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# MANAGEMENT SERVICES

*a magazine of planning, systems, and controls*

JUL 21 1992

**Scientific vs. Practical Management: A Pragmatic Approach . . . . . p. 13**  
Gordon L. Murray

**Key Item Control . . . . . p. 21**  
Howard G. Johnson

**Reports That Communicate . . . . . p. 27**  
Michael J. Reiter

**An Inventory Control System With Profitable By-Products . . . . . p. 31**  
Anthony A. Vallario

**A Decision Curve for Lease or Buy . . . . . p. 37**  
Kyojiro Hata

**Accounting's Role in Marketing . . . . . p. 43**  
John W. Barry

**Lessening the Dangers of Uncertainty . . . . . p. 51**  
Leon W. Woodfield

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**Gordon L. Murray • Scientific vs. Practical Management: A Pragmatic Approach . . . . . p. 13**

Some see operations research as the solution to all management problems; others call it a fad. The truth, of course, lies somewhere in between. Similarly, the practical way to solve immediate business problems

lies somewhere between a perfectionist refusal to solve anything until everything can be solved and a slapdash treatment of symptoms rather than ailments. This article outlines a middle ground.

**Howard G. Johnson • Key Item Control . . . . . p. 21**

Mountains of paperwork can stretch the executive's work day to intolerable length—much of it wasted time. This author's solution is key item control, a

system under which the reports for each manager are tailored to his needs and focused sharply upon those key items that require his active attention.

**Michael J. Reiter • Reports That Communicate . . . . . p. 27**

The modern accountant must be more than a manipulator of figures. It is not enough to gather information, or even to analyze its meaning; all this is so much wasted effort if the results are not really

communicated to those who must use them. This article reviews some of the basics of communication theory and explains their application to the accountant's reporting function.

**Anthony A. Vallario • An Inventory Control System With Profitable By-Products . . . . . p. 31**

Most drug stores are too small to carry large inventories. Yet customers need essential drugs within a matter of hours, not days. Here's the story of how one wholesaler, created by independent pharmacists, has evolved a computer system that can meet orders

for any of 20,000 items within the day. Incidentally, it has found that its new system can also furnish an accountants receivable program for the retailer and a profitable sideline for itself from franchises to other wholesalers.

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*Mr. Smith*

**JANUARY-FEBRUARY, 1967**

# MANAGEMENT SERVICES

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**Kyojiro Hata • A Decision Curve for Lease or Buy. . . . . p. 37**

Comparison of the costs of leasing and of buying industrial equipment is not a simple task, for two of the elements that determine the cost of ownership are uncertain future amounts that must be estimated.

This article outlines a method for graphical analysis of these uncertain factors: the discount rate of money and the residual worth of the equipment at the end of the period under study.

**John W. Barry • Accounting's Role in Marketing . . . . . p. 43**

Marketing men traditionally have given inadequate attention to the profitability and productivity of their own operations. There is a great opportunity here for accountants to contribute to overall corporate profit-

ability, but, this author warns, the accountant who wishes to serve marketing will be rejected unless he first builds a bridge of understanding between the two functions. This article has some suggestions.

**Leon W. Woodfield • Lessening the Dangers of Uncertainty. . . . . p. 51**

Every capital budgeting decision must be based on uncertain data—forecasts of future costs and returns. Executives allow for uncertainty in various ways, few of them explicit and none of them scientific.

This author proposes the use of "subjective probabilities" to estimate the likelihood of the values' proving correct and describes how the technique has worked in actual company application.

## DEPARTMENTS

**People, events, techniques . . . . . p. 5**

**What people are writing about. . . . . p. 56**

Current books and magazine articles on subjects of interest to management and management consultants.

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## people, events, techniques

### **Banks Must Become More Flexible to Adjust to Changing Conditions, Should Take Full Advantage of Management Science, FDIC Chairman Says**

Bank managers or bank supervisors can no longer view banks in isolation. Today, economic and financial interrelationships have become increasingly complex, and it has become more and more "clear that banking is but a part of the broad financial markets and that developments in banking influence and interact with developments in other sectors of the financial markets."

In an address before the annual convention of the American Bankers Association in San Francisco, Federal Deposit Insurance Corporation Chairman K. A. Randall said this, and he suggested actions the banking industry might take to facilitate its adjustment to a constantly changing economic environment.

First of all, Randall said, both bank management and bank supervisors must re-evaluate their basic concepts and guideposts to determine whether these concepts are relevant to today's world. They must take a searching look at existing legislation as it affects bank-

ing. Does it allow sufficient flexibility to deal with current conditions? Is one group of banks placed at an unfair disadvantage in relation to another group of banks or with respect to other financial institutions? Is the present system too restrictive or is the law so open to varying interpretations that it increases supervisory and operating problems?

Secondly, it is necessary to re-examine the operating efficiency of banking, said Randall. "Is your bank taking full advantage of new developments in the field of management science, for example, to cut costs or improve earnings?" he asked. It might be desirable, he suggested, for bankers to undertake a comprehensive review of their operations to determine whether they are making optimal use of total resources and to reassess plans for the future, in terms of maintaining a flexible posture and preparing for management succession.

"Thirdly—and this is our primary justification—we should ask our-

selves whether banking services are being provided the public at lowest cost and in the quantity and of the quality desired. Or are just the minimal demands being met?" Many of the banking services taken for granted today were considered quite revolutionary in the past, Randall said, and there now may be entirely new areas of activity that offer banks an opportunity to serve the public profitably and well.

#### ***FDIC aid reviewed***

Randall then reviewed what the FDIC is doing to help banks adjust to the new economic climate.

For a number of years the FDIC has been examining insured non-member banks, paying off deposit claims in closed banks, and acting as receiver for failed banks. However, both the times and our perspectives have changed, Randall pointed out, and it is difficult for the individual financial institution to seek and find satisfactory solutions to external problems.

Some progress at FDIC, according to Randall, are based on an optimistic undertaking that began in 1934—the collection and compilation of all bank statistics. Being the only bank supervisory agency with the responsibilities for compiling data from all banks in the country, both insured and noninsured, the FDIC has access to a wealth of raw material. But up until now this mass of banking data has proved almost worthless because, in the absence of the necessary tools, the sheer magnitude of the clerical task of sorting, compiling, and then interpreting the data was overwhelming. By the time much of this data could be made available it was largely of no more than historical interest.

But the FDIC has recently installed a large-scale, research-oriented computer capable of organizing

amount of data available, Randall said, and it is already fully operational. Armed with modern analytical tools and concepts and equipped with the means of organizing these data into useful form, the corporation can proceed to tackle questions of critical importance to the nation and to the banking community—such as standards for evaluation of loans and credit quality, the economic size of a banking unit, and the relationship between a geographic market and the need for banking services, bank costs, and manpower training aids in that market.

