. C EQUIPMENT					X

EXHIBIT 2
Expanded Matrix Data Base Concept

	REV. & EXP. ACCTS.	ASSET ACCTS.	LIABILITY AND EQUITY ACCTS.	FUND ITEMS	BUDGET ITEMS
FORECASTED DATA					
LAST YEAR'S DATA					
THIS YEAR'S DATA					
SALES					
COST OF GOODS SOLD					
SELLING EXP.					
ADM. EXP.					
FED. TAXES					
CASH					
ACCTS. REC.					
INVENTORIES					
LAND					
BUILDINGS					
DEPRECIATION					
ACCTS. PAY.					
LONG-TERM DEBT					
COMMON STOCK					
RETAINED EARNINGS					
INC. IN LONG-TERM DEBT					
SALE OF PROPERTY					
PAYMENT OF DEBT					
INC. IN INVENTORIES					
DEPT. C REVENUES					
DEPT. C COST OF GOODS SOLD					
DEPT. C PAYROLL EXP.					
DEPT. C SUPPLIES					
DEPT. C EQUIPMENT					

EXHIBIT 3

Transaction—Data Base Bridge

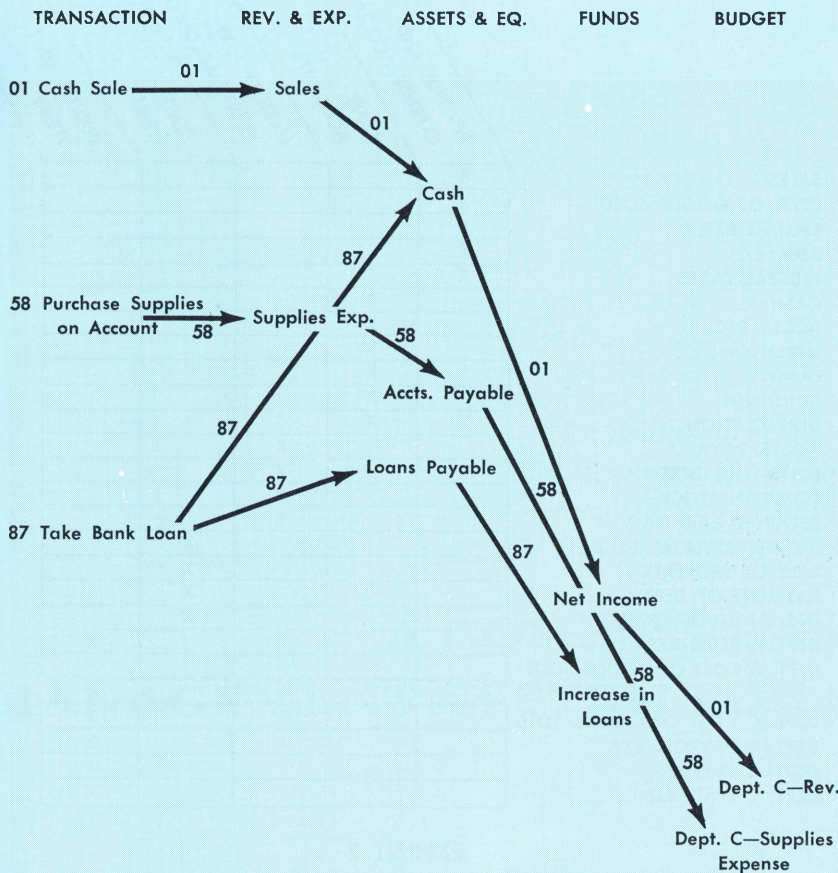


EXHIBIT 4

Proforma Income Statement

Knox Manufacturing Co.
December 31, 1974

	Projected
Gross Sales	\$3,300,000
Sales Returns and Allowances	\$ 130,000
Sales Discounts	\$ 160,000
Net Sales	\$2,910,000
Cost of Goods Sold	\$1,000,000
Gross Profit	\$1,910,000
Expenses	
Selling	\$ 915,000
Administration	\$ 530,000
Depreciation	\$ 120,000
Total Expenses	\$1,565,000
Net Operating Profit	\$ 345,000
Other Expenses:	
Interest	\$ 15,000
Net Income Before Taxes	\$3,300,000
Federal Income Taxes	\$ 165,000
Net Income After Taxes	\$ 165,000

dated and whether the account is to be increased or decreased. Thus, only two pieces of data are necessary to update the data base, although for accounting purposes a transaction date and reference will also be needed.

The financial management system is generalized because virtually any firm can use the system without the necessity of altering its transaction codes or chart of accounts. The series of tables built into the software will relate the unique characteristics of any firm to the logic of the system.

Case study

A case study will be presented to illustrate the fundamental concepts of the system. The case study centers on a hypothetical company, the Knox Manufacturing Company. Knox Manufacturing, a small company with sales of approximately \$3,000,000, would like to computerize its accounting system and desires to incorporate some financial planning techniques into its management process. Knox decides to use SMALBIS and the steps required to implement the system follow:

1. Build the financial data base.



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in industrial engineering from the University of Alabama, and her Ph.D. in operations research from the State University of



New York at Buffalo. RUSSELL C. KICK, Jr., is assistant professor of accounting at the University of North Florida, Jacksonville. Previously he was a consultant to the Alabama Commission on Higher Education, director of M.I.S.

for the University of Alabama, senior systems planner for Eastern Airlines, and programmer/analyst for Ormond Beach First National Bank. He is a doctoral candidate in finance at the University of Alabama and holds a certificate in data processing.

2. Define the routine accounting transactions.
3. Complete the decision tables which relate the transactions to the data base.
4. Use the system in the planning mode.
5. Use the system in the operating mode.

Build financial data base—In order to use the system in either mode, the user must first convert his accounting files to the data base format of the system. This is accomplished by completing specialized forms designed for this purpose.

Define routine accounting transactions—The user defines the accounting transactions which form the nucleus of all transactions. These are the transactions which can be anticipated in advance (except for amount), i.e., cash sale, payment on account, purchases on account. Ninety to ninety-five per cent of all transactions should fall into this category. Other transactions are treated as exceptions which are handled by the system in the normal double entry method.

Complete decision tables—The routine transactions are assigned a code and entered on a transaction definition form. This form relates each transaction to specific accounts and also specifies the logic required for each transaction. For example, a cash sale would debit cash, credit sales, add to the net income account in the funds file, and add into the revenue account in the budget file.

Use system in planning mode—Knox management creates forecasted transactions for 1974 and inputs them to the system. Proforma statements (balance sheet, income statement, funds statement, and statement of financial analysis) are produced which management analyzes. This process is repeated until management is satisfied with the projected values on the statements. The final set of statements represents the "picture" of the company which management would like to have at the end of 1974. The proforma income statement and

EXHIBIT 5

Proforma Statement of Financial Analysis

Knox Manufacturing Co.
December 31, 1974

	Projected
Current Ratio	2.40
Quick Ratio	1.20
Leverage	0.50
Times Interest Earned	15.00
Inventory Turnover	4.40
Average Collection Period	48 Days
Fixed Asset Turnover	1.46
Profit Margin	0.50
Return on Assets	0.03%
Return on Net Worth	0.09%
Earnings Per Share	5.10
Book Value Per Share	33.39

EXHIBIT 6

Transaction Register (Debit Record)

Knox Manufacturing Co.

31-12-72

Account Number	Tran. Code	Ref.	Date	Budget Unit	Amount	Explanation
199302	0	SL001	12-01	0	50,000.00	Pur. Treas. Stock
110620	1	SJ001	12-03	300107	140,000.00	Cash Sale
112740	2	SJ002	12-03	300107	40,000.00	Credit Sale
110620	3	CR001	12-07	0	50,000.00	Receive Paymnt. on Ac.
143108	4	CJ009	12-09	0	100,000.00	Purch. Raw Materials
64133	6	GJ001	12-11	0	1,000.00	Decr. Prepd. Expenses
24891	7	GJ002	12-12	0	324,000.00	Cost of Goods Sold
190016	12	CJ010	12-12	0	5,000.00	Inc. Insurance Depos.
110620	17	CR002	12-15	0	50,000.00	Sell Buildings
192411	18	CJ011	12-15	0	20,000.00	Purchase Equipment
64133	22	GJ003	12-16	0	10,000.00	Depreciation Charge
194506	23	CJ012	12-16	0	5,000.00	Inc. Deferred Charges
110620	1	SJ003	12-16	300107	20,000.00	Cash Sale
110620	1	SJ003	12-18	336212	150,000.00	Cash Sale
110620	1	SJ004	12-18	352207	170,000.00	Cash Sale
112740	2	SJ005	12-19	300107	20,000.00	Credit Sale
112740	2	SJ006	12-19	336212	50,000.00	Credit Sale
112740	2	SJ007	12-20	352207	70,000.00	Credit Sale
110620	25	CR003	12-20	0	20,000.00	Inc. Notes Payable
196307	27	CJ013	12-22	0	40,000.00	Make Payment on Acct.
110620	30	CR004	12-22	0	50,000.00	Finance with Bonds
65820	32	CJ014	12-23	0	6,000.00	Interest Expense
41160	36	CJ001	12-23	300107	17,000.00	Payroll Expense
41160	36	CJ002	12-23	336212	16,000.00	Payroll Expense
41160	36	CJ003	12-25	352207	18,000.00	Payroll Expense
64133	37	CJ004	12-25	300107	5,000.00	Supplies Expense
64133	37	CJ005	12-27	336212	4,000.00	Supplies Expense
64133	37	CJ006	12-27	352207	3,000.00	Supplies Expense
64133	38	CJ007	12-28	300107	5,000.00	Equipment Expense
64133	38	CJ008	12-29	336212	2,000.00	Equipment Expense
64133	38	CJ008	12-29	352207	2,000.00	Equipment Expense
84163	40	CJ015	12-30	0	40,000.00	Pay Common Dividend
34176	41	CJ009	12-30	352207	5,000.00	Selling Expenses
Total =				1,508,000.00		

statement of financial analysis appear in Exhibits 4 and 5, pages 22 and 23.

The entire set of proforma statements represents the financial planning strategies of the company and

budgets are then produced as the vehicle for implementing the plans. The 12 month projected data is broken down on a month-by-month basis and each month's forecasted value is used as input to the data

EXHIBIT 7

Income Statement

Knox Manufacturing Co.
December 31, 1974

	Last Year		Actual		Projected	
	Month	Yr.-to-Date	Month	Yr.-to-Date	Month	Yr.-to-Date
Gross Sales	\$250,000.00	\$3,250,000.00	\$300,000.00	\$3,400,000.00	\$300,000.00	\$3,300,000.00
Sales Returns and Allowances	\$ 1,910.00	\$ 130,000.00	\$ 2,000.00	\$ 130,000.00	\$ 3,000.00	\$ 130,000.00
Sales Discounts	\$ 90.00	\$ 86,000.00	\$ 200.00	\$ 110,000.00	\$ 300.00	\$ 160,000.00
Net Sales	\$248,000.00	\$3,036,000.00	\$297,800.00	\$3,160,000.00	\$296,700.00	\$2,910,000.00
Cost of Goods Sold	\$116,000.00	\$ 825,000.00	\$160,000.00	\$ 900,000.00	\$190,000.00	\$1,000,000.00
Gross Profit	\$132,000.00	\$2,211,000.00	\$137,800.00	\$2,260,000.00	\$106,700.00	\$1,910,000.00
Expenses						
Selling	\$ 66,000.00	\$1,002,760.00	\$ 64,400.00	\$ 996,000.00	\$ 43,650.00	\$ 915,000.00
Administration	\$ 30,150.00	\$ 770,800.00	\$ 32,400.00	\$ 690,000.00	\$ 22,050.00	\$ 530,000.00
Depreciation	\$ 10,000.00	\$ 120,000.00	\$ 10,000.00	\$ 120,000.00	\$ 10,000.00	\$ 120,000.00
Total Expenses	\$106,150.00	\$1,893,560.00	\$106,800.00	\$1,806,000.00	\$ 75,700.00	\$1,565,000.00
Net Operating Profit	\$ 25,850.00	\$ 317,440.00	\$ 31,000.00	\$ 354,000.00	\$ 31,000.00	\$ 345,000.00
Other Expenses:						
Interest	\$ 850.00	\$ 10,240.00	\$ 1,000.00	\$ 14,000.00	\$ 1,000.00	\$ 15,000.00
Net Income Before Taxes	\$ 25,000.00	\$ 307,200.00	\$ 30,000.00	\$ 340,000.00	\$ 30,000.00	\$ 330,000.00
Federal Income Taxes	\$ 12,500.00	\$ 153,600.00	\$ 15,000.00	\$ 170,000.00	\$ 15,000.00	\$ 165,000.00
Net Income After Taxes	\$ 12,500.00	\$ 153,600.00	\$ 15,000.00	\$ 170,000.00	\$ 15,000.00	\$ 165,000.00

base along with the approved budget.

Use system in accounting system mode—Knox enters its normal operating cycle for 1974. At the end of each period, financial statements are produced which show period, year-to-date, comparable last year and forecasted data. In addition, a transaction register (Exhibit 6, page 23) and a general ledger are produced as an audit trail.

The income statement and state-

ment of financial analysis produced at the year's end are shown in Exhibits 7 and 8, both of which appear on this page.

The information on the entire set of financial statements is indispensable for control purposes. At the end of each month (or upon demand), management can measure projected data, actual data, and last year's data. If management feels current performance is not meeting expectations, it can

take the necessary corrective action to put the company back on course.

Summary

The financial management system known as SMALBIS generates financial information heretofore unavailable to small businesses. This information is accurate and timely and is delivered at a reasonable cost. With a wealth of information he has never had before, the small businessman will be in a better competitive position because he can manage his business more efficiently.

The financial management system presented in this article is easily adapted to virtually any small business. Ideally, a service bureau would offer this system and small businesses would contract with the service bureau for the use of the system. Thus, any small business could have the tools of financial planning previously only in the domain of big business. These tools in concert with the reasonably-priced accounting system will provide the information vital to survival in today's business world.

EXHIBIT 8

Statement of Financial Analysis

Knox Manufacturing Co.
Statement of Financial Analysis
December 31, 1974

	Last Year	Actual	Projected
Current Ratio	1.70	2.00	2.40
Quick Ratio	0.80	1.00	1.20
Leverage	0.50	0.50	0.50
Times Interest Earned	14.71	15.00	15.00
Inventory Turnover	4.50	4.60	4.40
Average Collection Period	45 Days	45 Days	48 Days
Fixed Asset Turnover	1.65	1.50	1.46
Profit Margin	0.05	0.05	0.05
Return on Assets	0.04%	0.03%	0.03%
Return on Net Worth	0.08%	0.07%	0.09%
Earnings Per Share	4.79	4.75	5.10
Book Value Per Share	32.19	33.10	33.39

Traditionally, one of the more bewildering problems facing business has been the wide variety of product identification numbers. Now there's hope. Here is—

A UNIVERSAL DISTRIBUTION NUMBER SYSTEM

*by Eugene H. Kramer
Wolf and Company*

*and Edward A. Altshuler
Management Horizons*

AT ITS 1970 CONVENTION, the National Association of Wholesaler-Distributors made a decision which could have significant effects throughout American business. Paul L. Courtney, the organization's executive vice president, was authorized to create a new entity, the Distribution Number Bank, Inc.

The new organization's purpose: to establish a new and important service for all industries and all channels of distribution. The service: to design a universal numbering code which could be used to identify all products for both manufacturer and buyer.

For nearly 50 years, businessmen have struggled with the problem of simplifying the catalog numbers which identify products and their makers. The advent of the computer and its use for purchasing, inventory management, billing, sales analysis, and other information input and output purposes had further complicated the identification of products. There was lack of uniformity in number length; alphanumeric codes were used as well as straight number codes. Some manufacturers even used special symbols in their product designations.

In addition there was duplica-

tion of product designations within different industries. Since many products go to market through a number of different product channels, it had become impossible for any one industry to assign product code designations that wouldn't conflict with those in use in another industry. Some industry associations had made a start in assigning manufacturers identification code numbers but the practice was far from universal.

Inter-industry cooperation

Several industry associations did cooperate with each other in as-

The creation of a unique identification for every manufacturer . . .

signing manufacturer identification code numbers.

The numbering system initiated by the electrical industry, consisting of a four-digit manufacturer number and a five-digit product code, was the genesis of the DNB code system. Through the addition of only two more spaces, the code can accommodate up to one million different manufacturer firms.

First steps

Following the approval of the formation of DNB in January, 1970, Donald F. Martin was named president of the program. Mr. Martin

business going to market through the food stores of America includes a substantial dollar amount of non-food products, the close affinity of DNB with the national trade associations in these areas was most valuable.

Subsequently many associations officially adopted the DNB numbering system. The electrical, welding, heating, electronic, air-conditioning, and automotive equipment and supplies industries are well on their way. The Wholesale Stationers Association has also appointed a committee to start the program.

Many businessmen have been alarmed at the increasing volume

tify each manufacturer. Such assignment, without duplication, can now be accomplished by one organization, Distribution Number Bank, Inc.