Management science is an exciting new instrument, but, Randall warned, it can only supply bankers with the capabilities for solving these problems—not the solutions.

FDIC has recently authorized a

major study that will attempt to identify the factors responsible for variations in banking costs, Randall said. A pilot study exploring alternative analytical and statistical tools has already been completed. The results of the study, when completed, will be distributed to all banks for management use, say, in comparing the bank's own costs with the costs of other banks of similar size operating in similar markets.

Other projects either in process or in the planning stage mentioned by Randall were studies of banking markets, the cost of bank capital, the feedback mechanism between loans and deposits, the relationships between banks and other financial intermediaries and markets, and the development of training aids that can be used in bank supervision and by bank management.

## Ten Per Cent of R&D Funds Are Wasted Because of Deficiencies in Information and Retrieval Procedures, Technical Executive Charges

Ten per cent of the money spent in the United States today on research and development projects in all fields "is wasted, in the sense that the work would have been conducted differently—or not at all—if information already available had been properly utilized."

Such was the theme of a keynote address by Alfred E. Busch, president of Keuffel & Esser Co., to delegates attending the 1966 Visual Communications Congress in Los Angeles.

Busch proposed establishing a public-private U.S. technical information storage and retrieval network, patterned after the Federal Reserve System, as a way to avoid wasting an estimated \$2 billion a year on research and development work conducted with incomplete technical information.

"The tide of information is swelling at such a rate that it now doubles every ten years or so," Busch said. "It seems to me that we are coming close to the point

where information virtually can be equated with currency. And I wonder if we might not envision in the information field a system that might parallel our Federal Reserve."

### *Approach 'piecemeal'*

In the past four or five years a great deal of thought and effort on the part of the federal government, state governments, technical and scientific societies, universities, and private organizations has gone into trying to help solve this problem. But, Busch said, these efforts represent only a "piecemeal approach" to "consolidating and speeding the flow of information."

The K&E executive went on to point out that the Federal Reserve System is a public-private undertaking designed to work for a banking system with many independent banks and to provide credit and banking facilities needed in a diverse and growing economy. All

national banks must belong to the system, while others may join if they qualify.

A somewhat comparable public-private system for information could be organized to direct the planning for and development of a national network and the setting of standards. Most important, Busch said, such a system could encourage, and establish guidelines for, curriculums at colleges and universities for degrees in information science—since it will be necessary to graduate a new breed of experts who will be needed at all levels of the network to determine the validity and usefulness of information and to decide upon the most appropriate methods of storage and retrieval. The system could also establish suitable billing and cost accounting procedures.

Ideally the operation would eventually become self-supporting, Busch said, but meanwhile it could seek funds from Congress on behalf of federal agencies, which automat-

ically would participate in the system, and on behalf of public libraries and other centers whose improved functioning Congress may feel justified in promoting. Industry and technical and scientific societies could also be encouraged to contribute funds, Busch added.

The Visual Communications Congress is an annual gathering of experts in the graphic communications field, sponsored by the Society of Reproduction Engineers, the American Institute for Design and Drafting, the International Association of Blue Print and Allied Industries, and the American Records Management Association. K&E makes tools for the engineer, draftsman, and architect.



## Computers in Brooklyn Hospital Automate Most Routine Procedures

Two electronic computers are being used to assist in the care of patients at the new State University Hospital of the Downstate Medical Center in Brooklyn, N.Y.

The new eight-story, \$25-million, fully computerized, 350-bed State University Hospital is designed to serve the private patients of the center's medical staff and non-private patients whose cases are considered valuable for teaching or research.

The hospital's two computers assign beds, order drugs, laboratory tests, X-rays, supplies, and equipment, and perform administrative chores such as compiling medical records.

According to a *New York Times* article, the first official patient of the new hospital gave birth to an eight-pound, four-ounce baby boy "with the help of an attending physician, four residents, six registered nurses, and a computer."

An earlier computer system for pediatric bed assignment, linking nine Brooklyn medical centers, was launched by Downstate Medical Center last June.

Staff Sgt. Michael D. Sullivan checks performance of 500 computer like those that will be sent to Vietnam by Army. Computers are for use in inventory control in field. Army plans to send 18 units to the battlefield in Orient.

## U.S. Army Installing 18 Mobile Computer Centers In Vietnam for Equipment Maintenance Control

The United States Army is planning to send 18 traveling computer centers into Vietnam.

The systems are designed to travel with military units and improve the maintenance of Army equipment. Constructed around the National Cash Register Company's Series 500 computer, introduced last year, the mobile computer systems will be assigned to logistical units to mechanize the inventory control of repair parts for Army equipment.

For the past year the Series 500 has been put through durability tests at Fort Hood, Texas, including trailer trips over rough terrain. NCR has arranged with the Army to install the systems in standard six-ton Army shop trailers. Each traveling data center will require two of the 9-by-22 foot trailers, one to house the computer's central processor and certain peripheral

equipment, the other to provide card and ledger storage and desk space for operators.

Each installation will have a mobile unit to generate power for the computer and for lighting and air-conditioning. The trailers will have special wiring and shock-absorbent bracing for the computer equipment and will be insulated and air-conditioned to provide the appropriate operating atmosphere.

Each traveling data center, utilizing both punched cards and magnetic ledger cards, will keep track of around ten thousand repair parts items. The systems will automatically inform logistics personnel of inventory levels and ensure that parts are re-ordered at the proper time.

Valued altogether at more than \$2 million, the traveling computers represent the largest single order yet received for the Series 500 sys-



tem, according to NCR. The project has future significance for certain civilian computer applications, such as in the construction field, as well as the military, said an NCR spokesman.

The United States Armed Forces are among NCR's major customers. NCR's larger 315 data processors have been installed at a number of military bases and the Air Force is using 169 NCR 390 systems for military payroll processing.

## Mayo Clinic Studies Use of Computer for Medical Diagnosis

The Mayo Clinic of Rochester, Minn., has asked the Lockheed Missiles & Space Division of Lockheed Aircraft Corp. to find out whether or not it is possible to create a total medical information system based on the computer.

Lockheed will conduct a year-long study into the problem—with the immediate object of speeding the flow of information and freeing doctors from time-consuming routine. The study could ultimately lead to the use of the computer in diagnosis and a common computer language for recording medical histories. One outcome of the study may be a system under which a patient could speak his own medical history into a computer, his doctor could add information to it at later dates, and the history could be stored for such uses as laboratory tests and ordering drugs.

This is one of the largest studies of this type ever undertaken, according to a Lockheed spokesman. Investigating the application of computers to medicine is considered by Lockheed to be one of its major areas of future activity.