The DC System uses a six-digit number to identify each manufacturer, coupled with a five-digit number to identify each of the manufacturer's products. The combination of these two elements into one 11-digit number identifies one, and only one, item.

Because there are some 400,000 known domestic manufacturers of goods, six numeric characters are required to give each one its own individual number. Large firms can



has a great deal of experience in both electronic data processing systems and educational programs.

The first step taken by Mr. Martin, following formation of DNB, was to find a ready client and offer the special services of his organization. The Grocery Product Code Council, an incorporated enterprise of the food industry, whose mission paralleled that of DNB, accepted the offer.

This group of manufacturers, wholesalers, and retailers—including most of the major producers and retailing giants—needed an independent entity to administer their program. Since the volume of

of paper work which must be processed each day. Most of this data involves items bought and sold. Any refinement of existing methods for massaging this data is welcome. The creation of a unique identification for every manufacturer and each of his products eliminates many of the internal administrative chores of distribution. Adoption of an acceptable code makes possible savings in purchasing and inventory control, and speeds order processing, warehouse operations, and field sales services.

The basis of such a Distribution Code (DC) System is the assignment of a unique number to iden-

be assigned different numbers for each division. The DC system can accommodate 999,999 manufacturers, their divisions or departments. That capacity provides a large safety factor for future growth in the number of manufacturing establishments. According to Internal Revenue Service data, it will be sufficient to handle present and future manufacturing businesses at least until the year 2000.

The second part of the DC system number identifies every separate item a manufacturer produces. This part of the number consists of five digits and will accommodate 99,999 items produced

... and each of his products eliminates many of the administrative chores of distribution

by each manufacturer in each division.

One example of increased efficiency through the DC system is in ordering or reordering products. With current methods, an order clerk may write:

144 60 watt, white, frosted,
standard-base light bulbs
The XYZ Electric Mfg. Co.
Lamp Division
7516 Goshen Street
San Francisco, California 90101

With the DC system, he could have recorded all that data far more simply by writing:

144 123456-12345

Accuracy is the reason for an all-numeric code. Telephone companies have spent millions of dollars converting telephone numbers from alpha-numeric to all numeric. People read numbers more accurately than letters and/or combinations of letters and numbers. In typing or key punching, there is less chance for error if only combinations of 10 numbers are used, as compared to the 26 keys needed for letters or 36 for numbers and letters.

The DC system is an easy, low-cost method of product numbering. Sequential numbering is simple to set up and seldom needs revision. With products identified by rela-

computer. This should reduce paper work, chance for errors, and greatly shorten response time throughout the distribution process.

When a wholesaler-distributor begins to use a computer, he realizes that each item in his inventory must be assigned a unique number. Assigning and maintaining these numbers is an essential; it is time consuming; and the initial setup is expensive.

However, if a wholesaler-distributor has been using DC numbers in his manual system to save time and errors in purchasing, the need to assign numbers is eliminated. His employees are already accus-



Supermarket check-out counters will ultimately use scanners to ring up sales. Information will be automatically read from the item itself.

The 11-digit DC number becomes a complete, and unique, designation for one, individual item.

Neither the identity of the manufacturer, nor the identity of his products, will be impaired by the DC system. The manufacturer's name and logo will still appear on boxes, cartons, cases, display packs, items, and so on. Manufacturer's catalog numbers may still be preserved in his catalogs. Many manufacturers are already showing the five-digit DC item number in their catalogs.

Distribution Number Bank suggests all code numbers appear at the top of the label.

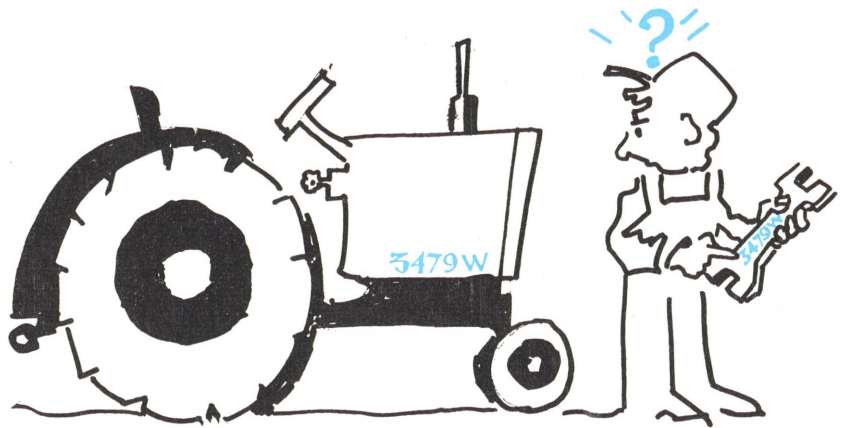
tively short and widely used numbers, a manufacturer will not be plagued with requests from customers to place "their number" on the product.

Eventually, most orders will go to a manufacturer with only the DC number included. A simple computer conversion will relate the DC number to a manufacturer's catalog or production code which may have as many characters (alpha and numeric) as a manufacturer needs.

In the future, the DC system will permit orders to be communicated directly from the customer to the distributor's and/or manufacturer's

tomed to using the DC number and do not need to be retrained. This means fewer headaches during the conversion process and faster realization of the benefits of computerization.

When the DC number is printed on the item (where possible), package, carton, and case, order taking, receiving, picking, and shipping will all be greatly simplified. In some cases, the productive selling time of outside salesmen can be significantly increased. Instead of spending time consulting voluminous descriptive and illustrated catalogs to determine the catalog number, the salesman will write orders



Duplication of product designations within different industries by different producers has complicated the identification problem immensely.

The DC system can automatically increase the productive selling time of outside salesmen significantly. Instead of spending time consulting voluminous descriptive and illustrated catalogs to determine the right number he can simply write the DC number from the item in the customer's stock or want book.

directly from the DC number printed on the items in the customer's stock or want book.

With the DC system in general use, there will be a strong tendency for retailers and business users to utilize these numbers for item identification. This will reduce the cost of paper work associated with purchasing, and will increase accuracy in ordering. Instead of writing a lengthy description of the item needed, they will simply write the 11-digit DC number on their want books.

Savings potential

In the not too distant future, use of a distribution number will make possible significant savings in re-ordering merchandise by reducing inventory and increasing turnover through better inventory management.

Research and development by the food industry points the way. Supermarket check-out counters will ultimately use scanning devices to ring up sales. Information on the complete nomenclature of the item purchased, brand name, contents, size, manufacturer or packer, and selling price will be automatically read from a number or symbol on the item itself. The cashier will not have to ring up the sale. Purchases will be recorded as fast as the conveyor takes the items past the scanner. Sales by specific item and department will be accumulated automatically for purposes of re-supply, sales and profitability analysis, management reports, and so on.

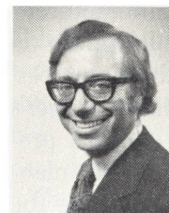
A long step will have been taken toward easing the "bottleneck at the check-out counter." More importantly, it will ultimately result in more economic distribution.

The DC system will produce increased accuracy, less paper work, and speed the flow of supplies which leads to smaller inventory requirements throughout the channels of distribution. The DC system thus promises increased economics in the entire distribution function. Performing the distribution function better, faster, and at lower cost ultimately benefits the consumer—the end user—who must eventually bear the total cost of distribution.



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the EDP committee of the California Society of CPAs and the AICPA's CPA use of computers committee. He has written articles for *Taxation, Commercial Law Journal*, and his firm's newsletter. EDWARD A. ALTSHULER



is a vice president of Management Horizons, a Columbus, Ohio, management consulting firm. He founded and directed the Institute of Advanced Business Studies and taught marketing, business organization, and management of the Col-

lege of the Desert in Palm Springs, Calif. Mr. Altshuler was an account executive with a Los Angeles advertising and public relations agency before starting his own consulting firm. He is the author of a dozen books on business and management practices.

Real-time EDP systems are the wave of the future, these authors believe. But real-time systems can be incredibly fast or comparatively slow. Speed costs money, and it can cost too much in some instances where a slower system would do the job. So a balancing of needs against capacities is recommended—

COST-PERFORMANCE TRADE OFFS IN REAL-TIME SYSTEMS DESIGN

*by Barry E. Cushing
The University of Texas*

*and David H. Dial
Branch & Orcutt*

THE INCREASING use of real-time computer systems in business and other administrative functions presents a new set of opportunities and problems to those managers concerned with getting the most out of expenditures on data processing. Real-time systems are being applied to manufacturing data collection, production scheduling, credit checking, airline and other travel reservations, sales order data entry, bank teller operations, and management simulation. The trend toward more efficient and reliable computer hardware and software, which is often less expensive than that which it replaces, is likely to

increase the number and variety of real-time applications. These developments underscore the need for managers to become more familiar with the concepts and technology of real-time systems.

The purpose of this article is to discuss some important aspects of the design of real-time computer systems. The primary objective is to develop an understanding of the trade offs which must be made in the design process between the conflicting objectives of cost minimization and performance maximization. A definition of real-time systems is offered and the essential elements of real-time systems are

reviewed. Cost-performance factors in systems design with respect to each of the basic elements are examined in turn. Our goal is to provide managers, system designers, and accountants with a framework for understanding problems of real-time systems design.

Real-time systems

A real-time system may be defined as a data processing system in which the time interval required to process and respond to input data is so small that the response itself is immediately useful in controlling a physical activity or proc-

For a real-time business system, the required response time must be determined for each particular application. For unlike process control systems which direct mechanical devices, the real-time business system controls the actions of human beings. A response time of less than one second is unnecessarily fast. Response times of more than 15 seconds may be too long.

ess. The most important concept in the definition is that of response time. Real-time systems are sometimes associated with immediate response. However, the length of response time which will qualify a given system as real time is actually dependent upon the nature of the physical activity being controlled by the system. If the activity is the launching of a space satellite, a response time measured in fractions of a second is necessary in order for the system to effectively control the activity. If the activity involves a business function, a response time of several seconds or even a few minutes may be adequate for control purposes. Thus, the nature of the activity being controlled determines the response time which is necessary in order for control to be accomplished by a real-time system.

Five elements in system

There are five basic elements of a real-time computer system. These are: (1) on-line direct-access files for storage of system data; (2) one or more central processors; (3) data terminals which provide the interface between the system and its users; (4) a data communications network which links the processor with the terminals; and (5) a software system, consisting of programs, documentation, and other user aids which enable users to operate the system effectively. A diagram of the elements of a real-time system and their relationship to each other is shown in Exhibit 1, page 31. Though not specifically illustrated in the exhibit, the element of software is inherent in each of the other four elements of the system. Each of these elements is discussed in turn in this article.

In discussing cost-performance trade offs with respect to real-time systems, it is necessary to clarify the concept of performance. There are two basic performance parameters in a real-time system: response time and reliability. Response time is basically the average

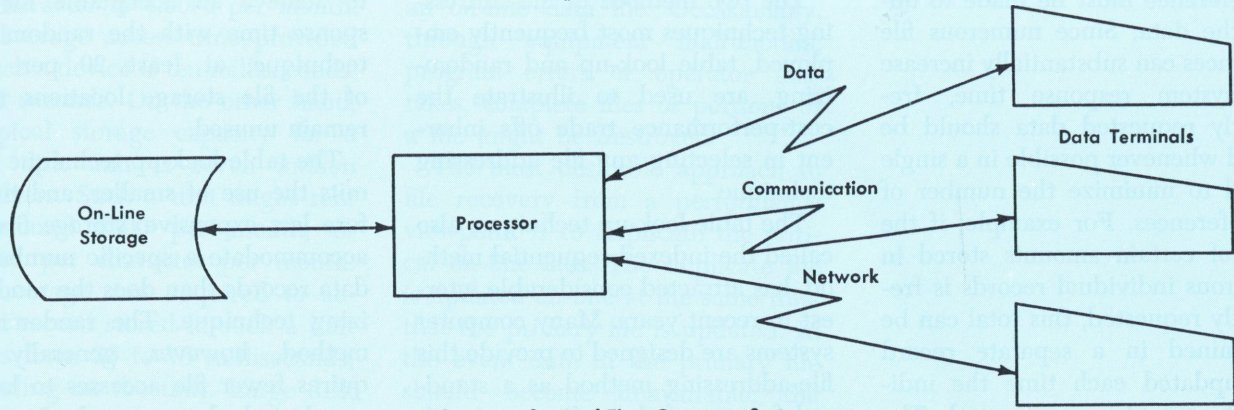
elapsed time between data entry and system response. Reliability encompasses both avoidance of system breakdowns and accuracy of data processing. Other performance parameters may be significant in particular applications of real-time systems. Examples include system availability, convenience of working with the system for human operators, and auditability of the system. The systems design process should seek an optimal trade off between cost minimization on the one hand and performance maximization with respect to these objectives on the other.

Application governs time

For a real-time business system, the required response time must be determined for each particular application. Unlike the process-control system which directs mechanical devices with response times measured in fractions of a second, the real-time business system controls the actions of human beings. Response times for interactive accounting and management information systems are measured in seconds or even minutes. When people are operating terminals to interact with a real-time system, the response times must be geared to human reaction times. A response time of less than one second is unnecessarily fast. Response times in excess of 15 seconds, however, may be so long that human operators become impatient. When the operator is engaged in a complex conversation with the computer, the response time needs to be relatively short. Some airline reservation systems, for example, are designed to react to 90 per cent of the transactions in less than three seconds.

Reducing response time will normally cause an increase in the cost of the system since more complex and expensive hardware is required. Increasing the response time may destroy some of the benefits expected from implementation of a real-time system. The importance of the response time

EXHIBIT I



Elements of a Real-Time Computer System

becomes evident when the cost-performance trade offs in various components of the system are examined. A number of factors affect the response time of a real-time system, including the number of operating terminals in the system, the number of messages awaiting processing, the amount of computation required for each message, the speed of the central processing unit, the type of telecommunication network, and the response time of the file storage device.

The degree of reliability required within a real-time system is also dependent upon the particular application. In some applications it is essential that the system be "up" at all times, whereas in others an occasional breakdown may not be critical. In the latter case, however, it may be important to minimize the frequency and/or duration of system breakdowns. With respect to system accuracy, the nature of most real-time applications justifies design of a system which is as reliable as possible. Currently available hardware is highly accurate, and so most of the design problems relating to data accuracy concern the software system.

To achieve a highly reliable system requires duplication of some hardware and procedures and more elaborate hardware and software. These elements may add significantly to the costs of developing and operating a real-time system. However, if the system is less reliable than it should be, expected

benefits will not be achieved and actual harm may be done to the organization. Careful analysis of the trade offs affecting system reliability is, therefore, essential in the design of real-time systems.

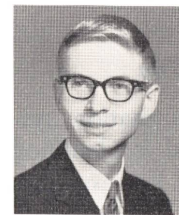
Real-time systems generally require a considerable amount of random access storage capacity. Since most transactions in a real-time system require the computer to access data in the storage files, the response time of the system depends largely on the response time of the storage devices. Certain techniques are available to reduce the response time of a random access file; however, most of these techniques also increase the storage capacity requirements. Such increases in storage capacity add significantly to the cost of the real-time system.

Since most real-time information systems are closely linked to the daily operations of the business, reliability of the storage files is an important factor in system performance. Increased reliability, however, usually means increased system costs for hardware and software. By properly analyzing the cost-performance trade offs in random-access storage files, the system designer can minimize the cost of the data storage and insure adequate system response time and system reliability.

The response time of the file storage device in a real-time system is based upon the number of rec-

ords which must be accessed by the system before a message can be transmitted to the terminal operator, and upon the time required by the storage device to access a record in the file. Both the number of file references and the average file reference time involve cost-performance trade offs.

Number of file references—The number of file references required to assemble the information to be transmitted as a single message to the terminal operator depends upon two factors. First, the required data may be stored in more than one file



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or in several records within a single file. In such cases, more than one file reference must be made to obtain the data. Since numerous file references can substantially increase the system response time, frequently requested data should be stored whenever possible in a single record to minimize the number of file references. For example, if the total of certain amounts stored in numerous individual records is frequently requested, this total can be maintained in a separate record and updated each time the individual amounts are changed. The cost-performance trade off in this example involves comparing the sum of the cost of storing and additional total figures and the cost of increasing the processing time to update the file containing the total records to the benefit of faster response time.

The second factor affecting the number of file references is the file addressing technique used to locate a specific record in a file containing thousands or even hundreds of thousands of records. File addressing techniques often present distinct examples of cost-performance trade offs in file storage systems, since these techniques influence both the file response times and the file capacity requirements.

Code identifies records

In a real-time information system, each data record is identified by some unique code. For example, the data record for an inventory item might be identified by the inventory part number. Each data record is stored in a separate location in the random-access file. The file locations are also identified by unique numbers, often called file addresses. To access a specific record, the computer needs the file address of the record. The user, however, might provide the computer an inventory part number or a bank account number rather than the file address of the record. The purpose of a file-addressing technique is to provide the computer a method of locating a specific record using only the identifying informa-

tion supplied by the terminal operator.

The two methods of file-addressing techniques most frequently employed, table look-up and randomizing, are used to illustrate the cost-performance trade offs inherent in selecting any file addressing technique.

The table look-up technique, also called the indexed-sequential method, has attracted considerable interest in recent years. Many computer systems are designed to provide this file-addressing method as a standard feature of the software. A primary characteristic of this technique is the use of one or more tables to provide an index to the random access file. At least two file references are required to locate the desired record: one file reference to read the appropriate indexing table and a second file reference to read the actual data record. With very large data files, the table look-up technique may require a hierarchy of indexing tables. In this case, several file references will be required to read the appropriate table at each level and finally to read the desired data record. Another factor influencing the file response time with the table look-up technique is the time required by the central processing unit to search the indexing tables for the desired entry after the tables have been read into memory from the random access storage file.

Another method of file addressing that is frequently used is a technique called randomizing. The randomizing method transforms a reference number into a random number within the range of file addresses where the desired record is located. This random number is the first address accessed to find the selected record. If the record is not located at the randomized address, another attempt must be made to locate the record at an overflow location. In some instances, several file locations must be accessed to locate the desired record. An important characteristic of the randomizing technique is that as the file packing density increases, the average number of file references

required to locate a specific data record increases. In most instances, to achieve an acceptable file response time with the randomizing technique, at least 20 per cent of the file storage locations must remain unused.

The table look-up technique permits the use of smaller, and therefore less expensive, storage files to accommodate a specific number of data records than does the randomizing technique. The randomizing method, however, generally requires fewer file accesses to locate a selected data record than the table look-up method and thus permits a faster response time. When the randomizing technique is used, the average number of file references required to locate a data record can be reduced at the cost of providing a greater percentage of unused storage locations in the file.

Compromise always necessary

The interrelation among file-addressing techniques, file sizes, and file reference times is an important aspect of random access file design. Every file design requires a compromise between response times and data storage costs. Careful analysis by the system designer of these cost-performance trade offs is required to achieve an optimal balancing of conflicting objectives.

Average file reference time—Regardless of the number of file references required to assemble the requested data, the system's performance can be improved by reducing the average file reference time. Reducing the average file reference time, however, requires a trade off in the cost of the random access files and perhaps in the storage capacity of the file device.

Three types of random access storage devices are magnetic drum, magnetic disk, and magnetic strip. A comparison of the access times, storage capacities, and monthly rental costs of these devices illustrates certain cost-performance trade offs inherent in file storage. An average-sized magnetic drum device provides a four-million-char-

acter storage capacity and rents for about \$2,000 per month for a cost per character of \$.0005 per month. The average access time provided by such a device is ten milliseconds, or .01 seconds. On the other hand, a typical storage capacity for a small disk unit is seven million characters. Such a unit might rent for around \$500 per month, or \$.00007 per character per month. The average time required to access a record stored in such a unit ranges from 30 to 75 milliseconds, depending on the unit. Large disk storage devices, with a capacity of 100 million characters, provide similar cost and access time characteristics.

The cost-performance trade offs in selecting file storage devices are further illustrated by the magnetic strip device, frequently called a data cell. The data cell is even slower, but is also less expensive, than the magnetic disk. A typical data cell unit has a capacity of 300 million characters and rents for about \$2,500 per month, for a cost per character of \$.000008 per month, which is about one-ninth the cost per character of disk storage. However, the average access time for a record in a data cell is 500 milliseconds, or seven to sixteen times slower than disk. An access time of 500 milliseconds may be too slow to provide an acceptable response time for a system which has a high volume of file inquiries and updates.

As these examples illustrate, trade offs exist among the three important characteristics of a file storage device: storage cost, access time, and storage capacity. A satisfactory compromise can be achieved in balancing these cost-performance trade offs only by carefully analyzing the requirements of the system and selecting the file storage device which can provide the required performance at the lowest cost.

File recovery

A final example of cost-performance trade offs in file storage is provided by a comparison of the

cost and desirability of various methods of recovering from loss of an on-line data file. Occasionally, through equipment malfunction, program errors or operator mistakes, complete files or portions of a file might be destroyed.

The most desirable approach to file recovery from a performance viewpoint is to duplicate the critical on-line files. The duplicate file is updated on-line at the same time that the primary file is updated. In the event data in the primary file should become unavailable, the computer system would automatically channel further file references to the duplicate file and notify the operator of the malfunction. Since this system requires a duplication of a substantial amount of the hardware and the use of specially developed software, the cost of providing file recovery in this manner is quite significant.

A less expensive technique for file recovery is to prepare a copy of the critical on-line files one or more times each day and to maintain a file of all changes that occur to the on-line files throughout the day. If an on-line file is damaged, the on-line system can be temporarily interrupted while one of the backup files prepared earlier in the day is updated for the transactions that have occurred since the backup file was copied. Since the on-line system is unavailable for a short period, procedures must be available for the system users to follow until the on-line system is again operative. In addition, some method must be available to permit updating the computer files for transactions that occur while the system is inoperative.

The cost-performance trade offs for file recovery require balancing the desired level of on-line service with the cost of providing this service. On one extreme, on-line service might not be interrupted more than a few seconds when a storage file is damaged or when a file device becomes inoperative. On the other extreme, the on-line system might be inoperative for several days or even weeks when a storage file is lost. The cost of a system that pro-

Trade offs exist among the three important characteristics of a file storage device: storage cost, access time, and storage capacity.

vides uninterrupted service is necessarily higher than the cost of a system that provides degrading service following a file breakdown. Thus, another decision involving cost-performance trade offs in file storage must be made during systems development.

Central processor

Selection of the central processor configuration in a real-time system involves a number of complex cost-performance trade offs.

Size of primary storage—One of the most critical factors in real-time systems design is the size of the primary storage, or storage area within the central processor. Primary storage, consisting of either cores or semiconductors, is very expensive, ranging around five- to seven-tenths of a cent per character per month. This is ten to 14 times the cost of drum storage, and 70 to 100 times that of disk. However, if primary storage is too small, system response time may be adversely affected.

Most real-time systems use multiprogramming, which means that the system can process more than one program simultaneously, though at any one instant system control is devoted to only one program. Multiprogramming increases system throughput, and therefore the greater the degree of multiprogramming in a real-time system, the smaller will be the average system response time. However, the degree of multiprogramming in a system is often limited by the availability of primary storage. The greater the available primary storage area, the greater is the degree of multiprogramming possible.

A good illustration of this relationship involves the concept of "virtual storage." In a multiprogrammed system, as one program is being executed the system must provide storage area for all other programs and data which are in process and waiting their turn for the computer's attention. The use of primary storage for this purpose may be very expensive. A way of economizing on storage for this

"work-in-process" is to store a portion of it on a high speed disk, drum, or other external storage unit. Programs or program sections may thus be relocated, or "swapped," back and forth between primary and external storage several times during their execution. Systems having this capability may appear to have virtually unlimited storage capacity, and are therefore referred to as "virtual storage" systems.

Though virtual storage systems provide a useful means of economizing on storage costs, these devices have an adverse effect upon response time in a real-time system. This is because the extra time required to swap programs back and forth between external and primary storage increases the average time required to process each user's transaction.

Careful analysis of cost-performance tradeoffs involving primary memory size is required in order to obtain a system having an adequate response time and yet avoid excessive expenditures for primary memory.

Processor configuration—A critical factor in real-time system reliability is the processor configuration. A configuration which consists simply of one central processor will at times cause the system to be shut down due to a failure of the processor. Very occasionally, an error in processing may be made as a result of an error by the central processor. The reliability of a real-time system may be considerably improved by configurations which include more than one central processor.

One example of a configuration which increases reliability in a real-time system is the duplex configuration. This system includes two central processors, with one serving as backup for the other. If a failure occurs in the on-line processor, all work is switched over to the backup processor. In such systems the backup processor is generally used for non-real-time functions at those times when both systems are operational. In addition, in the event of a file breakdown, the backup

processor may be used to speed file recovery while the on-line processor continues to handle file inquiries and updates as best it can. The duplex configuration is quite common in real-time systems. It greatly increases system reliability in that the probability of failure of both processors concurrently is much smaller than the probability of failure of one processor.

While this example by no means exhausts the number of processor configurations which may be devised to improve reliability in a real-time system, it does illustrate the trade offs involved. Increases in reliability are achieved by duplication of processors, which may significantly increase the cost of the system. The cost of the additional software required is also a relevant factor. However, these additional costs are partially offset by the additional work that may be performed by backup processors while the real-time processor is functioning properly.

Data terminals

The data terminals in a real-time system are the interface between the system and its users. Therefore, decisions involving the terminal subsystem are often a critical factor in the success of a real-time system. Convenience may be a more essential performance factor than either reliability or response time.

A wide variety of terminal devices is currently available for use in real-time systems. The two major categories are (1) teleprinters or teletypewriters, and (2) cathode ray tube (CRT) or display devices. A comparison of some of the major features of these types of devices illustrates some of the cost-performance trade offs involved in the selection of data terminals.

Teleprinters are generally less expensive than display terminals. A purchase price of from \$600 to \$3,000 is typical for a teleprinter, whereas display terminal prices range from \$1,000 to \$10,000. Another advantage of the teleprinter is that it automatically produces a paper copy of all terminal

Data terminals in a real-time system are the interface between system and users.

activity, which in some cases significantly improves the convenience and auditability of the system.

The more expensive display terminal, however, has several performance advantages over the teleprinter. One important advantage is output speed. Typical printing speeds of teleprinters range from 10 to 30 characters per second. In contrast, display terminal output speeds depend upon the transmission speed of the data communication facility, and therefore speeds ranging from 60 to 240 characters per second or more are common. This factor is particularly important if output volumes are large.

Other advantages of display terminals over teleprinters include: (1) easier correction of errors in previously entered data by modifying only erroneous characters rather than retyping entire lines, (2) superior capability in displaying graphic output, and (3) noise-free operation. In addition, some display devices can store in memory more lines of data than can fit on the screen at any one time, in order that the operator can refer back to such data after it leaves the screen. Many display terminals can be equipped with a device which will produce a paper copy of whatever is on the screen when desired. However, all of these additional performance factors add to the expense of the terminal device.

Another critical decision relating to data terminals in a real-time system is the appropriate number of terminals in the system. User convenience is maximized if there is one terminal available for each user. However, this also requires a maximum expenditure on terminals. If several users can share each terminal, the expenditure on terminals may be reduced. However, such a reduction in cost is accompanied by a reduction in user convenience. This trade off involves

evaluating the needs of the users relative to the cost of the terminals.

Still another factor relating to the selection of data terminals involves the possibility of using terminals which have a "stand-alone" capability. Such terminals can continue to perform such functions on their own even if the central computer system goes down. For example, some terminals can record and store transaction data on a machine-readable medium for transmission after the failure has been corrected and the system is available. Such terminals may also be capable of preparing a printed record of such transactions if one is desired. To obtain a stand-alone capability may require a more expensive terminal.

Several of these elements in selection of data terminals in a real-time system are illustrated by the case of a hospital which developed such a system for processing patient charges, laboratory test results, and related patient data. Terminals in each laboratory, in the pharmacy, and in other locations from which patient charges originated were used to enter transaction data into the system. Terminals were also located at nurses' stations throughout the hospital so that laboratory test results could be sent to them for inclusion in patient records, and so that doctors could use the terminals for fast retrieval of patient medical data. Still another terminal was located at the accounts receivable office for use in recording patient checkouts and preparing receipts for collections from patients.

The choice of terminals for the nurses' stations presented an interesting situation. Cost minimization was an important objective, and documentaton of laboratory test results was essential. These criteria pointed to the selection of an inexpensive teleprinter, such as the Teletype Model 33 at a purchase

cost of \$600. However, due to the proximity of the nurses' stations to the hospital rooms, another essential objective was noise-free operation. Furthermore, due to the intended use of these terminals by doctors to retrieve patient data, output speed was very important. For these reasons, a small CRT display terminal with an attached hard copy unit was chosen at a purchase price of approximately \$3,500. Though costing almost \$3,000 more per unit, this device met all performance criteria, including minimization of machine noise.

The selection of terminals for the pharmacy and for the accounts receivable department also required a compromise of the cost minimization objective. Because these departments dealt directly with patients and the general public, it was considered essential to utilize a stand-alone terminal which could record transaction data and provide receipts even while the central computer system was down.

Data communications

The terminals used to communicate with the computer in a real-time system are often located at some distance from the computer. A telecommunication network is required to link the various terminals with the central computer. Basically, this telecommunication network consists of a transmission link and a set of electronic devices used to increase the efficiency of the network. A well planned network utilizes the combination of transmission links and peripheral devices that provides the required transmission rate and system response times at the lowest cost.

The cost of a telecommunication network is determined by several factors including the line transmission speed and the choice of leased

TABLE I

Computation of Line Cost for a Leased Line

Miles	Rate Structure Rate/Mile	Detroit-Chicago Hookup	
		Computation	Result
1-25	\$3.00	25 x \$3.00 =	\$ 75.00
26-100	2.10	75 x \$2.10 =	157.50
101-250	1.50	138 x \$1.50 =	207.00
251-500	1.05
501-up	0.75
Totals		238 miles	\$439.50

TABLE II

Computation of Switched Line Cost

No. of Calls	Orders/Call	No. of Orders	Length of Call	Cost/Call	Total Cost
600	1	600	2 minutes	\$0.90	\$540.00
100	2	200	4 minutes	1.17	117.00
20	3	60	6 minutes	1.71	34.20
10	4	40	8 minutes	2.25	22.50
Totals		900			\$713.70

or switched lines. Certain alternatives to the use of private lines are available such as Private Exchange (PBX) or multidrop lines. Each of these factors affects not only the cost of the network but also the performance of the system.

Line transmission speeds—Communication lines can be classified into three primary categories based upon the number of data bits per second that can be sent over the line. To measure transmission speeds in characters per second, the number of bits required to represent a character must be known. In the following discussion, a ratio of ten bits per character is assumed since this figure is representative of the transmission codes commonly used.

The lowest speed lines, called subvoice-grade lines, are designed for telegraph and similar machines transmitting at speeds generally not exceeding 300 bits per second. A subvoice-grade line can provide a low-cost communication link for a real-time system that uses only typewriter-speed terminals operating at transmission rates up to 30 characters per second.

Voice-grade lines, originally designed for telephone communications, provide transmission speeds as high as 9,600 bits per second.

When the regular dial-up telephone lines are used however, the maximum attainable transmission rate is limited to 4,800 bits per second. The high speeds are possible on private lines that are specially conditioned for data transmission. Real-time systems using display terminals will usually require voice-grade channels to take advantage of the extremely high transmission speed possible between a computer and a display terminal.

Wideband lines provide the capability of transmitting data at speeds up to 500,000 bits per second. One application for wideband lines is high-speed communications between two computers. Subvoice-grade and voice-grade lines are currently the most important communication links for real-time business systems. The speed at which input data can be entered, or output data interpreted, by human operators using keyboard terminals is so severely limited that very high-speed transmission facilities are not usually required.

An obvious cost-performance trade off exists between subvoice-grade and voice-grade lines. Although the voice-grade line costs more to lease than the subvoice-grade line, the voice-grade line permits a substantially greater trans-

mission speed. These performance factors and the cost differentials among various line transmission speeds must be carefully examined to determine the proper balance between line cost and transmission speed.

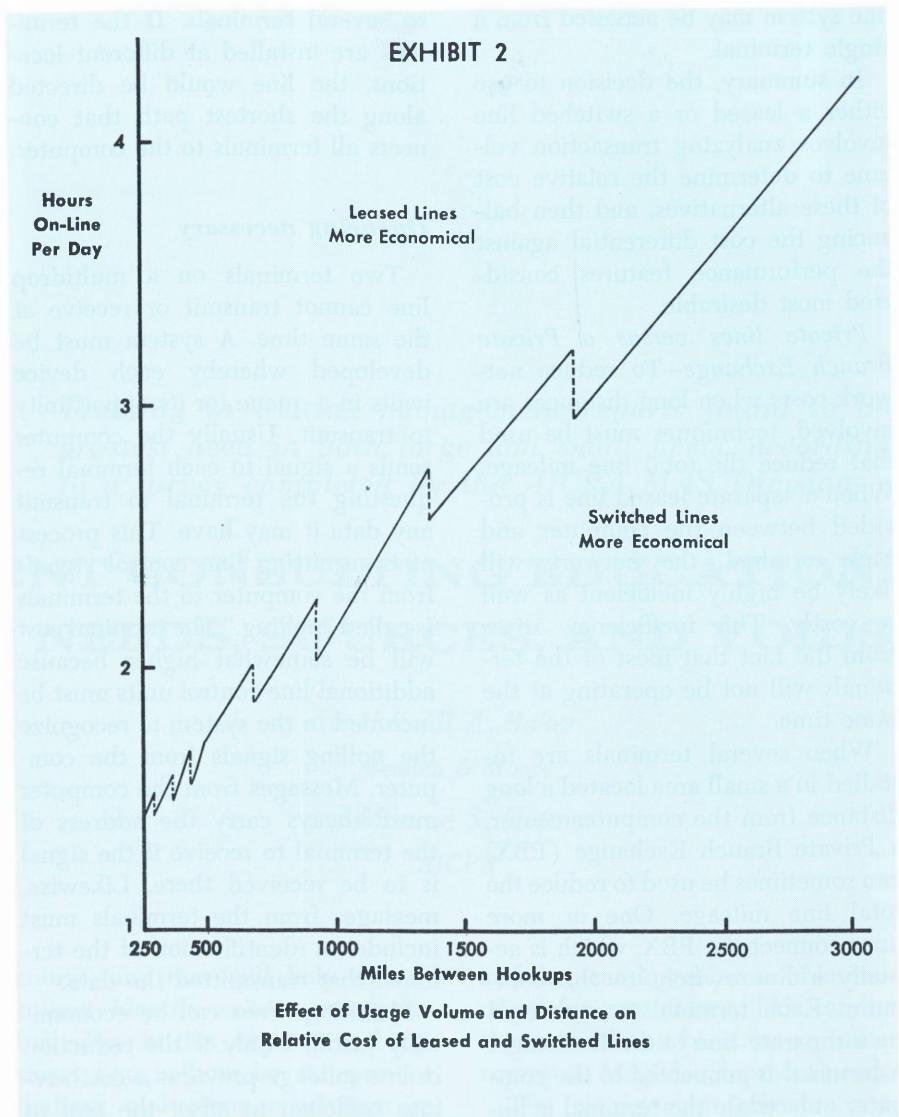
Leased versus switched lines—Two basic options are available with respect to usage of data communication facilities. These are (1) leased or private lines, and (2) switched lines or dial-up service. Leased lines are devoted exclusively to the use of a single customer. Dial-up involves simply using the long distance telephone service available to the general public. The cost of a leased line between two points is fixed and is determined by the length of the line. The cost of dial-up service is variable with distance and usage time. Therefore, dial-up service is less costly than a leased line—up to a breakeven volume, beyond which the leased line is more economical.