### *Honeywell system outlined*

A three-phase computer program to handle everything from medical accounting functions to monitoring patients on the operating table was

outlined by a Honeywell executive for hospital administrators at a computer seminar recently held in Wellesley Hills, Mass.

## Budget Bureau: National Data Center Would Improve Federal Reports

A national data center, housing under one roof the billions of figures gathered by the government on the workings of the economy and on the state of the nation and co-ordinating the activities of some 21 agencies that currently collect, process, and interpret statistics on such things as employment, prices, health, and education, is now a real possibility.

A Budget Bureau task force recently reported that such a center seems the only solution for correcting or halting the gross inefficiency inherent in the current decentralized statistics system.

Members of the task force group included Carl Kaysen, director of Princeton's Institute for Advanced Study, who headed the group; Charles C. Holt, University of Wisconsin; Richard Holton, University of California at Berkeley; George Kozmetsky, University of Texas; Richard Ruggles, Yale; and H. Russell Morrison, Jr., president of Standard Statistics Corp.

During the past ten years the amount of money spent by federal agencies in gathering statistics has mushroomed from less than \$50 million a year to more than \$120 million—and the resulting data still fail to meet the needs of government or outside economists and analysts, said the group.

It is hoped that the task force report will help smooth the ruffled feathers of some Congressmen who view the proposed data center as a giant dossier bank containing personal information on millions of Americans—a system that could seriously threaten the constitutional right of privacy. Last summer, a House subcommittee on the inva-

sion of privacy, headed by Representative Cornelius E. Gallagher (D., N.J.), held three days of hearings on the data center. (See news story, M/S, Sept.-Oct., '66, p. 11.) The task force group and other Budget Bureau officials agree that the threat to individual privacy inherent in such a system does exist and must "be met squarely," but they insist that such fears can be quelled by legislation and should not be allowed to interfere with a long-needed reform of federal statistical services.

### *Critics still skeptical*

However, Gallagher and other critics on Capitol Hill still remain unconvinced.

The main trouble with the current system, according to the Kaysen report, isn't the resources devoted to collecting and sorting the figures so much as the methods by which the statistics are generated. Under the present system, ordinary government statistics, for the most part, can only help explain complex phenomena through broad averages. Government agencies have yet to realize the value of computer-processed data. The computer, by being able to handle huge amounts of data, enables economists to study individual behavior and to discover actual relationships, such as the relationship between companies' financial condition and their investment history and cost experiences.

Current statistical procedures are highly inadequate for analyzing the behavior of individual economic units, the report said. For instance, one agency may collect figures on output while another agency, using an entirely different sample of industry, collects figures on input. This problem of comparing inputs and outputs in unlike samples of particular industries led the Office of Business Economics to underestimate the gross national product by some \$17 billion in 1964 before it revised its estimate using correlated data.

In fact, the task force feels that

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the current system is so bad that the best solution would be to forget the whole thing and start over with a whole new setup. However, since that seems unlikely, the second best move, they feel, would be the creation of a national data center under a director of the Federal Statistical System, appointed by the President and located in the Executive Office. The statistics director would also have authority over the Census Bureau, which would be moved out of the Commerce Department and put under White House control.

An advantage of the center pointed out by the Kaysen group would be the saving in valuable corporate manpower. As it is, every month corporate executives must tackle a myriad of forms sent to them by government information gatherers—each month the Bureau of Labor Statistics asks them for information on prices and employment; every month the Census Bureau wants to know about new orders, shipments, and inventories; every quarter the Commerce Department and the Securities & Exchange Commission question them about investment intentions; and to top things off, SEC is combining with the Federal Trade Commission to ask about profits.

### **Advantages of centralization**

By gathering all this activity under one roof, most of this material could be supplied on one form and then distributed to the agencies that make up the indexes. As well as making life easier for the corporate executive, centralization would assure each government agency its sample of companies was the same sample being used by another group studying a different aspect of the same activity.

The cost of setting up the data center would not be exorbitant—the Kaysen group estimates that its initial expense would be \$2 million, increasing to \$5 million after three years.

But cost won't be the main stum-

bling block to getting the operation under way—it will be the “threat-to-privacy” objection.

In any case, some government officials feel this isn't the best time to present the proposal to Congress for authorization. But even if the idea gets held up for awhile, it would seem to appeal too much to the economists to be permanently abandoned.

## **Increasing Dependence On Software Companies Predicted for Banks**

The growing demand for computer-based services is creating quite a few headaches for the nation's bankers.

How to fully utilize the new third generation computers, in view of the banks' sizable investment in them, and how to convert to the equipment on order with minimum interruption of service are the big questions confronting bank management. Consequently more and more banks are turning to independent software companies for assistance in working out systems development, Robert V. Head, an executive of Computer Sciences Corporation, a computer software company, said in the Dec. 1 issue of *American Banker*.

Until recently very few banks were aware that such software companies even existed. Today, the strong demand for computer-based services has confronted bankers with the difficult choice between two equally undesirable alternatives, Head declared. If a bank fails to provide the services demanded of it, customers will go to a competitor which does. But if the bank is to develop these services internally, it must divert its own programming staff from their own routine duties. Temporarily expanding their staffs during the conversion period also fails to offer a satisfactory solution, not only because the increased staff often adds new dimensions to the total con-

version problem, but also because of the simple fact that experienced EDP specialists are so scarce that it is difficult enough for many organizations even to maintain their normal requirements for competent personnel.

Another reason for the trend toward the use of software companies, Head noted, is the increasing complexity of banks' needs for information processing. Their requirements for advanced techniques, such as management query languages, simulation modeling, and the central information file, demand the kind of expertise found among professionals on the software companies' staffs, he said.

## **National Cash Announces Newly Miniaturized Microfilming Process**

The National Cash Register Company is entering a major new market — microform information storage and retrieval systems.

NCR's ticket to the information systems field is a new technique that NCR calls photochromic micro image reproduction (PCMI), which can record up to 3,200 8½-by-11 inch pages of information reduced about 150 times on a 4-inch-by-6-inch sheet of transparent plastic. A conventional microfilm card of that size holds only 60 to 100 pages.

The PCMI trademark refers to a special NCR-developed photochromic coating that is used in the recording process. The coating is capable of reproducing extremely fine detail and, unlike conventional photographic film, requires no development process. If an error is made or a speck of dust is encountered during the recording process, the individual image can be erased and re-recorded. Errors on conventional photographic film cannot be detected until the film is processed.

The PCMI system is being marketed initially for applications



which require frequent updating of a large volume of information for quantity distribution—such as catalog systems, service manuals, and reference libraries. All the user needs is an NCR microform reader (which can be rented from NCR for about ten dollars per month) and a file of microform transparencies. An equivalent of 10,000 books can be stored on a file of transparencies that would fit in the corner of a desk drawer. The transparencies are inexpensive—around one dollar each, according to NCR.