To illustrate the relative cost differential between leased and switched lines, consider the case of a company having a main office and computer center in Chicago and a branch sales office in Detroit. The company wishes to connect a data terminal in its Detroit office to the computer center in Chicago using data communication services, so that sales orders from its Detroit customers may be processed on a real-time basis. If a leased line is used, the differential cost per month will include approximately \$30 for communications hardware at the Detroit and Chicago locations, plus the cost of the line itself. A rate structure embodying a decreasing cost per mile as line mileage increases is used to compute the line cost. This computation, using actual Bell system rates in effect June 1, 1973 for a voice-grade line, and assuming a distance of 238 miles between the two locations, is illustrated in Table I, on this page.

The resulting line cost of \$439.50, plus the additional hardware cost of \$30, yield a total cost per month for the leased line of \$469.50.

In contrast, the cost of switched lines (dial-up service) depends upon long distance rates, number of calls, and length of each call. For example, assume that the long distance rate from Detroit to Chicago is \$0.90 for the first three minutes and \$0.27 for each additional minute. If an average of 900 sales orders per month are received from Detroit, and if each requires a separate call of less than three minutes in duration, the cost will be $\$0.90 \times 900 = \810 per month. However, if some calls are entered in groups of two or more, the average cost per order will be less due to the lower number of calls required and the smaller rate per minute once a call exceeds three minutes. To compute the actual cost would require knowledge of the pattern of receipt orders at the sales office and the average length of time required to enter order data over the terminal. For example, assuming an average of two minutes connect time per order, Table II, page 36 illustrates this computation under an assumed pattern of receipt of orders.

Exhibit 2, this page, illustrates the relationship of usage volume and distance between hookup points to the breakeven point between leased lines and switched lines. Each point on the breakeven line represents a point where the monthly cost of a leased line for the number of miles given on the horizontal axis is exactly equal to the monthly cost of a switched line for that number of miles which is used for the amount of time per day shown on the vertical axis. The computations underlying the chart incorporate line costs only, and assume a month of 22 working days. Furthermore, the computations are based on the dial-up rate for each additional minute beyond the initial three minutes, which means that the chart reflects a situation in which transactions are entered in large batches (remote batch processing) such that the extra rate for the first three minutes increases total cost by an insignificant amount. If, alternatively,



transactions are entered as they are received, the pattern of receipt must be known or assumed before a chart of this type may be prepared. Note that the breakeven line itself for any such chart would be almost identical in appearance to the line in Exhibit 2.

To further explain the breakeven line, note that each discrete drop in the line represents a mileage level at which a rate break occurs in the station-to-station dial-up rate. For example, at 676 miles the rate per minute increases from \$0.32 to \$0.35, causing a discrete drop in the economic desirability of switched lines. Furthermore, the change in the slope of the line at 500 miles reflects the decrease in the cost per mile of a leased line from \$1.05 to \$0.75 (see Table I). In conclusion, the exhibit demonstrates that for short distances

leased lines are more economical unless the volume of usage is quite small, whereas for long distances switched lines are more economical unless the volume of usage is quite high. In any given situation the cost differential between these two alternatives may be quite significant.

In addition to relative costs, the choice between leased and switched lines is affected by such performance factors as transmission speed, error rate, and flexibility. Transmission speed favors leased lines, since 4,800 bits per second is the maximum attainable transmission speed with dial-up lines. Error rates also favor leased lines, which can be conditioned to reduce error rates significantly below those experienced on dial-up lines. However, flexibility favors the use of dial-up service in the sense that more than

one system may be accessed from a single terminal.

In summary, the decision to use either a leased or a switched line involves analyzing transaction volume to determine the relative cost of these alternatives, and then balancing the cost differential against the performance features considered most desirable.

Private lines versus a Private Branch Exchange—To reduce network costs when long distances are involved, techniques must be used that reduce the total line mileage. When a separate leased line is provided between the computer and each terminal, the network will likely be highly inefficient as well as costly. This inefficiency arises from the fact that most of the terminals will not be operating at the same time.

When several terminals are installed in a small area located a long distance from the computer center, a Private Branch Exchange (PBX) can sometimes be used to reduce the total line mileage. One or more lines connect the PBX, which is actually a line switch, to the computer. Each terminal is connected by a separate line to the Exchange. A terminal is connected to the computer only while the terminal is being used. The economic feasibility of using the PBX depends upon whether or not the reduction in line mileage provides sufficient cost savings to offset the cost of the PBX.

One disadvantage of the PBX approach is that terminal operators may at times be unable to obtain a line to the computer because all lines are busy. The number of terminals that can be used simultaneously cannot exceed the number of lines from the Exchange to the computer. Thus, a cost-performance trade off arises as the reduction in network cost must be balanced against the possible reduction in system availability as an operator awaits a line to the computer.

Multidrop versus private lines—Another technique for reducing the total line mileage is to use a multidrop line, a single line connected

to several terminals. If the terminals are installed at different locations, the line would be directed along the shortest path that connects all terminals to the computer.

Queueing necessary

Two terminals on a multidrop line cannot transmit or receive at the same time. A system must be developed whereby each device waits in a queue for its opportunity to transmit. Usually the computer sends a signal to each terminal requesting the terminal to transmit any data it may have. This process of transmitting line control signals from the computer to the terminals is called "polling." The terminal cost will be somewhat higher because additional line control units must be included in the system to recognize the polling signals from the computer. Messages from the computer must always carry the address of the terminal to receive if the signal is to be received there. Likewise, messages from the terminals must include an identification of the terminal that transmitted the data.

Multidrop lines can be economically justified only if the reduction in line mileage provides a cost savings sufficient to offset the cost of the additional hardware required in the system. However, any cost saving achieved may be offset by a performance reduction in the form of increased system response time and decreased system reliability. While a message is being transmitted to or from one terminal, all other terminals on the line must wait, which means that system response time is increased in some cases. On the other hand, if one section of a multidrop line fails, the system is unavailable to all users located down the line from that point. A line failure in a system using point-to-point lines or a PBX will generally only affect one user. Thus the cost-performance trade off to be considered with multidrop lines is the reduction in total network costs achieved by increasing average system response time and sacrificing some degree of system reliability.

Many software decisions are inherent in decisions relating to the four areas of hardware already discussed. Examples include the selection of file reference method, the design of file structures, and the selection of processor configurations. These are not discussed further here.

Perhaps the most important cost-performance trade offs involving software in a real-time system relate to the reliability of the system. Software costs are the "personnel costs" of system analysis and programming. Software reliability is dependent upon such factors as the extent of system testing, the adequacy of system documentation, and the thoroughness of input data validation. These factors have been discussed extensively elsewhere in the literature* and are not belabored here.

Summary and conclusions

Cost-performance trade offs are inherent in decisions relating to file storage, central processor, data terminals, data communications, and software in a real-time system. Though for convenience these five topics have been discussed separately in this article, they are closely interrelated in the design process. The decisions made have important implications for such performance factors as system response time, reliability and user convenience.

Real-time systems are the wave of the future in computerized data processing. Therefore it is important that the managers, accountants, and other non-specialists involved in the planning and evaluation of real-time systems develop a general understanding of the performance economics of such systems. Though a comprehensive treatment is beyond the scope of an article of this length, we have attempted to discuss some of the more important cost-performance trade offs in real-time systems design.

*For a comprehensive treatment, see James T. Martin, *Programming Real-Time Computer Systems*, Englewood Cliffs, N.J., Prentice-Hall, Inc., 1965.

Training in writing management reports found to be greatest need in both large and small firms, according to a survey completed by the AICPA MAS Division—

MANAGEMENT CONSULTING EDUCATION: NEEDS, SOURCES, AND VOIDS

by Lowell A. Baker

Meaden & Moore

and Monroe S. Kuttner

AICPA

ALL ASPECTS of consulting skills and expertise considered, the most critical educational need of practicing consultants is a course in the content and preparation of management consulting reports. This surprising, and yet not really surprising, finding, considering the importance of reports, resulted from a survey conducted by the AICPA's committee on management advisory services education. The survey involved sending questionnaires to a sampling of interested practitioners with CPA firms in all size ranges in 14 states. It was aimed at identifying professional development program needs in management advisory services.

A course on MAS report preparation and content was given highest priority by survey respondents irrespective of firm size, though the priority placed on most other subject course needs differed when the respondents were with the largest CPA firms. While courses in the techniques of business writing are plentiful, what is needed, apparently, is an engagement-oriented

course—one that will help a consultant identify salient points for inclusion in his reports and instruct him in how he can present findings and recommendations in a way that will generate interest, understanding, and action on the part of the client.

Can an effective report preparation course be developed? The committee intends to find out and to investigate the possibility of filling other educational voids which future surveys uncover. Task forces have been appointed which will review this and other course needs. Where feasible, they will initiate and participate in the preparation of such courses, working closely with the AICPA's Continuing Professional Education Division (formerly Professional Development Division) and other interested parties.

As a first step in their program to determine and fill the management consultant's continuing educational needs, the committee researched existing literature on the practice of management consulting

and then cataloged "areas of knowledge" for consultants. This catalog then served as a basis for an initial survey on MAS development needs.

The management advisory services "areas of knowledge" catalog, which may not as yet be all inclusive because of the seemingly limitless nature of management advice, consists of 20 major areas (see Exhibit 1 page 40). Each area title is followed in the catalog by a list of relevant items which may serve as the subject matter for a course or a series of courses. In some cases, a subtopic is listed more than once because it is relevant to more than one major area. There are, for example, seven different major areas within the EDP field (see Exhibit 2 page 41). The catalog has not been formalized—it exists only as a working document to facilitate research into MAS educational needs.

The following ten subjects were most frequently selected for course development by survey respondents, excluding those with the 15 largest CPA firms. They are ranked

EXHIBIT I

Major Areas of Knowledge for Practicing Management Consultants

- Consulting Techniques
- Conducting a General Consulting Engagement
- Conducting an EDP Consulting Engagement
- Administering a Consulting Group
- Management Technique Applications
- Organizational Development
- Financial Analysis and Planning
- Marketing and Distribution
- Personnel Management Techniques
- Techniques for Presenting Operating Information
- Manufacturing-Oriented Subjects
- Office Operations Subjects
- Accounting Systems and Control Techniques
- Computer Concepts
- System Design Concepts
- Specialized Computer Applications
- Application of Computers in Management Science
- Computer Controls
- Programming Languages
- New Fields, Techniques, and Equipment

in accordance with priority designations given by the survey respondents:

1. Content and preparation of consulting reports
2. Techniques of conducting consulting engagements



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MONROE S. KUTTNER is a manager in the management advisory services division of the AICPA. His duties include providing staff support to the MAS education committee. Before joining the Institute, he was a manager in the management consulting department of Peat, Marwick, Mitchell & Co. and held a number of managerial and technical posts in the insurance industry. He holds a B.A. and M.B.A. from the City University of New York.

3. EDP feasibility studies
4. EDP control implementation
5. Systems analysis and design
6. Cash forecasting
7. Cost accounting systems
8. Forms flow and communication
9. Budgetary planning and control
10. Capital expenditure planning and control.

Two-thirds of those selecting these subjects indicated in the survey that they must rely upon external sources to fill MAS professional development needs.

Respondents with the 15 largest CPA firms, which frequently develop and conduct their own internal MAS training programs, most often selected the following six subjects (again listed in order of assigned priority):

1. Content and preparation of consulting reports
2. Budgetary planning and control
3. Systems analysis and design
4. Manufacturing-oriented subjects
5. Cost accounting systems
6. EDP systems design concepts.

Exhibit 3 on page 41 lists the top 15 selected subjects to be considered for development and relates the priority rankings assigned by the survey respondents.

Existing sources for programs

There are many sources of continuing professional education available to the consultant. These include university extension courses, seminars and courses given by such education-oriented organizations as the American Management Association and AMR International Incorporated, and sessions sponsored by specialized groups such as the American Institute of Certified Public Accountants, the National Association of Accountants, the American Production and Inventory Control Society, the Association for Computing Machinery, the Association for Systems Management, etc. Currently being offered are many resident short courses and semi-

nars; some in those areas in which survey respondents indicated a critical need existed, and others on a number of the subjects listed in the management advisory services "areas of knowledge" catalog.

Aside from courses developed and given by CPA and consulting organizations for their own personnel, and certain consultant-oriented data processing courses given by computer manufacturers, there are few courses aimed exclusively at consultants. The AICPA does currently have a number of courses (e.g., "How to Approach and Develop an MAS Engagement") that are designed for personnel with CPA firms, and some state accounting societies occasionally offer a course or seminar on an MAS subject. The AICPA committee, as mentioned earlier, is seeking to add to the MAS courses offered by these groups. Since there are few courses oriented toward the consultant, existing courses, which are aimed at people from industry and government as well as professional organizations, should be utilized when they present the best or only existing way to satisfy a management consultant's educational needs.

While the development of new courses will be its major concern, the committee also intends to relate existing courses to consultants' education needs and to make such information available whenever it can be instrumental in disseminating data on existing courses through AICPA publications or in publicizing sources for such data.

One such source is now available. It is a single publication which lists many short courses and seminars of interest to management consultants. It is called, appropriately enough, *Continuing Education*, and is published quarterly by Pennsylvania Research Associates, Inc., 1428 Ford Road, Cornwells Heights, Pa. 19020, at a subscription price of \$35.00. This publication lists resident courses offered by many organizations, including most named in this article and other sources. The courses are listed under five major categories: science;

technology; management; medicine /health; and law/government. Each category has a number of sub-fields, and many of the fields listed in the management category correspond to the items contained in the management advisory services areas of knowledge catalog. Individual courses are listed two ways: by subject and by the location at which they are to be given. The information given for each individual course listed includes the title, location, starting date, duration, sponsor, and fee. This publication can be an extremely valuable tool for those who can utilize external sources of continuing education where attendance for a short period at a specific location is required.

In addition to the resident courses discussed above, there are also a number of organizations which offer self-study courses on subjects of interest to management consultants. For example, the AICPA offers recorded courses on cassettes which include one on conducting an interview during a consulting engagement. It also offers, in a self-study series entitled "The Management Education Portfolio," five courses on "Management and the Computer," five courses on "Marketing Management," five courses on "General Management Skills," and five courses on "Managerial Finance and Control."

The AICPA Committee on MAS Education was established in the belief that continuing professional education for the management consultant is of vital importance if he is to stave off the obsolescence which will otherwise slowly erode his level of expertise. For the advanced practitioner, it provides a way of keeping abreast of new techniques and developments in his own field or specialty. For the consultant who must constantly expand his expertise into new areas, and the beginning practitioner who recognizes a need to increase his expertise, attendance at short formal courses and seminars could result not only in professional growth, but in broader career horizons.

EXHIBIT 2

Example of Area of Knowledge Subtopics

- **Conducting an EDP Engagement**
 - EDP Engagement Administration and Control
 - Use of Outside Service Bureaus
 - *Timesharing
 - Evaluation of Software Packages
 - Computer Systems Definition and Design
 - Computer Systems Installation
 - Computer Programming Instruction for Client Personnel
 - Systems Analysis Instruction for Client Personnel
 - Communicating with Client Management
- **Specialized Computer Applications**
 - *Timesharing and Remote Terminals
 - Management Information Systems
 - Data Base Design
 - Computer Output Microfilm
 - Minicomputers
 - Data Communication Systems
- **Manufacturing-Oriented Subjects**
 - Manufacturing Processes
 - Production Planning, Scheduling, and Inventory Control
 - Maintenance, Planning, Scheduling, and Control
 - Factory Work Simplification, Work Sampling, Measurement Standards, and Controls
 - Warehousing
 - Plant Layout
 - Quality Control Techniques
 - Network Analysis Methods
 - Value Analysis
 - Cost Reduction
 - Profit Improvement
 - Manufacturing Information Systems
 - Research and Development Planning and Control
 - Purchasing
 - Transportation and Distribution Methods

*Example of subtopic in more than one area.

EXHIBIT 3

Professional Development Survey Results Identifying Needed Continuing Education Courses for MAS Consultants

Subject	Respondents' Priority Ranking	
	15 Largest CPA Firms	Other CPA Firms
Content and Preparation of Consulting Reports	1	1
Budgetary Planning and Control	2	9
Systems Analysis and Design	3	5
Manufacturing-Oriented Subjects	4	12
Cost Accounting Systems	5	7
EDP Systems Design Concepts	6	11
Cash Forecasting	7	6
EDP Feasibility Studies	8	3
EDP Control Implementation	9	4
Capital Expenditure Planning and Control	10	10
Techniques of Conducting a Consulting Engagement	11	2
Statistical Techniques	12	15
On-Line Storage Systems	13	13
Forms Flow and Communications	14	8
Flowcharting	15	14

The first step toward solving a problem is defining exactly what the problem is. This may sound simplistic but sometimes a problem may have as many definitions as there are people dealing with it. Here are some guidelines to approaching problem solution—

PROBLEM DEFINITION—KEY TO EFFECTIVE PROBLEM SOLVING

by Thad B. Green

Mississippi State University

THE PROBLEM is the problem. We see it every day, in an all too frequent way: Frank didn't develop an effective solution because he inaccurately defined the problem; Mort failed to design a suitable system because he defined the problem in a general, ambiguous way and never really viewed it with clarity; Jim's system was ineffective because he focused on the symptoms, rather than the causes of the problem.

What is the problem with the problem? In a sense, it is psychological. Defining a problem seems to be a simple enough task. In fact, it appears "too simple." This simplicity often implies triviality, and with it comes the tendency to disregard. However, most people would not engage in such irrational behavior; or would they?

There is, of course, another problem. But it is more illogical than psychological. Some problem solvers simply do not possess the talent and know-how to effectively design solution approaches. Such ignorance is no excuse for poor performance, yet it is more excusable than being guilty of disregarding what one knows. But in either case, the outcome is equally unfortunate.

Just how often do the results of a problem solution or a new system turn out to be something less than desired? Certainly it happens too frequently. Are such occurrences explainable? Perhaps not to those involved, but, yes, the reasons are identifiable. According to one systems analyst, "It is possible to identify a common, major contributing factor. That factor is lack of prob-

lem definition."¹ This same point is emphasized in yet another way: "The correct formulation of the system problem, as with other problems, is the essence of its solution."² A well-known systems consultant even more cogently observes this as he maintains that, "The successful formulation of a problem may be tantamount to 'half-solving' the problem."³

When an acceptable solution approach is not on the horizon, more

1—Ehlers, Marvin W., "Management's Blunder Buffer," *Business Automation*, March, 1966, p. 38.

2—Goode, Harry H., and Robert E. Machal, *System Engineering*, New York, McGraw-Hill Book Co., Inc., 1957, p. 119.

3—Optner, Stanford L., *Systems Analysis for Business and Industrial Problem Solving*, Englewood Cliffs, N.J., Prentice Hall, Inc., 1965, p. 81.

often than not it is a situation in which "the problem defied *definition*" rather than one where "the problem defied *solution*." In reality, few problems truly defy accurate formulation, except when our disregard for defining, or ignorance in doing so, is imposed on the process. But because of the frequency of such impositions, it does indeed often appear that problems actually defy accurate, clear, and detailed definition.

How can this difficulty be avoided? What kind of perspective or conceptual model must one have in order to avoid problem solving difficulties which relate to initial inadequacies in problem definition?

When a problem is a problem

Development of that perspective begins by beginning at the beginning, with conceptually (though simply) understanding what the problem is. Optner suggests that:

"A *problem* is defined as a situation in which there are two states: one is characterized by the present state, the other by a proposed state. The present state is exemplified by the existing system; the proposed state is exemplified by the system that is hypothesized (desired) or proposed."⁴

Awareness of these two states indicates the recognition of a problem. And solution attempts would be an effort to narrow the gap between the existing state and the proposed state until the proposed state is realized.

Newell further points out that the word *problem* should be limited to situations in which "a problem solver desires some outcome or state of affairs that he does not immediately know how to attain. Imperfect knowledge about how to proceed is at the core of the genuinely problematic."⁵ Stated somewhat differently, Wilson and Wilson note

that "a problem exists when someone desires a certain state of affairs and does not immediately know how to attain it."⁶

Goals of problem formulation

As with all tasks, there are certain goals one should strive for when formulating a problem. An important one, according to Optner, is to "state the problem in terms that are known, as opposed to terms that are unknown."⁷ Consider an example where a manager says "the problem is to reduce maintenance cost." Does this statement include any unknown words? It doesn't seem to have any words subject to interpretation . . . except . . . except perhaps . . . "maintenance." Just what kinds of cost are classified as maintenance costs? And precisely what does "reduce" mean? Does it refer to lowering cost by 10 per cent, 50 per cent, \$100, or \$10,000? You, the problem solver, must know the manager's meaning of such key words.

Another goal of problem formulation is to omit hypothesized causes of or solutions to a problem in the statement of the problem. Don't say "the problem is to reduce maintenance cost by 30 per cent by decreasing the frequency of preventive maintenance." Once the analyst defines the problem to include causes or solutions, his objectivity ends. All of his efforts focus on an idea or information generated early (too early) in the problem solving process. He either ignores or doesn't see other possible causes and better solutions. Certainly he doesn't search for them.

Initially formulating the problem

When a problem is first recognized, it generally cannot be stated accurately, clearly, and in detail immediately. Usually it must be defined first in a general, somewhat vague, way with the limited

information available. Gradually, through an iterative process, the definition becomes progressively more accurate and more detailed as investigation generates additional information to make this possible.

The statements' purpose

The purpose of the initial statements of the problem are to "bring the problem into focus."⁸ Achieving this requires more than simply following a pre-established "one-two-three" procedure. Yet, several specific steps can be advantageously employed.

How was the problem recognized?

The problem solver may be the person who first recognized the existence of the problem and therefore would be cognizant of the circumstances around which it arose. However, he often is assigned the problem after someone else officially declares it a problem. In this situation, he should explore how the problem came to be known. This serves as a logical starting point for the thorough information gathering activities which must follow.

Why is it viewed as a problem?

One type of information to be obtained involves understanding why the problem is viewed as a "problem." When pursuing this, it should be remembered, as Miller and Starr have observed, that "not all persons view the same things as problems even when they are faced with the same kind of situations."⁹ Take the common problem of long waiting lines. A bank manager notes long queues of depositors at the teller windows. The tax collector observes long lines of people waiting to pay their taxes. A doctor has a waiting room full of patients.

6—Wilson, Ira G., and Marthann E. Wilson, *Information, Computers and System Design*, New York, John Wiley and Sons, Inc., 1966, p. 186.

7—Optner, *op cit.*, p. 82.

8—Optner, *op cit.*, p. 84.

9—Miller, David W., and Martin K. Starr, *Executive Decisions and Operations Research*, Englewood Cliffs, N.J., Prentice Hall, Inc., 1960, p. 363.

4—*Ibid.*, p. 73.

5—Newell, Allen, *Proceedings: Western Joint Computer Conference*, 1960, p. 257.

Each of these men may view the waiting lines differently. To the bank manager, long lines are a problem because of the possibility of losing customers to a competitor. The tax collector views similar waiting lines as a problem, not because of competition, but because he is an elected official and/or because he must hire additional personnel to process the lines. For the doctor, the long waiting lines may not be viewed as a problem at all, but rather as proof to his patients that he is a good doctor.

The problem solver cannot view the problem solely from his own perspective. He must identify the key people who view the situation as a problem, determine why they consider it problematic. That is, he must obtain, from various people, their opinions regarding the current state and the desired state of affairs.

Establish the viewpoint

From this variety of opinions, the analyst must ultimately determine from whose viewpoint the problem is to be stated. This is necessary because stating the problem from the wrong perspective results in an incorrectly formulated problem.¹⁰ To illustrate this, consider the inventory manager who has stated that the problem is to reduce inventory storage cost. However, if the problem is considered from another, and broader, perspective it may be stated in this way: minimize total costs. Stating the problem

10—Goode and Machal, *op. cit.*, p. 120.



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and the coeditor of four others. His articles have appeared in many professional journals and he has produced two films. Dr. Green is president of the Southeast Chapter of the American Institute for Decision Sciences and chairman of the Management Education and Development Division of the Academy of Management.

in such a different way would surely result in different solution approaches. If the production set-up cost is high, *total* cost reductions may be best achieved through producing large lot sizes and consequently increasing the inventory storage cost. Viewing the problem from the more narrow perspective suggests the opposite—reduce the inventory level. The conclusion, then, is that the problem must be stated from the systems viewpoint, i.e., from a perspective sufficiently broad to preclude suboptimization. It is the analyst who must assure that this is done, although it isn't easy at all because it often involves judgements from among a diversity of opinions.

Obtaining agreement

And the difficulties continue. Quite often all persons involved (the management, the analyst(s), and those affected directly by the problem) cannot arrive "at a mutually exclusive, understood and agreeable definition of the problem to be solved, but yet the project continues."¹¹ When this happens, when there is not a uniform understanding of how the problem should be defined, there is a further magnification of obstacles in the pathway of acceptable solutions. Simply put, members of the problem solving group do not work in unison toward the solution of the *same* problem. As each person defines the problem in a slightly different way (or perhaps more than slight), so it is that each will go in different directions developing solutions (and perhaps good ones) to the *wrong* problem. Obviously this is costly in time, effort, and commitments, all of which translate into dollars.

Symptoms vs. the problem

Aside from the ever-present people problems, the analyst must take care, especially initially, to distinguish between the problem and its symptoms. In many ways we know that treating the symptoms

11—Ehlers, *op. cit.*, p. 39.

doesn't solve the problem. For example, a person may have a sharp pain (symptom of some problem) in his lower right abdomen. Now if the physician treats the symptom by using a "pain killer," the pain may indeed go away, at least temporarily, or seem to. But the problem (a bad appendix) still exists; and, in fact, it may be aggravated. So it is that extreme caution must be taken not to define the problem in terms of its symptoms because this results in a wrongly directed focus. Instead, symptoms can and should be used to help recognize and diagnose problems.

The ultimate problem

In each of these so-called "steps in initially formulating a problem," the idea is to "slowly but surely" gather the necessary ammunition to formulate a workable definition of the problem. It is during this process that the definition begins in a hardly recognizable embryonic form and progressively takes a more identifiable shape as it grows and changes and develops until . . . until it is ready . . . ready to become a fruitful starting point for evolving viable solutions.

What form does the mature problem definition take? Indeed, does it have a definable form? Yes, of course, and the essential characteristics can be enumerated. It may have countless *restrictions*, but it should have only one *condition*; it probably will have numerous *boundaries* and a variety of *requirements*. Let's consider these.

Problem restrictions

An Optner observation is that "the combination of objectives that set the course, and the constraints that limit the objectives constitute the *restriction* under which the study of the problem is begun."¹² The *objectives*, of course, are the end-points, the goals to be achieved; the *constraints* are the conditions that place limitations on how the objectives can be obtained.

12—Optner, *op. cit.*, pp. 82-83.

The analyst must always take care to distinguish between the problem and its symptoms . . .

Quite simply, the point here is that every problem statement should have a definable restriction. That is, associated with every problem are one or more objectives, and they all should be identified and clearly stated. And it is seldom that a problem can be approached in the absence of constraining and limiting conditions. Consequently, it is only logical that all constraints be identified to provide a precise problem solver perspective.

To be more specific, consider this practical example. The problem area deals with inefficiency in preparing shipping orders. The objective, loosely stated, is to "improve the method of preparing the shipping orders." One constraint the analyst may have to work within is management's preference not to computerize. In combining this constraint and objective we have the *restrictions*: to improve the method of preparing shipping orders, without incorporating computerized methods.

Condition of the problem

Defining problems in this way, with greater precision, must be complemented with a genuine concern to eliminate redundancy and avoid contradiction. The problem may be stated in a way that promotes redundancy. For example, the objective may be to computerize a large-scale inventory control system with the constraint that the existing data processing system be continued in parallel indefinitely (i.e., longer than necessary). Under this condition, the analyst may well be able to proceed with the development of a system which meets the objective, yet doing so yields a redundancy that translates into costly waste. Obviously, this is no way to state problems.

An equally inept approach is to formulate the problem so that contradiction exists between the ob-

jectives and constraints. This condition exists when the relationship is such that if one element is true the other must necessarily be false. This is evidenced in the old gourmet proverb that "you can't have your cake and eat it too." Also likely to be contradictory is the objective of improving quality subject to the constraint of reducing cost. These examples of contradiction are obvious, but it is not the obvious ones that are problematic. Instead, the real concern is with those so subtle that only the trained eye can detect them.

So the condition of the problem may be either *redundant* or *contradictory*, in the absence of both we say the condition is *sufficient*.¹³ And of course the analyst's efforts should be to have this condition of compatibility among the various objectives and constraints.

Problem boundaries

Establishing boundaries for a problem is another important element in problem formulation because limits need to be placed on the system to be studied. Boundaries restrict the scope of the problem to a size commensurate with the cost or time available for solution and the amount of detail necessary to understand the process.¹⁴ Consider the problem in which the objective is to reduce the amount of scrap in the production process. Should the boundaries of the problem be the entire production control function? Or should the bounds confine the focus of the analyst to machines and their operators? Optner suggests the rule for determining the boundary is to look at the processor most directly concerned with the problem, in this case the operators and their machines.¹⁵

13—Optner, *op. cit.*, p. 83.

14—Optner, Stanford L., *System Analysis for Business Management*, Englewood Cliffs, N.J., Prentice Hall, Inc., 1960, p. 21.

Specifying the requirements of the problem is the final characteristic of a well-defined problem. The requirements can be considered as "images" of the objectives. They are a means of converting ambiguously stated objectives into detailed, precise statements. Requirements can be stated in terms of objects, attributes, and relationships. For example, the generally stated objective is "to improve the method of preparing shipping orders." Stating this in the form of a requirement, we would have: "to develop a system which will prepare 1,900 shipping orders per day rather than 1,000." In this example the object is "a shipping order," the attribute is "1,900" and the relationship is "to prepare 1,900 shipping orders." In this way, a vaguely stated objective becomes a detailed, specific statement. The above statement becomes a complete problem definition when all constraints are included, when the boundaries or scope of the problem area are specified, and when the relationship between the objective and constraints is tested to assure that contradiction does not exist among them and that redundancy is not promoted.

Conclusion

Conclusions? There are none. It is obvious, both intuitively and empirically, that there is no substitute for formulating problems in the "proper" way. And it is readily apparent that the appropriate formulation emanates from the systematic implementation of a simple process. But the central question remains unanswered: How, in spite of this obviousness, can anyone move ahead toward solutions while leaving behind the unfinished task of clearly and specifically and otherwise appropriately defining the problem in question?

15—*Ibid.*, p. 23.

In-house computers, even if they can be afforded, demand a great many well trained people and a very high demand for data processing. Service bureaus are notoriously unreliable. Why not—

INTERACTIVE ACCOUNTING ON THE SHARED COMPUTER?

by Allen P. Vollen

Xerox Computer Services

ELECTRONIC data processing, which grew to young adulthood in the environment of the large scientific and industrial complexes, has stretched out and down in recent years. It has reached, inevitably, the small businessman.

The product of a technology that has advanced in design and application at a rate unlike anything else in our culture, the computer has become faster, cheaper, smaller, and remarkably versatile in a very short period of time. It is, at the moment, a tool that can enormously benefit a business enter-

prise as small as, say, a two-man professional partnership. It does this not only by bringing speed, efficiency, and economy to day-to-day, month-to-month operations, but also—and perhaps most importantly—by distilling and ordering information in a manner necessary for intelligent business planning.

Whether leaders of a small or medium business should put data processing to work for them has become an academic question; the computer has long since passed this kind of examination. The question becomes, more precisely, how

the businessman can most easily and profitably employ this technology in his enterprise.

There are, obviously, several alternatives open to the businessman who has decided to step into E.D.P. We will discuss them briefly. In the main, however, we will address the concept of the shared computer and, within that realm, we will discuss in particular a new concept called interactive accounting, a solution that puts the end user, the businessman, in direct communication with a large-scale computing system on a real-time basis.

The first data processing option usually considered by the businessman is the obvious one: buying or leasing his own computing system. It's an enticing thought—having one's own computer—and certainly there are a number of small machine configurations available.