Initially NCR is offering two models of the PCMI microform transparency readers which provide magnifications of either 115 or 150 times. Other equipment to complement the product line will be added in the future.

## IBM Shows Optical Reader to Interpret Handwritten Figures

A machine that reads handwritten numbers directly into a computer for processing was recently introduced by IBM Corporation.

The new IBM 1287 optical reader recognizes 15 hand-printed characters—the ten digits and the letters C, S, T, X, and Z. (The five alphabetic characters are used as information coding symbols on 1287 input documents.)

Designed for use with the IBM System/360, the 1287 reads machine-printed and credit-card-imprinted numbers as well as handwritten numbers, in any combination from paper forms and cash register or adding machine journal rolls.

This means, for example, that hand-printed merchandise transactions, credit-card-imprinted account numbers, and preprinted document serial numbers can be read from the same department store sales check during one pass through an IBM 1287.

Data are transmitted directly from source documents, eliminating



Scope of 1287 reader reproduces image of handwriting on sales check.

the need to convert pencil-written or printed numerical data into punched card machine language before processing.

For several years IBM and others have been experimenting with optical scanners that can accept handwritten characters for computer processing. IBM demonstrated a prototype of the 1287 two years ago in its pavilion at the New York World's Fair.

IBM solved the problem of variations in handwritten numbers by a technique called "curve-following." Projected by the 1287's optical sensing unit, a tiny "flying spot" of light scans lines or fields of numbers on a document. When the flying spot crosses any part of a handwritten or printed number, it traces the outline of the number before moving on. The values of the numbers traced by the flying spot are interpreted by the 1287's logic components and automatically transmitted through cable connections to a System/360 for processing.

There are two models of the 1287. Model I reads hand-pencilled, printed, imprinted, and pencil-marked cut-form documents. Model II reads printed cash register and adding machine journal rolls in addition to cut-form documents. Both models will be available during the first quarter of 1968.

## DPMA Offers Book On Computer and Punched Card Data Processing

The Data Processing Management Association published *Principles of Automatic Data Processing*, a 93-page introduction to business data processing, late in October.

The softbound book, designed to serve as a comprehensive orientation for businessmen and students, has been used previously as a text in DPMA indoctrination programs.

Covered are basic punched card processing, electronic data processing, numbering systems, and concepts of computer equipment and programing. A typical computer application in business is also included.

The book has a glossary of data processing terms and a short bibliography.

Copies may be ordered from the International Headquarters, Data Processing Management Association, 505 Busse Highway, Park Ridge, Illinois 60068, at \$1.25 each.

## Calculator for EDP Forms Available

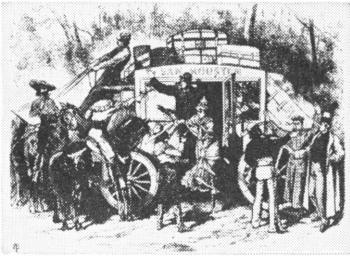
A slide rule device for assisting data processing personnel in scheduling computer reports has been developed by Wallace Business Forms, Inc., 444 West Grand Avenue, Chicago.

Called the QTC computer, this device calculates the number of forms needed to run a specific report, the number of hours it will take to run the computer report, and the total computer-time cost.

All one needs to know to make these calculations on a QTC device, the manufacturer says, is the number of line items in a given report, the speed of the computer printer, and the hourly cost assigned to the printer.

The device also compares the number of forms required in various print-out spacings.

# Are you holding up the U.S. Mail?



*It happens every day!*

People hold up mail service for themselves and for everyone else by not using Zip Code on their mail.

Their mail has to be sorted and re-sorted several times along its route. A single unzipped letter can slow up the mail at 6 post offices!

But when your letter has Zip Code, postal workers can sort it faster and send it more directly to its destination.

They can also use modern electronic machines that “read” Zip numbers and sort mail fifteen times faster than was possible before.

*So remember:*

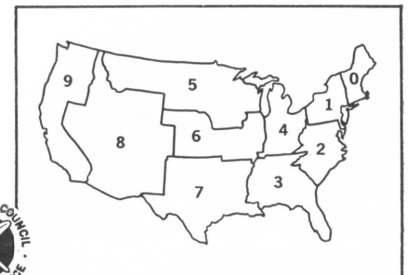
1. Always add Zip Code to every address you write to. If you don't know the number, call your post office or look it up in their Zip Code Directory. Local Zips can be found on the Zip Map in the business pages of your phone book.
2. Add Zip Code to your return address, too. That makes it easy for others to Zip their mail to you.

The post office must handle over 200 million new pieces of mail a day. Don't hold it up. Use Zip Code!

*Mail moves the country—  
ZIP CODE moves the mail!*

## HOW ZIP CODE WORKS

Suppose the Zip Code is 60635. The “6” says it goes to the Midwest. The “06” narrows it down to Chicago. The last two digits—“35”—pinpoint the local post office. This eliminates many handling procedures. The letter is sorted faster, and sent more directly to its destination.



Published as a public service in cooperation with The Advertising Council

*The gulf between the business theoretician and the hard-headed man of experience is a wide one. But there is a middle ground in which the distinctions are more subtle. Here are suggestions as to how to achieve a compromise that works—*

## SCIENTIFIC VS. PRACTICAL MANAGEMENT: A PRAGMATIC APPROACH

*by Gordon L. Murray  
Haskins & Sells*

**I**S SCIENTIFIC management-operations research-mathematical science going to transform American industry into a Jules Verne kind of world, or is it all a fad without substance and without a real contribution to make in business affairs? Which is more effective—management science or practical experience?

These questions can be — and are being — debated endlessly. The theoretician can afford to dream of the day when the mathemati-

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This article was adapted from a talk Mr. Murray presented before a group of financial executives who had asked for “provocative” comments on the position they should take vis-à-vis scientific management techniques.

cian and the computer will inherit, if not the earth, at least the management of our business affairs. The executive on the verge of retirement can afford to debunk the whole subject and be amused by it all.

But for me as a consultant, with a job to do here and now, neither of these approaches is adequate. My clients tend to want practical solutions to difficult problems—and they want them today. A reasonable solution now is what they are looking for, even though there may be a better answer tomorrow. I have to adopt what is essentially a pragmatic view.