Problem areas

There are other problems, however, and several basic questions business management must answer before embarking on this course. There are the matters of the capital investment required for the system; the office space that must be dedicated to its installation and operation; the time and attention that must go into the period of design and development of the programs necessary to the particular business; and, most critically, the employment of trained people who will implement and operate the system.

We categorize the problem of trained people as critical, simply because it is just that. Assuming the businessman is willing to devote the funds, time, and space necessary for launching his system operation, he still faces the biggest hurdle: recruiting and retraining analysts with the ability to design and develop systems not only geared to the needs of the particular business but also to bring about healthy utilization of the computer's capacity. Setting out to hire and keep such people can put the small businessman in competition with the larger computer users; organizations that can afford to pay premium salaries and offer career paths to the data processing professional. And compromise is no solution: efficient use of a small system is no less desirable or difficult to achieve than efficient use of a large system.

The second alternative open to the businessman in the past has been the batch processing service bureau, the organization that receives source documents from its customers, processes them sequentially at its computer center, then returns reports to the customer

some days later. The industry composed of this kind of conventional service bureau has been a rough and tumble one in recent years, with many firms falling out. The common problem has been largely one of not delivering to the customer the kind of service promised.

Although this industry has settled down to some extent, there are still a number of factors the small businessman must consider. Time lags remain a problem, information entry is prone to error and difficult to correct, and the customer tends to feel he is out of touch with the processing of his information—which, indeed, he is.

Shared computer option

The option we will discuss in detail is the shared computer interactive accounting service. This system permits all users, with only typewriter-like terminals on their premises, to draw, as required, upon the data processing resources of a large central computer to carry out accounting functions. Sophisticated operating systems permit these users to do their processing concurrently, each functioning as though he were the only person employing the system he is using.

We see immediately in this concept the advantages of the economies of scale, without the cost of scale. We see immediately the elimination of the headaches and expense of acquiring, installing, operating and maintaining an in-house computer. We also see the elimination of the time lags and the sense of remoteness of the batch processing service.

The businessman who subscribes to interactive accounting in the shared computer environment has in his office one or more terminals, which clerical personnel learn to operate in a few hours. These devices provide immediate, continuous access to the central computer which may be many miles away. Data entry, manipulation, and retrieval are done in real time; that is, each action at the terminal draws an immediate response from

There are several basic questions business management must answer before installing its own computer. There are the matters of the capital investment required for the system; the office space that must be dedicated to its installation and operation; the time and attention that must go into the development of the programs necessary; and, most critically, the employment of trained people who will implement and operate the system.

EXHIBIT I

INTEGRATION OF THE INTERACTIVE ACCOUNTING SYSTEM

GENERAL LEDGER

ACCOUNTS RECEIVABLE	
3	

SALES	
	3

INVENTORY	
	3

COST OF SALES	
3	

TAXES PAYABLE	
	3

FREIGHT	
	3

SUPPORTING LEDGERS

ACCOUNTS RECEIVABLE		
SALES	RECEIPTS	BALANCE
6		1

INVENTORY			
RECEIPTS	ISSUES	BACK ORDERS	BALANCE
	2	5	1

SALES ANALYSIS		
CURRENT	YTD	HISTORY
4	4	

COMMISSIONS	
CURRENT	YTD
4	4

the computer. Although the user has his desired level of data processing sophistication at his command, it is delivered to him economically—he pays only for the resources used: storage of information records, print lines generated, and transactions entered. Low utilization in relation to capacity, another problem common to the in-house computer, is no longer of concern, as there is no need to buy resources in anticipation of growth.

The terminal user enters all accounting transactions into the system from the keyboard. Data is checked and balanced as entered, and here is a main advantage from the viewpoint of data integrity. The user's methods must be precise and his transaction entry correct because the system is programmed to catch and refuse data outside of fixed parameters. Clerical accuracy increases, errors are caught and must be corrected immediately under the system because data must be validated before going into the central computer.

Once an entry has been accepted by the system, it is automatically posted to all appropriate accounts and journals. This concurrent posting, possible because the system is integrated, is a highly important aspect of interactive accounting.

Data from a sales order

Exhibit 1, shown above, graphically demonstrates the integration that occurs with the entry of a customer's sales order.

- (1) Checking of customer credit and inventory.
- (2) Reduction of "on hand" inventory.
- (3) Posting of general ledger sales, accounts receivable, cost of sales, inventory, taxes, and freight accounts.
- (4) Updating of sales analysis and salesman's commission records.
- (5) Recording of any back orders for suggested purchase order reporting.
- (6) Printing of customer invoice.

This complete cycle of automatic checking and posting takes place at electronic speeds, while the user is at the terminal. More important from the auditing standpoint, it means that entries are consistent; the transaction, once validated by the system, is posted identically to each account affected, a feature that in itself can mean many hours saved in later examination.

The user may make inquiries of the interactive accounting service at any time, even interrupting data entry to do so. For example, the following are representative of requests a user could make:

- Inventory "on hand" position
- Back order status
- Customer accounts receivable balance
- Inventory selling price(s)
- Inventory cost
- Sales history
- Employee earnings and tax information
- Vendor balance and invoice detail
- Work-in-process status
- Sales order status
- Profit and loss summary or complete statements
- Fixed asset depreciation data
- Sales information

Management and accounting reports which the businessman requests during the course of the business day are available at the user's terminal or prepared at the central computer center that night for delivery the next day. Typical report requests are:

- Customer statements



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Management Adviser

- Aged accounts receivable trial balance
- Inventory listings and valuations
- Customer invoices
- Gross profit analysis
- Back orders
- Cash receipts journal
- Detail job cost analysis
- Work in process summary trial balance
- Multiple sales analysis
- Sales commissions
- Comparative financial statements
- Trial balances
- Payroll checks and registers
- Accounts payable checks and registers
- Labor distribution
- Cash requirements
- Budgetary analysis.

We have in the shared computer interactive accounting service, a full range of accounting and management information activities available to the extent and in the measure the businessman requires.

For the auditor, much of the arithmetic drudgery is eliminated, taken on by the system. He is able to devote his time and efforts to carrying out analysis and performing other functions of the consulting role. The user's internal controls are enhanced by the system because they must be satisfactory—or the system would not work. The user's employees become disciplined and learn accuracy as a result of system data entry requirements.

The businessman's source documentation never leaves his premises, yet his processing is done at a remote location where records are beyond irregular manipulation. A password security system protects the data of each user of the shared computer interactive accounting system; a boundary concept built into the basic architecture of the system precludes one user's data from going to the data base of another. Duplicate tapes and a log of all transactions are maintained at the computer center and at a secure remote site.

While the costs of acquiring in-house computing systems are going down, in terms of hardware, the

EXHIBIT 2

CUSTOMER PROFILE

Business:	Restaurant Chain
Annual Sales:	Not Available
Employees:	650
Annual Growth Rate:	10%

<u>Application</u>	<u>Monthly Volumes</u>	<u>Monthly Charges</u>
Base Charge	1 Computer Access Port	\$ 200
General Ledger	2200 Accounts	347
Accounts Payable	320 Checks	306
Inventory Control	900 Items	200
Payroll	2500 Checks	800
TOTAL =		\$1853
Terminal and Communication Charges =		115
TOTAL MONTHLY CHARGES		\$1968

Cost Comparisons

Prior Method:	Small Commercial Computer	
	<u>Shared Computer</u>	<u>Prior Method</u>
Systems/Equipment/Services	\$1968.00	\$2000.00
Personnel and Clerical Costs	300.00	2500.00
TOTAL =	\$2268.00	\$4500.00

EXHIBIT 3

CUSTOMER PROFILE

Business:	Winery
Annual Sales:	\$35,000,000.00
Employees:	500
Annual Growth Rate:	15%

<u>Application</u>	<u>Monthly Volumes</u>	<u>Monthly Charges</u>
Base Charge	2 Computer Access Ports	\$ 375
General Ledger	1400 Accounts	297
Accounts Payable	850 Checks	456
Accounts Receivable	390 Customers	79
Order Entry	850 Invoices	517
Inventory Control	300 Items	80
Payroll	200 Checks	500
Cost Accounting		393
TOTAL =		\$2697
Terminal and Communication Charges =		480
TOTAL MONTHLY CHARGES		\$3177

Cost Comparisons

Prior Method:	Service Bureau	
	<u>Shared Computer</u>	<u>Prior Method</u>
Systems/Equipment/Services	\$3177.00	\$3000.00
Personnel and Clerical Costs	3500.00	6000.00
TOTAL =	\$6677.00	\$9000.00

EXHIBIT 4

CUSTOMER PROFILE

Business:	Automotive Parts Distributor
Annual Sales:	\$6,000,000.00
Employees:	100
Annual Growth Rate:	20%

Application	Monthly Volumes	Monthly Charges
Base Charge	1 Computer Access Port	\$ 200
General Ledger	200 Accounts	35
Accounts Payable	400 Checks	112
Accounts Receivable	800 Customers	359
Order Entry	1200 Invoices	452
Inventory Control	2500 Items	268
Payroll	400 Checks	120
TOTAL =		\$1546
Terminal and Communication Charges =		150
TOTAL MONTHLY CHARGES		\$1696

Cost Comparisons

Prior Method:	Accounting Machine	
	Shared Computer	Prior Method
Systems/Equipment/Services	\$1696.00	\$ 300.00
Personnel and Clerical Costs	3500.00	3500.00
TOTAL =	\$5196.00	\$3800.00

EXHIBIT 5

CUSTOMER PROFILE

Business:	Mail Order Distributor
Annual Sales:	\$1,000,000.00
Employees:	20
Annual Growth Rate:	30-50%

Application	Monthly Volumes	Monthly Charges
Base Charge	1 Computer Access Port	\$ 200
General Ledger	20 Accounts	2
Accounts Receivable	4500 Customers	295
Order Entry	2560 Invoices	564
Inventory Control	2200 Items	345
TOTAL =		\$1406
Terminal and Communication Charges =		105
TOTAL MONTHLY CHARGES		\$1511

Cost Comparisons

Prior Method:	Manual	
	Shared Computer	Prior Method
Systems/Equipment/Services	\$1511.00	\$ —0—
Personnel and Clerical Costs	600.00	2400.00
TOTAL =	\$2111.00	\$2400.00

costs of staffing installations with trained data processing personnel are going up. Data processing industry publications estimate that the people-cost of the typical installation is now more than half the total, and rising.

Exhibits 2-5, pages 49-50, are customer profiles showing the monthly processing charges under the shared computer system by application. The per unit cost for the transaction volumes indicated will not be consistent amongst the customers profiled due to the various report options available and number of master file records maintained.

The profiles selected vary in annual sales from one million to thirty-five million and include "prior method" cost comparisons for service bureau, accounting machines, and manual systems.

System is modular

The shared computer concept seems to be the answer to the problems of the in-house or service bureau system. An interactive accounting service, properly offered, is modular. The businessman may start off with a limited number of applications, adding more as warranted by his increasing confidence in the system or by his expanding business. Interactive accounting users are customarily "up and running" within 60 days; often, it is accomplished within 30 days.

The businessman who uses such a service, when provided by a substantial corporation with a record of achievement, is better assured of a high level of data processing expertise behind the system offered him. He is offered privacy, security, reliability, and full support—at a cost that represents one small share of the investment required for the hardware-software-people resources that are at his disposal.

All indications are that an increasing number of small and medium sized business firms as well as government bodies are choosing this alternative as their most practical data processing solution.

what people are writing about

BOOKS

The Sovereign State of ITT by ANTHONY SAMPSON, Stein and Day Publishers, New York, 1973, 323 pages, \$10.

This impressionistic portrait of one of America's most controversial corporations was written by a political writer rather than a business reporter—and it shows. Accountants will find the book thin and lacking in concreteness. It is, nevertheless, an important book, for it raises some disturbing questions about the role of the multinationals in national and international affairs.

The International Telephone and Telegraph Corporation first burst upon the consciousness of the non-business sector of the American public when it became embroiled in two major scandals: the affair of the Dita Beard memo, with its implications that ITT had offered to underwrite San Diego's lukewarm bid for the 1972 Republican convention in exchange for Antitrust Division approval of its merger with The Hartford Insurance Group; and the affair of its alleged intervention in the Chilean elections of 1970, in which it apparently tried to get the Central Intelligence Agency to go along with it in creating "economic chaos" in Chile in order

to prevent the rise to power of the late Salvador Allende.

These two incidents are, naturally, the climax of this book, and they are explored in detail. But the author, an editor of the *London Observer*, tries to do much more. He tries to present a full-scale portrait of this remarkable corporation, which, he thinks, embodies many of the virtues and defects of those two industrial phenomena of our age, the conglomerates and the multinationals.

To show the shaping of ITT's character (if such a word can be used for a corporation), the author goes back to its founder, Sosthenes Behn, a flamboyant tycoon who

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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built ITT into the world's major international manufacturer and operator of telephone systems. He tells how Behn collaborated actively and ardently with the Nazis before and during World War II; how he played fast and loose with the Communists during the Cold War in a risky game that eventually led to the jailing of two of his executives as spies in Hungary and the execution of two other men; and how he lobbied and manipulated officials in Britain, Canada, and the United States in an (eventually unsuccessful) effort to build a new transatlantic cable.

Effective and ruthless

All these operations, according to Mr. Sampson, suggest that ITT's own "diplomatic and intelligence services were more effective, and also more ruthless, than those of the Western nations it dealt with . . . How continuous are the characters of corporations? . . . in two central respects it still resembles Behn's invention. First, it is still constructed around a single dominating head . . . Second, ITT still regards itself as above governments, above controls, and above morals. It presents itself still as an American company in America, British in Britain, German in Germany; but it owes loyalty to none of them, and regards each government as an unnecessary obstruction . . . throughout its five decades, it has remained irresponsible and uncontrollable." It is, says the author, "like a jellyfish, both everywhere and nowhere."

The bulk of the book, however, deals with ITT's history under the leadership of Harold S. Geneen, the Lybrand alumnus who became the highest-paid manager in the world. He changed ITT from a holding company, "investing in factories thousands of miles away and hoping for the best," into a tightly controlled international conglomerate so centralized and so indoctrinated that it is almost "a closed system." Taking a dim view of ITT's prospects abroad, he reduced its dependence on foreign earnings

from 82 per cent to 40 per cent, largely embarking on a major domestic merger binge. In the process he brought ITT up the size ladder of American corporations from fifty-second in 1959 to ninth in 1970.

Actually, the author thinks, Geneen's diversification was not necessary; ITT's foreign holdings, he says, are still the most profitable part of its business. But the acquisitions have made ITT a power to be reckoned with domestically.

The author traces the history of the major acquisitions, with particular attention to the methods that were used to get them. He criticizes the "unaccountable accounting" that enabled ITT in February, 1973, to report record earnings for the fifty-fourth successive quarter. He attacks the pooling of interests accounting by which "a conglomerator could absorb the merger company's net assets at their old book value, even though he paid a huge premium on the acquisition. Then the conglomerator could dispose of these acquired assets, and the proceeds, which were compared to the historical cost, could show enormous book-keeping profits, which could appear on the conglomerates' statements as if they had really been earned." And he takes a swipe at Arthur Andersen & Co. for going along with these devices at ITT.

Chiefly, however, the author's concern is with the emerging independent power of the multinational companies: "The serious issue is not whether multinationals should be allowed, but how they should be controlled and counterbalanced. The scale of industrial development has far outstripped the scale of political development, a discrepancy which ruthless companies can easily exploit. ITT has been especially able to exploit it, not only through its size and diversity but through its tradition of deviousness and many-sidedness, and its mastery of communications."

ITT, the author thinks, is "a caricature of a multinational conglomerate, not a typical example." Yet

"some of its traits . . . are ones which others are tempted to follow. And many of the questions which arose from the ITT scandals and hearings have a wider relevance. Has private power, as Senator Hart asked, now extended its reach so far that no government can control it? Does the scale of world trade necessitate giant conglomerates, which their home government cannot afford to defy? Do they have the right, and the power, to create their own foreign policy?"

This book has many flaws. It covers a lot of ground somewhat superficially, reflecting the haste with which it was prepared in order to capitalize on ITT's headlines. The author lacks the technical and business training really to put it all together, and, despite his frequent references to interviews and hearing records, much of the book reads like a rehash of the daily press.

Many readers would like something much deeper. Accountants, for example, will find that his attack on conglomerate accounting procedures adds nothing to what they already know, and students of management will feel frustrated that the allegedly unique and incredibly effective control system that Geneen has set up is not really explained.

Even so, this is a consequential and worthwhile book. Its author sees clearly what is important and what is not important about ITT and the other conglomerates and multinationals, and he asks the right questions. It is up to more sophisticated analysts to take it from there.

Zero-Base Budgeting: A Practical Management Tool for Evaluating Expenses by PETER A. PYHRR, John Wiley & Sons, New York, 1973, 231 pages, \$13.95.

A great idea but a lot of work—that will probably be the immediate reaction of any manager—or even any accountant—who confronts zero base budgeting for the first time. This book, by the man who developed this new planning-budgeting

technique, is not likely to change any minds on either score. Every consultant needs to read it just the same.

In a 1969 speech Dr. Arthur F. Burns, then counsel to the President, identified the basic need for zero-base budgeting: "Customarily, the officials in charge of an established program have to justify only the increase which they seek above last year's appropriation. In other words, what they are already spending is usually accepted as necessary, without examination. Substantial savings could undoubtedly be realized if [it were required that] every agency . . . make a case for its entire appropriation request each year, just as if its program or programs were entirely new."

However, as Dr. Burns pointed out, "Such budgeting procedure may be difficult to achieve, partly because it will add heavily to the burdens of budget-making, and partly also because it will be resisted by those who fear that their pet programs would be jeopardized by a system that subjects every . . . activity to annual scrutiny of its costs and results."

Actually, according to this author, just such a technique is currently in use in Texas Instruments, Inc., and in the government of the State of Georgia, and it has not made budget-making impossible. Indeed, he says, ". . . effectively planned and properly managed, zero-base budgeting can actually reduce the burdens of budget making while significantly improving management decision making and the allocation of resources."

In the typical budgeting process, Mr. Pyhrr points out, most corporations and government agencies use current operating and expenditure levels as a base, from which they analyze in detail only those increases (or decreases) desired—thus looking at only a small fraction of the final budget dollars approved. This approach leaves two major questions unanswered: "How efficient and effective are the current operations that were not evaluated? Should current operations be

reduced in order to fund higher priority new programs or increase profits?"

Three common problems

After an experience with the traditional type of cost reduction, a group at Texas Instruments identified "three problems that I think are common in budget procedures throughout industry and government:

"1. Some goals and objectives had not been established, or stated goals and objectives as understood and anticipated by top management were not realistic in light of the final amount of money budgeted. (In my conversations with several other companies, I have been told that they first establish their budgets and then determine their goals and objectives—which seems to put the cart before the horse.)

"2. Some operating decisions had not been made that affected the amount of money required. . . .

"3. Budget dollars were not strictly allocated in accordance with changing responsibilities and work loads. Some work loads had increased significantly while others had decreased, yet everyone had his budget cut from 1 to 10 per cent."

As a result, Mr. Pyhrr reports, he developed "the planning and budgeting methodology that we termed zero-base budgeting. The technique was used to prepare the 1970 budget for the staff and research divisions of Texas Instruments. Mr. Pyhrr later installed the system for the State of Georgia (beginning with the fiscal year 1973), and it also has "been adopted by other corporations and governmental agencies."

Zero-base budgeting "requires each manager to justify his entire budget request in detail and puts the burden of proof on him to justify why he should spend any money" at all, Mr. Pyhrr explains. For each activity or operation under his control each manager must prepare a "decision package" which includes an analysis of cost, purpose, alternative courses of action,

measures of performance, consequences of not performing the activity, and benefits. In addition to identifying different ways of performing the activity, managers must analyze different levels of effort for it. They must identify a minimum level of spending and then, in separate decision packages, analyze the costs and benefits of additional levels of spending. This analysis "forces every manager to consider and evaluate a level of spending lower than his current operating level; gives management the alternative of eliminating an activity or choosing from several levels of effort; and allows tremendous trade-offs and shifts in expenditure levels among organizational units."

Once the decision packages have been developed, they must be ranked or listed in order of importance. This ranking process "allows each manager to explicitly identify his priorities, merges decision packages for ongoing and new programs into one ranking; and allows top management to evaluate and compare the relative needs and priorities of different organizations to make funding decisions. As the list of decision packages increases the cost also increases, and top management can decide at what point on the list the added costs outweigh the benefits."

Zero-base budgeting, according to Mr. Pyhrr is applicable to administrative, technical, and most commercial portions of the budget; it is not directly adaptable to direct production and manufacturing costs, but it can be used for expenses that are closely related to direct manufacturing operations, such as maintenance, supervision, production planning, and other manufacturing support services. It is also adaptable to capital expenditure analysis. "Although zero-base budgeting may apply to only a fraction of the total budget in a heavy manufacturing organization, the activities subject to zero-base budgeting techniques are usually the most difficult to plan and control and yet offer management the

greatest lever to affect profits," Mr. Pyhrr says. In government, since government is a service organization, the technique is applicable across the board.

Zero-base budgeting is more work and takes more time than traditional budgeting, Mr. Pyhrr concedes, especially at the beginning. However, in the second year of zero-base budgeting at Texas Instruments, the cycle "was reduced to half the first year calendar time, which was less than the time spent under the previous budgeting procedures."

The advantages, Mr. Pyhrr claims, are many: "Zero-base budgeting provides top management with detailed information concerning the money needed to accomplish desired ends. It spotlights redundancies and duplication of efforts among departments, focuses on dollars needed for programs rather than on the percentage increase (or decrease) from the previous year, specifies priorities within and among departments and divisions, allows comparisons across these organizational lines as to respective priorities funded, and allows a performance audit to determine whether each activity or operation performed as promised."

In the book Mr. Pyhrr describes in considerable detail how to pick the levels at which decision packages are to be prepared, how to design the packages, how to rank them, how to install the program, how to keep it going, how to use it to supplement or to replace Planning - Programming - Budgeting (PPB), how to use computers in the process, and how to evaluate results. The appendixes present a sample zero-base budgeting manual and suggest activities for which decision packages may be developed.

A great deal more is going to be heard about this technique in the years to come. For that reason, if for no other, every consultant needs to have zero-base budgeting in his bag of tricks and every accountant needs to have at least a nodding acquaintance with its principles.

This is the definitive book on the subject.

The Corporate Computer: How to Live with an Ecological Intrusion by NORMAN SANDERS, McGraw-Hill Book Company, New York, 1973, 161 pages, \$10.

How to run a computer operation in 19 easy chapters—many readers would like to have such a book; many authors have tried to write it; here it is at last.

Suppose that you, as an ordinary manager with no experience in computers, have suddenly been ordered to set up a computer operation in your company. This doesn't happen as often as it used to, but it's not impossible even today. What do you do?

This book sets up such a situation and tells you how to handle it—from how to decide whether or not to accept the assignment to planning your first expansion. It really does.

The author, a Briton with more than 20 years of computer experience in Europe, has a gift for differentiating wheat and chaff. In less than 150 pages he takes the reader through every step of computer management, concentrating on basic principles yet never neglecting vital procedural details. He is never dogmatic; where there are alternative ways of doing things he outlines the pros and cons; yet he is not afraid to take a firm stand on such issues as how to deal with users, with suppliers, with programmers, and with top management. His style is light, sometimes funny, clear, concrete, and eminently readable.

No significant aspect of computer management is omitted. Among the chapter topics: Why you should reject the appointment and what to expect if you don't; the reasons for acquiring a computer; getting the backing of the top man; the fiscal impact; the need for a corporate plan, its appearance and promulgation around the company;

the need for a technical assistant, how to choose him, the function he is to perform; organization of the systems department; organization of the service department; converging on the configuration; the selection process; the contract; how to hire and keep technical people; project control; standards and files; programing; how to help the manufacturer help you; finding out whether the computer is working; maintenance; documentation; operational research; measurement of results; and forecasting. Appendixes present a glossary of terms and a description of how to set up a "war room."

After reading this book the manager will really feel equipped to run a computer department. This may be an illusion, but if it can be done by the book, this is the book to do it by.

Corporate Power in America by RALPH NADER and MARK J. GREEN, Grossman Publishers, New York, 1973, 309 pages, \$7.95.

The modern corporation has grown too powerful for the public good and must be curbed. That is the assumption rather than the thesis of this book, which concentrates on solutions.

Corporations must be made "responsible to more than merely their own self-contained rules and narrow horizons," the authors of this book declare in the preface. "As law professor Abe Chayes has written, 'the modern business corporation emerged as the first successful institutional claimant of significant unregulated power since the nation-state established its title in the sixteenth and seventeenth centuries.' Our large corporations are unparalleled as buffers shielding their executive decision-makers from public inquiry and accountability. A supposed democracy should not suffer the exercise of such uncontrolled power."

Only a few of the speakers at Ralph Nader's Conference on Cor-

porate Accountability, which was held in Washington, D. C., in the fall of 1971 and on which this book is based, bother to document this charge. A few supporting accusations are made: The antitrust laws have failed to restore the power of the marketplace; regulatory agencies have become arms of the industries they supposedly watchdog; corporations influence Congress and virtually dictate to the Administration; the corporation, in the words of Professor John K. Galbraith, has assimilated itself to the state.

But on the whole the speakers—economists, political scientists, and lawyers who have “distinguished themselves by their studies and commentary on corporate power”—accept the problem as given and concentrate on possible solutions.

Those solutions vary widely. Professor Galbraith predicts that eventually all the great corporations will become public enterprises. Congressman Fred Harris recommends reform of campaign financing, the end of income deductions for lobbying, a ban on political activity by corporations, elimination of the tax deductibility of institutional advertising, antitrust action to break up monopolies, and Federal chartering of corporations.

Social moves discounted

Actually, Federal chartering, the cornerstone of Mr. Nader's own proposals, is implicit in the recommendations of most of the speakers. But others go off in other directions as well, depending on their fields of interest. Professor John J. Flynn, seeing employees as the “only visible, practical, and legitimate constituency of the corporation,” wants them represented on the board of directors. Robert Townsend offers “a modest proposal” for a public director. Professor Andrew Hacker advocates more consumer and citizen action of the Nader type.

Joel F. Henning, a fellow of the Adlai Stevenson Institute of International Affairs, dismisses the corporate social responsibility move-

ment as a “shell game,” and most of the other speakers apparently agree, for their emphasis is on compulsion—action by Congress, regulatory bodies, and the courts.

Legal action plan urged

Professor Arthur S. Miller draws up an action plan for the judiciary: Enforce the antitrust laws more stringently, use mandatory orders to make the bureaucracy “govern more adequately,” enlarge the class action category, allow shareholders greater access to the corporate decisional process, permit *qui tam* actions to enforce antipollution laws, further enlarge the category of those with standing to bring the administrative process or judiciary into operation, apply constitutional norms to corporate activity, and allow more legal actions to be brought against the companies themselves, as in stockholders' derivative suits. Professor Walter Adams suggests a host of specific prohibitions and obligations, under Federal charter, for corporations with assets over \$250 million and corporations that rank among the top eight producers in an industry where the eight firms among them control 70 per cent or more of the market. Such corporations would be prohibited from making acquisitions; granting or receiving any discrimination in price, service, or allowances unless such discrimination could be demonstrated to be justified by savings in cost; engaging in tie-in arrangements or exclusive dealerships, and participating in any scheme of interlocking control over any other corporations. In addition, such corporations should be required to serve all customers on reasonable and nondiscriminatory terms, license their patents and know-how, and pursue pricing and product policies calculated to achieve capacity production and full employment.

For accountants, probably the most interesting recommendations are those of Professor Willard F. Mueller, who calls for much more disclosure of corporate information

to the public. He wants segmented disclosure of investment, revenue, and profit data by product lines drawn as narrowly as possible, public disclosure of product sales, public access to income and other Federal tax returns of large corporations, disclosure of intercorporate holdings, disclosure of publicly owned facilities operated or leased by private corporations, disclosure of foreign operations, disclosure of social costs, and public representation on the board of directors.

This is a provocative and controversial book. If some of the proposals seem extreme, it may well be that this is the grave American business has dug for itself. (References to ITT as a horrible example are rife throughout the book.) Most of the speakers at this Nader conference were not wild-eyed radicals, and this book may be an indication of the direction in which public opinion is swinging.

Confessions of a Corporate Headhunter by ALLAN J. COX, Trident Press, New York, 189 pages, \$6.95.

The world of the executive recruiter is a mysterious and glamorous one to most managers. This book does a better job of dispelling the glamor than the mystery, but it does offer a few helpful hints for both employer and employee.

In the preface to this book the author offers three reasons for writing it:

Out of “benign compassion” for today's mobile executive, he wanted to offer some advice on “coping with corporate wisdom.”

On the basis of the insights he has gained as a corporate headhunter, he wanted to add to the general reader's understanding of corporate organization.

He sought to “present a challenge to American business” to reorder its priorities and make itself more appealing to the crop of young executives coming up.

All this is quite an order for a book of less than 200 pages, and,

as might be expected, he doesn't quite make it. The goals are too varied to make for a unified book, and the result lacks both cohesion and depth.

Advice for prospect

The most interesting part of the book—and also the most successful—is Mr. Cox's advice to the so-called "candidate." He tells how to get into contact with a recruiter without letting him suspect you are looking for a job, how to play hard to get, how to wend your way through the little rituals of the courtship, how to deal with psychological tests (fake them or refuse to be subjected to them), whether to ask for an employment contract (a simple severance arrangement is better).

His advice to the client, apart from an eminently sensible plea for complete honesty in dealing with the recruiter, is sketchy and rather supercilious. (A corporation president reviewing this book in *Business Week* found this chapter "presumptuous," "sensational," and "often bizarre.") His suggestions on how to deal with a candidate once he has been presented seem laughably obvious, but perhaps his rather dim view of clients' intelligence is justified.

His advice to business as a whole is sound and idealistic. The call for a stronger corporate sense of social responsibility, while neither original nor profound, is creditable and seemingly sincere.

Also of general interest is Mr. Cox's description of the way corporate headhunters operate, although it is more a collection of highly entertaining anecdotes than a genuine explanation. In the process he manages subtly to denigrate his competitors and imply that he is just about the only man in the business with sensitivity and integrity.

Here, perhaps, is the real clue to what the book is all about. For Mr. Cox is not proud of his profession, which he characterizes as "probably the most opportunistic,

cynical, defensive, and manipulative of the corporate-service industries." (On the jacket blurb the term corporate headhunter is defined as "a mediator between executives who don't understand their problems and job candidates who don't care what the job is so long as there is a quick buck to be made.") Often his real objective in writing the book seems to be self-justification rather than service to the reader. Perhaps the title was not chosen purely for sales appeal but reflects the author's true aim—a cathartic apologia.

This is a book that promises a lot more than it supplies, but it is skillfully written, vastly entertaining, full of human interest—and it contains a few nuggets of wisdom that are relatively painless to dredge out. Most executives will enjoy reading it. Few will find it changing the course of their lives.

Profiles of Involvement by the HUMAN RESOURCES NETWORK, Human Resources Corporation, 2010 Chancellor Street, Philadelphia, Pa., 19103, 1973, 843 pages in three paper bound volumes, \$60.

This group of lavishly illustrated brochures presents the results of a survey of corporate social action programs.

Described in the text as "the first national compendium of corporate social involvement," this book offers brief descriptions of social action programs in 186 corporations; 59 foundations, associations and nonprofit corporations; and 40 government agencies.

The editors sent a form questionnaire to organizations they thought likely to have such programs, promising to publish the resulting "profile forms" without "manipulating or editing" the material other than improving the grammar or format. These profiles are the heart of the book.

There is a little more. Volume 1 contains, in addition to introduc-

tory material by the editors and profiles of 535 social action programs in the 186 corporations, a section called "perspectives," with articles on corporate social responsibility by selected persons "in the field" and selected speeches by corporate representatives. Volume 2 contains an article in addition to the profiles from nonprofit organizations and government. Volume 3 provides a bibliography (known here as a "biblio-view"), glossaries, and indexes.

The action programs themselves are briefly summarized and interpreted. The editors note that most of the programs were launched since 1970 as "band aid jobs" in response to the crises of the 1960's. The greatest number of programs, they report, are in the area of employment—employee training, upgrading of job skills, and integration of the hard core unemployed; the second most popular category is education, chiefly remedial or compensatory education programs aimed at minorities.

The most successful programs, the editors find, have these characteristics: They involve participation on the part of the people being helped; they involve "an exchange of perspectives"; and they are programs that "in some way contributed to a strengthening of self-esteem." Case studies of three programs that have these characteristics are presented.

This book is described by the editors as a "\$300,000 experiment in communications." It is easy to see that it may have cost \$300,000. The three volumes are an art director's delight, lavishly illustrated with four-color photographs, paintings, and graphics, heavily adorned with sidebars and other typographical attention-getting devices. But it is difficult to see in what sense it is an "experiment in communications," unless the format is to be considered experimental.

It is even more difficult to see why \$300,000 should have been spent on it. The volumes are so heavily encrusted with art work that it is hard to figure out where

the articles begin and end, who wrote them, and what they deal with. The editors' contributions to the book are so encumbered by fine writing that merely to discover what the book is about requires a major effort on the reader's part.

Human Resources Network describes itself as "a nonprofit educational corporation whose charter purpose is to collect and disseminate important information about pressing social issues." It describes the purpose of the book as to provide a "collective exchange of ideas and experiences" about "corporate expeditions into the social arenas."

The accountant or businessman probably would have preferred a simply written, clearly presented report of the information contained in this book, which is substantial if you can dig it out. Such a report would not have cost \$300,000, yet it would have been more useful, for the "experimental" format of this work clearly impedes communication. For those who love to look at pictures, it is another *Arizona Highways*.

The Foundations of Management
by ROY A. LINDBERG, Oceana Publications, Inc., Dobbs Ferry, N. Y., 1973, 115 pages, \$4.

This little volume represents one man's philosophy of management. That man, a management consultant in a CPA firm, is not a nationally known authority on management. He is, however, a thoughtful man, and in this book he has made an effort to distill the essence of his thinking and experience for other managers.