My thesis, here, is that the pragmatic view is also the one for the

businessman to take. Certainly he should speculate on the ultimate possibilities of developments in scientific management and, as a minimum, keep abreast of what is going on. The returns from speculation have real limits, however, in terms of accomplishments today and in the near future. A man can stand on the sidelines too long and never get in the game. The businessman who waits for the ultimate in a computer will never live to get one; the executive who waits to adapt new ways of solving old problems until the perfect method is at hand will see someone else reap the rewards. Why not take what can be applied right now to a problem of manageable dimen-



sions and move along with the job? It has been said that operations research-management science promised much but has produced little in relation to that degree of promise. Why is this so? How can we narrow the gap between theoretical approaches to scientific management problem solving and the practical application of these techniques? First let's look at the early development and the nature of operations research.\*

**Management science**

The first identification of operations research came during World War II, when persons with a variety of backgrounds (but heavily from the mathematical and scientific disciplines) were assigned to work on various military problems, computing trajectories, radar problems, hunt and search techniques, and the like. These people were exposed to a whole series of problems in subject matter different from that to which they had been exposed in their previous training and experience, yet they found that the techniques at their disposal had application. After the war some of these people continued to apply their academic techniques and wartime experience to subject matter outside their immediate disciplines, and inevitably they gravitated into the business sphere.

By the early 1950s these people

\*Points made in this section about the characteristics of OR are taken from *A Manager's Guide to Operations Research* by Russell L. Ackoff and Patrick Rivett, John Wiley & Sons, New York, 1963.

began to emerge as organized groups and to assert themselves as having a unique approach and common body of OR knowledge. They now maintain that operations research is a unity – that, regardless of the type of situation or activity under scrutiny, there is the common characteristic of a mathematical model and that all OR problems may be classified as inventory, allocation, queuing, sequencing, routing, replacement, competition, or search. These they identify as the eight different types of problems that confront the manager.

The essential characteristics of the OR method are systems orientation, use of interdisciplinary (or mixed) teams, and the adaptation of the scientific method.

**Systems orientation**

Systems orientation refers to the theory that the activity in any part of an organization has some effect on every other part – a sort of the thigh bone connected to the hip bone, hip bone connected to the backbone concept. In deference to this "law," the operations researcher says, he must identify all significant interactions and evaluate their combined impact on the performance of the organization as a whole, not merely on the part originally concerned.

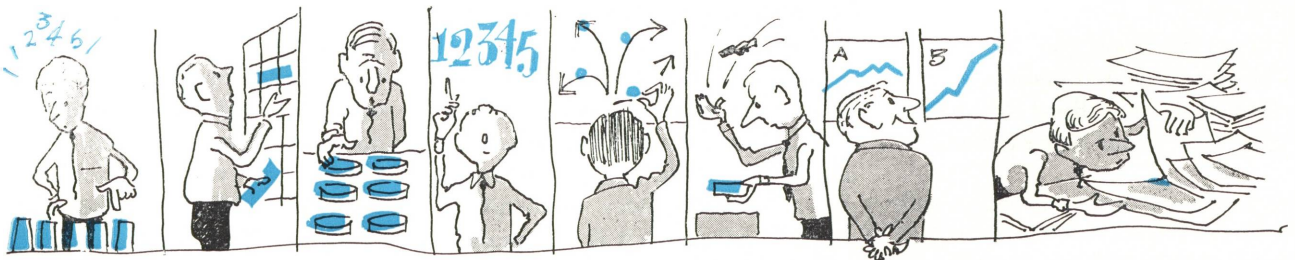
Therefore the purist in operations research exhorts his colleagues to avoid the natural inclination to cut a very complex problem down to size and isolate it from its environment—eliminating aspects of

the problem that make it difficult to solve and thus reducing it to one that can be handled by standard techniques or by judgment based on experience. The operations researcher is told that a systems orientation requires moving in the opposite direction, to the deliberate expansion and complication of the statement of the problem until all significant components are contained in it. This approach covers the entire area under a manager's control instead of concentrating on some special aspect. The ultimate of this philosophy is the total synthesis of the firm, a model that comprehends all the interacting factors affecting a business – external and internal.

A somewhat facetious statement of this theory would be that the OR purist will solve nothing until he can solve everything.

The idea of ever expanding the definition of a problem before coming to grips with it may have validity to a researcher. To one seeking better answers to business problems right now, it is simply not practical. This is not to say that one should accept the first definition of a problem without questioning to make sure he is actually dealing with the real issues. Rather, it is to say that to the pragmatist a practical end is to come up with a practical improvement that can be implemented in a practical way – whether or not the solution is the very ultimate that may some day be achieved.

To be fair, I must acknowledge that those practicing OR in business finally must – and do – ac-



Theoreticians believe that all OR problems can be classified as inventory, allocation, queuing, sequencing, routing, replacement, competition, or search.



Operations researchers often deliberately expand and complicate the statement of a problem until all significant components are contained.

cept the limitations of the systems approach in everyday life. Their doctrine, however, calls for viewing such limitations as a serious imperfection that they should strive to overcome through enlargement of the problem. One might ask: What is wrong with a substantial improvement in a significant piece of the problem? Most managements seek a gain in a known period of time for a known cost; they are more interested in improving their *operations* than in subsidizing the OR practitioner's *research*.

### **Interdisciplinary teams**

The second characteristic of OR is the use of interdisciplinary teams. This means that to qualify as an OR achievement, the solution must result from group effort — a group composed of an engineer, a physicist, an economist, and an accountant, for example. They say that this organization was originally a product of necessity, because of a shortage of scientists of any single breed. Then, they say, they found that the mixed team was necessary for good solutions—and I guess the assumption is that the only good solutions are OR solutions. The

principle here is that before you begin to study a problem you cannot anticipate its characteristics or the best way to look at it, so you had better have as many different viewpoints and different solutions as possible available at the start.

On the face of it, this is a difficult position to refute. Of course, it is true that the greater the number of different points of view that are focused on a problem the greater the number of angles that are likely to be discovered. To be pragmatic again, I am not convinced that this is altogether necessary to get close to the target most of the time. Given an understanding of business problems, experience in problem solving, and knowledge of the main core of techniques known to be applicable to these problems, something less than an interdisciplinary team can achieve very useful improvements.

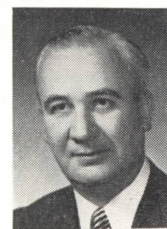
### **Scientific method**

The third characteristic of OR is the adaptation of the scientific method. Here the operations researcher is referring to experimentation. He reasons that he is at a disadvantage in applying the scientific method because business prob-

lems do not lend themselves to laboratory study. The risks are usually too great to use the business under study as the "laboratory" and try out various approaches to see what happens and what works.

The operations researcher gets around this limitation by building a mathematical model of the situation in which the pertinent factors are recognized and their relationships are expressed and quantified. Of course, some factors are controllable, and others are not, and in business problems quantification necessarily depends on estimation. Through use of the model, however, the operations researcher is able to experiment by trying different factors, different combinations, and different values.

The moment of truth comes when



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the solution is implemented, and applied in actual practice. In preparation for this, the solution is sometimes applied retroactively to see whether it would have yielded an improvement over what actually resulted under the old method. All this comes under the heading of model building and simulation—the application of experimentation.

This is sound, and there is no occasion to quarrel with it. The mathematics and symbology are forbidding, but mathematical knowledge is for hire at surprisingly fair prices. Furthermore, much of the mathematical symbology offered in OR literature is in proof of a rule or relationship, and it is possible to apply the resulting principle without necessarily understanding, in depth, the mathematical gymnastics required to develop it. If it can be demonstrated that a particular input produces a given output, the underlying mathematics can generally be accepted.

**Pragmatic approach**

As you can see, approaching a business problem in terms of any literal or strict interpretation of operations research ground rules can be a complex undertaking. Surprisingly good results can be obtained, however, with a pragmatic

instead of a purist approach. In the two instances I'll tell about, we did not know we had an OR solution until it was all over, nor did we care whether the OR label applied. Good solutions to complex problems were the only objective we had in mind.

In the first case, the management defined the problem as a need for improved procurement, so we surveyed practices applied in the purchasing department. The results showed a fair purchasing operation; a few improvements could be made here and there, but on the whole a pretty good job was being done.

What made purchasing's job tough was the requirements it received from requisitioners. A routine request at 9 a.m. could become rush-expedite-emergency by noon, and by evening the item was likely to have been canceled by the requisitioner. So we reported our findings and got permission to investigate where the requirements came from. This was the application of "systems orientation"; we enlarged the definition of the problem.

Requirements for expendable inventory replenishment (the company was an airline) were determined by some traditional rules of thumb. The first rule of thumb was

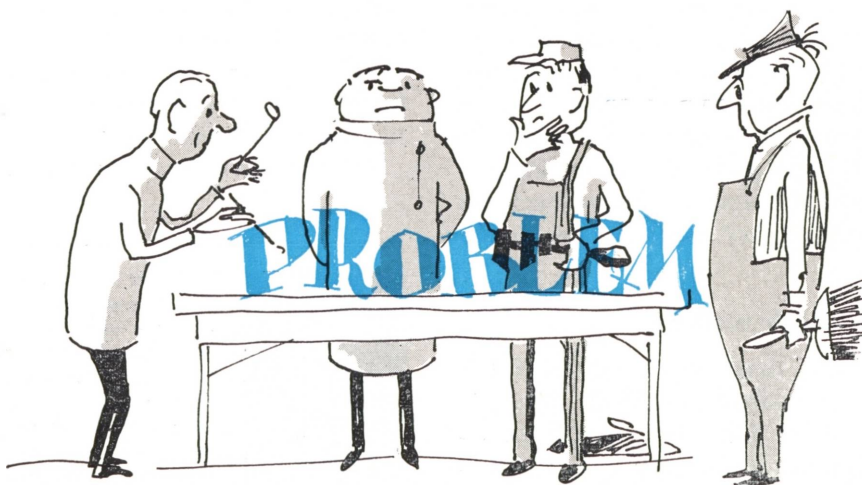
this. Don't ever be out of anything — ever.

We went through the process of classifying the inventory items by usage characteristics, and when we had identified the large bulk of items subject to statistical control, we structured these by the A-B-C approach. Here we went counter to the OR systems orientation and yielded to the natural inclination to cut the complex problem down to size. We decided we had too big a problem — 37,000 items — so we cut it to get to the A items — some 2,300 — and then still further to 700 A engine items. We then selected twelve of these, representing all the different characteristics we could identify, and decided to develop decision rules for managing these items in terms of when to buy, how much to buy, and how much safety stock to keep. We established some ground rules, for example, that any decision rules must be capable of application on a computer so that we would have a pragmatic, practical system to apply to all the 37,000 items in due course.

We manipulated these twelve items according to various rules and refinements, applying them to actual usage for the previous eighteen months and comparing our results with what the company had actually achieved.

So far, so good. We had been systems oriented and had enlarged the definition of the problem (although later we fell into the error of cutting it down to size). We used the scientific method and simulation (although we really didn't think about it in those terms).

What about the mixed team? Up to now the team was two of us and a client man—no physicist, no psychologist, no anthropologist. We had a solution that worked — so well, in fact, that the ultimate system reduced inventory levels by five and a half million dollars, or the worth of one 707 — but the success had not been proved out at this point. So we decided to bring in some math talent and ex-



A characteristic of OR is the use of interdisciplinary teams representing many specialties.

perience to tell us the mathematics behind the solution so that we could improve it.

**Purist's approach**

The math talent was a decidedly pure purist, and he made the observation quite early that you really couldn't solve the problem the way we had solved it. First of all, our data were not good. We had only monthly usage figures and only for usage that was recorded in a month, not for what was in fact used that month. Weren't we aware of the fact that flying hours are heavier in certain months than in others, on certain days than on others, in daylight hours than at night? Didn't we take note of the fact that some items were common to more than one type of aircraft while others were peculiar to a single type? Our math friend said the first order of business was obviously to refine the data.

Furthermore, our solution was based on the premise that past

usage was the best available practical indicator of future usage and that it provided a means for monitoring usage and coping with it through a unique system of control limits. We were told that this, too, was a serious defect; the right approach was to find out why parts were used at all, what triggered usage of any given part (flying hours, number of landings and takeoffs and of what kind, defects in workmanship, metallurgical properties, and so on). If we could find the causes of usage, we could do a better job of predicting usage and managing the inventory.

Right away we had a beautifully enlarged problem — two large problems, in fact—data purification and a search for the culprits causing usage. Perhaps we also had a third problem, the one we had started with: how to manage inventories better. But now this one would have to wait its turn.