The theme of this book, according to Mr. Lindberg, is that "management, to be performed competently, requires more than experience or knowledge, that it also requires perceptions that may never be proven by any form of interaction with the outside world. These perceptions form the basis of management as each manager practices it."

A manager, Mr. Lindberg notes, must make decisions whether he possesses relevant knowledge or experience or not. He must, then, decide on the basis of "managerially relevant generalizations so simple, cogent, and persuasive they must be labeled beliefs, values, convictions . . . a true generalist . . . is a manager who . . . has decision guides in the form of concepts large, accommodating, earthy, and attractive enough to be capable in all situations of keeping him from making serious errors."

Manager must have philosophy

These concepts, he says, "must also be mutually compatible and woven into a comprehensive view. Therefore, it can be said that every successful manager has a philosophy—that is, a body of basic and integrated views, tenets, or convictions." This book is Mr. Lindberg's philosophy.

It presents "a number of propositions . . . that appear to the author to describe the basic character of business and management and managing as they exist in a 'free' economy. The propositions are offered with full recognition of their logical or empirical vulnerability, but with the confidence that they represent a step in the right direction."

The book is made up of 85 briefly discussed propositions—on the nature of business, on the nature of management, on the role of the manager, on planning, on control, and on "selected matters"—ranging from "A Business' Prime Responsibility Is to Survive" to "Organize for Unknowns as well as Knowns."

The majority of them, as the author himself notes, are generally familiar. "Some will not strike the reader as having any importance, and a few are likely to be rejected as being totally unacceptable. No harm. Consideration of the propositions offered in these pages cannot lead to worse than their rejection because they seem obvious, unrealistic or, even, absurd. On the other hand, consideration of them may

stimulate new perspectives or ideas of value to the manager."

The manager or consultant who likes to stop and take stock occasionally of what he is doing and how he is doing it may find some of these thoughts worthwhile.

MAGAZINES

A Direct Approach to Choice Under Uncertainty by MORTON I. KAMIEN and NANCY L. SCHWARTZ, *Management Science*, April, 1972.

For certain classes of problems, an alternative conceptualization of decision making under uncertainty is considered. Under this direct approach, decision making is viewed as the selection of a modification program for a given probability distribution; practical applications are developed for problem covering preventive maintenance policies, monopoly product pricing, and R&D project planning.

In theory, decision making under uncertainty in the past was considered a problem in selecting the optimal from a set of available probability distributions. The selection of a portfolio has been most often used to illustrate this process. A certain amount of funds are available to distribute among the various securities, each having an associated probability distribution over the return it could yield. The allocation of the funds among the securities then results in a composite probability distribution over the rewards from the entire portfolio. The decision is to choose which allocation scheme maximizes the utility of the return, or simply to choose the best composite distribution from the available set.

In some circumstances, it is argued, this indirect approach is not always the most natural. In the portfolio selection problem, the presence of a securities market enables the decision maker to modify his set of probability distributions and obtain a desired distribution. In the absence of such a market, the decision maker would have

been forced to rely solely upon his previous or "inherited" probability distribution. Under these circumstances, the decision maker could modify his existing distribution only by direct action. For example, a firm may alter the failure rate of its equipment by a policy of preventive maintenance; thus, the invoking of the policy is a direct method to modify the probability distribution over the date of machine failure.

The authors contend that their direct approach is more appropriate in those situations where the decision maker is unable to resort to an existing market to obtain probability distributions. In these cases, the decision maker would select a most preferred distribution over payoffs by direct modification of an existing or "inherited" probability distribution, at some direct monetary cost. This may be illustrated where a monopolist faces possible market entry by competitors.

By setting his prices at some relatively high mark, P_0 , the monopolist stands to reap great profits; however, his market also may be invaded by competitors anxious to share those profits with him. By lowering his prices to some P_1 , where $P_0 > P_1$, the monopolist will be able to discourage the market entry of his rivals and prolong the period of monopoly. The monopolist's trade off is the cost of reduced profits against the payoff of extended monopoly life. The monopolist, facing the possibility of competition, thus can directly modify the probability distribution governing such market entry by means of pricing policy.

This direct approach to decision making under uncertainty should be considered by accountants for two reasons: 1) its theory and application is relatively simple and straightforward; and 2) in most problem areas encountered, the established market will be nonexistent. Undoubtedly many decision makers are already familiar with this decision process. For those who are, this article may clarify

your thinking. For those who aren't, it offers a new alternative.

KENNETH FERRIS

The Ohio State University

Improving the Profitability of Retail Merchandising Decisions

by DANIEL J. SWEENEY, *Journal of Marketing*, January, 1973.

Mr. Sweeney notes the recent decline in the financial performance of retail department stores and suggests that the use of a modified return-on-investment measure in merchandising decisions may be the answer. The article includes the results of a simulation conducted by the author in support of his proposal.

Mr. Sweeney feels that the decline in rate of return on owner's equity (from 8.98 per cent to 7.25 per cent between 1965 and 1970) can be traced to the turnover of inventory. He cites the fact that the ratio of net profit to inventory cost fell from 19.08 per cent to 14.60 per cent between 1965 and 1970. This is due primarily to the fact that while stores have successfully raised their initial markups from 40.28 per cent to 43.62 per cent during that period, the rate of stock turnover declined from 3.47 to 3.17 times.

Thus he concludes that merchandising executives, while concerned with margins, neglect overall return on investment. Mr. Sweeney feels that one of the major causes for this neglect of rate of return is the uncertainty among both theorists and executives as to an acceptable definition of rate of return. He suggests that the simplest, and at the same time one of the most valid, is gross margin return on investment (GMROI). He defines this as gross margin dollars divided by either average or end-of-month inventory investment. Alternatively it may be calculated as the product of the gross margin per cent times the average rate of inventory turnover:

$$\text{GMROI} = \frac{\text{Gross Margin Dollars}}{\text{Net Sales}} \times \frac{\text{Net Sales}}{\text{Average Inventory}}$$

Companies using retail valuation for inventory may employ this retail inventory base in the calculation. The gross margin return thus completed, while not a measure of return on investment, is still a useful measure.

Mr. Sweeney points out that not only does GMROI provide a measure of the management control of the major asset of a retail firm, but also allows comparisons between the performance of product lines or different divisions.

To test the validity of this measure as it applies to retail decisions, he worked with a large mid-western department store to develop a model of their decision making process. After the validity of the model was established using historical data, a corresponding model was constructed using GMROI as the primary decision rule. A five-year simulation was run with both models and the results were compared using Wilcoxon matched pairs signed-ranks test (used to measure overall variations between a series of matched scores, in this case certain monthly performance data).

Several things emerged from the simulation. Volume increased using GMROI due to the fact that the number of stockouts dropped to zero, reflecting the understocking of some items and overstocking of others. Markon and margin percentages were virtually unchanged, but gross margin dollars rose 11.81 per cent. Turnover increased 13.84 per cent while average inventory value increased only 2.31 per cent. GMROI increased 11.33 per cent from an average monthly percentage of 113.99 per cent under traditional decision rules to an average of 126.91 per cent under GMROI rules.

In summary, it would seem that the use of GMROI in making inventory decisions results in signifi-

cantly better inventory management with associated better profitability performance. Two things should be pointed out, however. First, the simulation was conducted using data for stable merchandise items. Thus one should be careful when using GMROI with non-staples. This is not to say that it is invalid, but only to say that other factors must be given greater weight.

The second, and probably the major problem, is that of implementation. As with any budgeting or evaluation procedure, care must be taken that the figures are realistic. It must be remembered that there may be valid differences among departments even with a generally comparable measure such as this. Lastly, implementation will involve fairly substantial reorientation and reorganization and will require a solid backing from top management. Mr. Sweeney presents a good case that the end result is worth it.

DAVID A. PATTON, JR.

The University of Virginia

The MBA and the Accounting Profession by JOHN J. McDONOUGH, *The CPA Journal*, April, 1973.

The author presents some developments and their implications for the graduate business school and the accounting profession. He suggests that the MBA's knowledge of accounting issues and the MBA's attitudes towards the accounting profession will determine the future importance of accounting in business schools.

During the last 20 years, according to John McDonough, the business school's teaching and financial interests have shifted from undergraduate to graduate education. The number of schools granting graduate degrees and the number of students graduating from such schools have increased. In addition, graduate business schools

have experienced two phenomena (i.e., the education of large numbers of MBAs and the research emphasis of academic accountants) which have implications for the accounting profession.

MBAs weak in accounting

If importance is measured by the number of graduates, the MBA is the most important current product of the graduate business schools. The MBA has a heavy bias towards financial management positions in large corporations and in financial institutions. Mr. McDonough describes the MBA's accounting knowledge as follows:

1. The MBA is oriented towards managerial accounting aspects but is weak in financial accounting aspects.

2. The MBA is unfamiliar with basic accounting processes and is unable to link technical problems with functional implications.

3. The MBA places a low value on the accountant's attest function.

4. The MBA bases his attitudes towards the accounting profession on the status and the competence of the accounting professors that he encounters as a student.

Accordingly, the MBA has a limited knowledge of accounting issues and has a poor attitude towards the accounting profession.

The research emphasis in graduate business schools has developed for the following reasons:

1. Research support of the academic accountant has covered the costs of the research and has also covered some university overhead costs.

2. Research success of the academic accountant has been required for budget support, for influence over university policies, and for university promotions.

Accounting research provides an important link between the academic accountant and the business community, but the MBA receives no direct benefit from such research.

John McDonough suggests a need for integration of research and teaching efforts to provide for professional management education. The proposal could be implemented in schools which require two years of graduate education for the MBA degree. The success of the proposal will require the cooperation of academic and practicing accountants.

The academic accountant can promote the integration of research and teaching efforts by supporting curriculum changes such as the following:

1. If the MBA is searching for electives, the academic accountant must provide courses which will broaden the student's understanding of accounting issues.

2. If the MBA is pursuing accounting as a career, the academic accountant must provide a three- or four-course sequence which will give the MBA an adequate knowledge of accounting issues.

The practicing professional accountant can promote the integration of research and teaching efforts by taking the MBA seriously in the job market (i.e., by hiring the MBA whenever possible) and by using the MBA as a prime source of managerial talent.

In summary, John McDonough presents a proposal which will keep accounting the premier discipline in business schools. If the integration of accounting research and teaching efforts is not achieved, large numbers of MBAs holding positions which can influence the future of graduate business schools will have neither an adequate knowledge of accounting issues nor a favorable attitude towards the accounting profession. The author suggests the time is right for the integration of research and teaching efforts, the facilities are already available for such integration, and the prospects look promising for success from such integration.

JERRY L. HAUGLAND

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Leadership and Organizational Performance: A Study of Large Corporations, by STANLEY LIEBERSON and JAMES F. O'CONNOR, *American Sociological Review*, April, 1972.

As a two-phase study on the relative importance of leadership influence in the performance of a firm, where performance is measured by economic criteria, the influence of changes in top management of a firm due to such factors as the state of the economy, the industry, and the firm's overall performance position within the industry are isolated for 167 firms over a 20 year period. Three measures of performance (sales, net earnings, and profit margins) were used.

Using an analysis of variance technique to analyze the data, the results of the first phase were that leadership did not greatly influence performance measured by the first two variables. However, when time lags were introduced to allow for the possible long-term effects of a leadership change, leadership became the most important influence on the third performance variable, profit margins. (In this study, profit margin is defined as the ratio of gross margin to sales revenue.)

The various constraints which operate on top management, both internal (committees, regulations, standard procedures), and external (competitors, government regulations, unions, customers and supplies) are one set of factors restricting its influence with respect to sales and earnings. Also, the effects of the other variables (state of economy, industry, and industry position) are less influential with regard to profit margins than the other two performance measures.

The second phase of the study broke the companies down into their respective industries, to determine if different leadership effects existed across different industries. Some industrial characteris-

tics, such as degree of concentration, advertising expenditures and the number of vice-presidents employed, were correlated across industries in an attempt to outline some characteristics of organizations where leadership influence is significant.

With respect to sales, it was found that leadership influence was high in concentrated industries. With profit margins, on the other hand, leadership impact was high in industries low in labor intensity. It was similarly found to be so in rapid growth industries, industries where advertising is important, and also where the number of vice-presidents in the industry's average company was relatively high. With regard to the latter factor, it is suggested that a large number of vice-presidents may give top management tighter control through better policy execution and greater feedback on company operations.

Overall results important

Although questions can certainly be raised about the methodology, which is not clearly explained and validated, the overall results of the study are of great interest.

In the divisionalized firm, where assessment of responsibility and overall performance of division managers is generally made on the basis of their net earnings performance, the study suggests that they should, perhaps, be evaluated on the basis of their profit margins. For here is where a manager can apparently exert the most influence and so his performance in exerting it can be assessed, taking account of the other variables as well. Further, this internal assessment method, especially where divisions are selling outside the organization, may be able to be utilized to get a better overall comparison of one division against another, rather than the net earnings criterion which is currently utilized most widely.

DAVID C. HAYES
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How Business School Students Rate Corporations, *Business and Society Review*, Summer, 1972.

Results of a survey of graduate business students designed to rate the social performances of 50 corporations are reported.

The survey was conducted by the National Affiliation of Concerned Business Students, a new nonprofit educational organization of graduate business students whose primary purpose is to promote research on social aspects of the corporation.

This brief article tabulates the results of a questionnaire mailed to 300 graduate business students and returned by 150. The appropriateness of the questionnaire and the validity of the survey cannot be analyzed because it is not presented in the article, nor are the statistical procedures used in the survey described.

The ratings reflect participating students' evaluations of the responsiveness of 50 corporations to social problems. Possible corporate averages ranged from a maximum of 5.00 to a minimum of 1.00. The highest average scores were attained by: Xerox, 4.12; First Pennsylvania, 3.54; IBM, 3.54; Cummins Engine, 3.48; and Prudential Insurance, 3.37. The worst averages were received by: Con Edison (N.Y.), 1.81; Standard Oil (Calif.), 1.97; U.S. Steel, 2.00; L.T.V., 2.11; and Commonwealth Edison (Chicago), 2.12.

A significant aspect of the survey is that it is not intended to reflect a factual analysis of corporate social policies, but rather the opinions of the participants. This would appear to be a source of relevant information for corporate businesses. For instance, the survey may reflect how effective a specific corporation's social policies have been in establishing a social awareness image. Another possibility is that the survey may hold a hint as to why some corporations have difficulty in recruiting the most promising students as employees.

JOANN S. DEVRIES
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Management Adviser

Accounting System for Earnings Per Share by R. J. HUEFNER, *Management Accounting*, March, 1972.

This article presents a formal accounting system designed to facilitate the complicated procedure of maintaining the relevant information needed to compute earnings per share.

As a result of Accounting Principle Board Opinion No. 15, the once direct operation of computing earnings per share has now become a complicated process. Under Opinion No. 15 all securities which possess a potential claim to common shares must be identified, their effect on earnings per share determined, and, if appropriate, incorporated into the computation. Each of these securities may or may not be included in the computation of earnings per share and each security may affect the computation in a different manner. Because of the difficulties caused by APB Opinion No. 15, Mr. Huefner has designed a practical accounting system to accumulate and maintain the data relevant to the computation of earnings per share.

The system provides a set of self-balancing accounts which are "in effect, proforma accounts." They are designed to accumulate and maintain the permanent data relevant to the computation of earnings per share and also to reflect any temporary data employed in the computation in a particular period. Thus, the system provides all data employed in the computation of earnings per share in an organized manner for each period.

Permanent information is recorded in a set of permanent accounts and reflects securities that are considered "common stock equivalents." Each security is recorded in a manner that will facilitate the computation of earnings per share. The accounts for convertible securities serve as "contra accounts" to the regular accounts and, therefore, reflect the assumption of conversion. In the case of options and warrants, entries are

made to reflect the asset that would be generated by exercise or conversion. These accounts normally have debit balances, the offsetting credit going to the "committed common stock" account. Therefore, this account reflects any potential increase in equity resulting from conversion or exercise of these residual securities.

Generally, there will not be a need for adjustments to the permanent accounts since common stock equivalence is determined at the date of issue of the security and usually does not change. However, if the conversion rate does change during the life of a security, adjustments will need to be made to reflect the change in committed common shares.

Mr. Huefner's accounting system provides a set of temporary accounts which reflect temporary information and adjustments needed in the computation of earnings per share. The adjustments are concerned with the "earnings available for common stock." These adjustments arise when the conversion of residual securities would affect these earnings in a dilutive manner. Other temporary accounts reflect the residual securities that enter into the computation of "primary" and "fully dilutive" earnings per share.

Mr. Huefner's system for accounting for earnings per share is a very uncomplicated and practical system. It should be of great value to both management and public accountants. It provides a systematic and organized method of accumulating and maintaining permanent and temporary data used in the computation of earnings per share and, therefore, provides an organized record of each year's computations and provides a base for the following year's computation. Because of these organized records, the auditing function will be greatly enhanced since the procedures employed in computing earnings per share can be traced through these accounts.

CHARLES S. DOUTHITT
Oklahoma State University

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