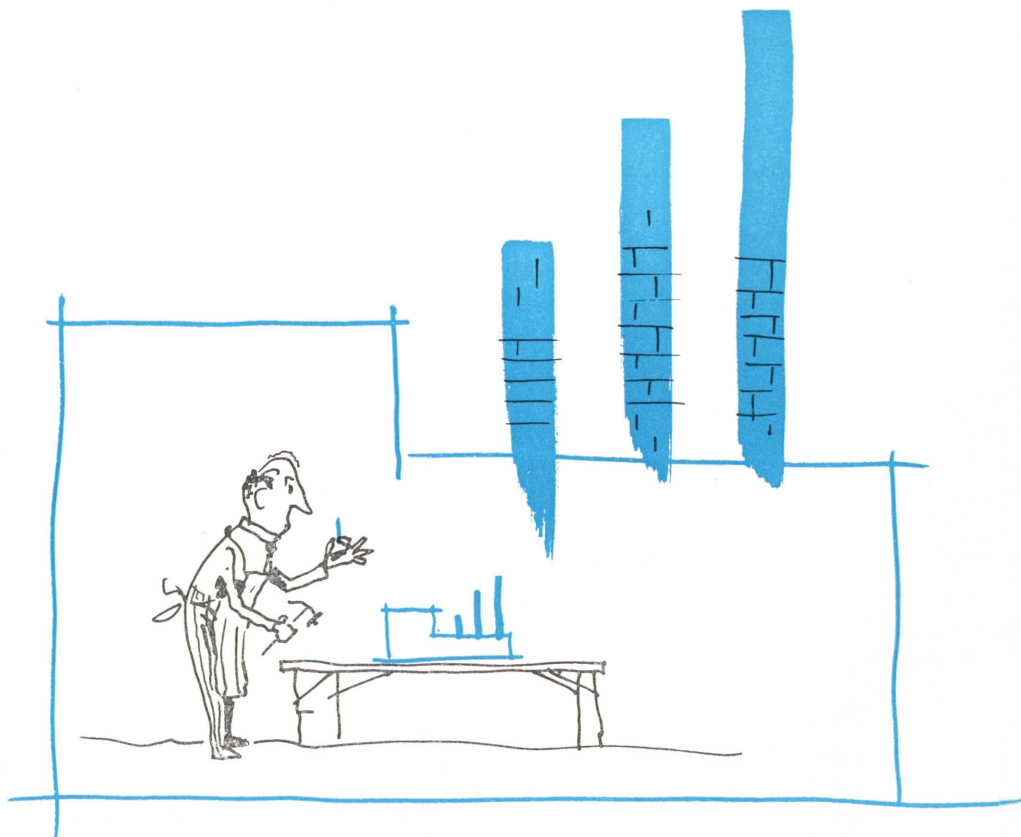
I could go on, but perhaps I have made my point. Pick the right OR specialist or mathematician—

one with a pragmatic point of view.

**Problem reduction**

In solving complex problems there are common characteristics of approach having general applicability. Something very similar to the inventory problem we also applied to airline crew scheduling. The problem was how to schedule crews against a flight schedule to produce the least cost, to get the most flying hours for time paid. With all the restrictions of CAB regulations, company policies, and multiple union rules, this was obviously a complex matter.

The company used rules of thumb and intuitive judgment to take a given flight schedule and break it into flight segments and combinations of segments to constitute a set that could be flown by a crew and that met all the restrictions. Flight pairings originated and ended at a crew domicile. These were posted for bidding by



The specialist, unable to use actual company operations to test approaches, usually constructs a mathematical model in which pertinent factors are recognized and their relationships are expressed and quantified.





The ultimate system reduced inventories by the monetary value of a new 707.

the crews, who selected the “package” they wanted, and packages were awarded by seniority. Did these “bid packages” represent the least cost in terms of the most flying hours for paid hours?

How did we approach this problem? First, we examined the company’s current flight schedule and concluded that an actual flight schedule contained too many flights and too much data to be manageable for analysis purposes. Again, we succumbed to the temptation to cut the problem down to size. Rather than attempt to deal with all flights in a complete schedule, we constructed a hypothetical airline with only a few cities and a few flights taken from the whole. Selection was made in such a way as to preserve in the sample the characteristics of the actual system.

Each flight on our hypothetical airline was recorded on individual index cards showing origins and terminations, times of arrival and departure in Greenwich mean time, and hours and minutes consumed. These cards were then manipulated according to various rules.

For example, we began with a first-in, first-out rule. At the beginning of any period we assumed that a crew took the first flight out and took it as far as it was legal to take it under the CAB, union, and other restrictions. The crew was then assumed to be given the required rest and to take the next flight out at the end of that period no matter where it went. This iterative process was applied again and again. Each time we learned something. For example, under a first-in, first-out rule the crews rare-

ly if ever got back to where they were domiciled until their monthly flight-hour limits were reached and they deadheaded back.

We kept this up: Try a rule; keep score; refine the rule; try again; keep score; and so on. Ultimately some fundamental characteristics became apparent. One of the most significant was that the essence of the matter was a whole series of two-city problems — how to match up crews and flights between any two cities — rather than the large problem of how to man an entire flight schedule.

The details of the actual solution cannot be spelled out since they are deemed confidential by the company concerned. Essentially, the solution was to apply a set of rules in a prescribed sequence to make the crew decision regarding each flight in and out of a given station. A linear programming matrix was applied as part of the process to provide the least-cost answer. This procedure, including solution of the matrix, was programed for a computer.

As a result, in a matter of minutes a proposed flight schedule was broken into flight segments, and the segments were paired and packaged for crew bidding purposes with assurance that they were the best possible combinations from a cost standpoint. In addition, the cost was computed so that an evaluation of crew costs between alternative flight schedules was readily available.

One sidelight was the disclosure that crew domiciles were not in all cases properly located. A shift in certain domiciles would produce

still further savings in crew costs.

In effect, then, we reduced the problem to manageable proportions, built a model, simulated the system, and adopted an available technique (the matrix). These actions, in combination with other techniques, gave a very practical result. These efforts were not referred to as operations research at the time. To us, they merely represented a pragmatic approach through a logical process of problem solving.

### *OR and the manager*

The primary training and experience of most businessmen and accountants has been outside the fields of science and mathematics, except for some orientation courses and an exposure here and there. This lack of formal training in the field is no reason to fear or ignore more scientific approaches to business problems. We have one thing (and perhaps the most important thing) required for their successful application—an understanding of the business. Many scientific types do not have and may never be expected to have this essential ingredient.

In one sense, the operations researcher or management scientist is a man with a set of solutions looking for problems that fit his solutions. The electronic data processing salesman or specialist is in a similar position; he has a solution or method and is seeking his kind of problem. We have learned, and many companies have learned, that you are using the wrong approach when you ask an EDP salesman in to have a look around to see what he would like to mechanize. He will find areas of interest to him, to be sure, but they will not necessarily be the ones best serving the interests of the management.

So it is with OR and the mathematical sciences. Management must not abdicate the responsibility for recognizing the opportunity, defining the problem, identifying the important factors and relationships,



guiding the effort through channels, and testing the solutions. Doing these things does not require knowledge in depth of the techniques but rather awareness of possibilities and, the most essential ingredient, understanding of the way the management and the business operate.

Not long ago *Business Week* reported on a Harvard Graduate Business School study of the extent to which business management has embraced and put into practice "management science" techniques. In this study management science was given a broad definition to include all the sciences that can aid managers, from conventional organization theory through sociopsychology. Under this definition they found more than 80 per cent of the largest corporations taking advantage of one or more of the new techniques, with this practice extending from such obvious areas as production scheduling and inventory control into personnel, marketing, and R&D areas.

Another conclusion was still more interesting. The researchers found that no matter how competent the management science practitioner may be in his own field, few of them are skilled in the art of managing a business. As a result, the management scientist may come up with sophisticated techniques based on invalid assumptions or with elegant solutions to insignificant problems. The study concluded with the warning that businessmen would have to be around to give some guidance to the scientist, no matter how all-embracing his science might seem.

### **Happy medium**

The mode of functioning of the great entrepreneurs of the Nineteenth and early Twentieth Centuries, held in awe for their intuitive shrewdness, is passé. The professional manager of today finds he has to grub rather hard to squeeze an inflated profit dollar out of the company's operation. Generally he

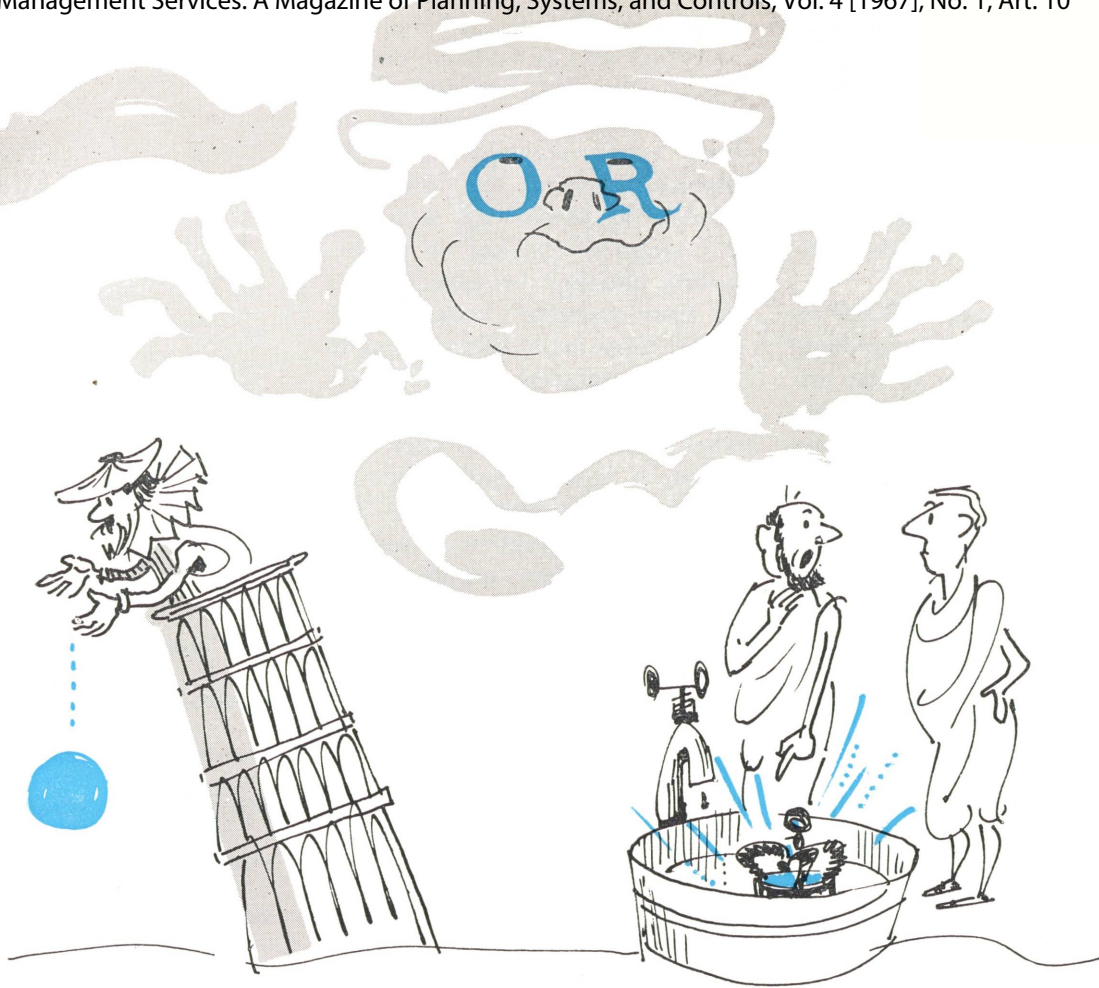
nowadays he has a liberal arts, legal, or accounting background. He is more and more aware of the basic approaches applied in the physical sciences; the behavioral sciences of psychology, sociology, and anthropology; and in mathematics, although he generally has no deep technical knowledge in any of these fields. As he struggles with the problems of his business he is prone to experiment to see what these fields might offer. The climate is right for innovation.

This development is all to the good, and the operations researcher and management scientist have definite contributions to make, provided they recognize — and the manager requires that they recognize — the practical limitations in business applications. Business is obviously not a laboratory situation. The economic environment cannot be excluded; measurement is not very precise; some elements cannot be measured at all but must be estimated; historical data are spotty; time factors are likely to be critical; unpredictable people problems enter in.

Such limitations notwithstanding, a more scientific approach, a higher degree of quantification, and the establishment of mathematical relationships among variables can produce attractive results. What you usually cannot expect is an absolute answer expressed in absolute terms providing absolute certainty to an extent that precludes the need for applying judgment. What you can expect is a reduction in the area of uncertainty so that management judgment can be applied to the more significant factors with a greater probability of being right a greater percentage of the time.

Much of this technical development is closely related to what successful managers have traditionally done. They have solved problems by defining them and specifying the objectives, by identifying the alternative courses of action, by evaluating the alternatives, and by selecting the course of action most

***The training and experience of most businessmen and accountants has been outside the fields of science and mathematics . . . but this is no reason for businessmen to fear or ignore scientific approaches to business problems. The businessman has the one thing required for their successful application—an understanding of the business.***



Some technicians would even have us believe that Galileo and Archimedes were applying OR without realizing it.

nearly meeting the objectives. This process still applies. What is new is the greater range of alternatives, the added degree of precision, the narrowing of the area of uncertainty, and, I suppose, a rationale to explain what the successful manager has to a degree been doing all along without being aware of it.

### *The 'hot' label*

Some of us have come to approach anything with the operations research or management science label as we would a hot iron; we are afraid to touch anything for fear of getting burned. These labels are being applied to an ever broadening subject matter. Perhaps because these techniques have so recently come to the fore in the business arena, some practitioners who adhere to management

science in its purer form feel a need to delineate themselves and their work from those who engage in scientific management in its less pure form. This is done in part by setting up a set of characteristics and holding that any problem and solution with these characteristics is an OR problem and an OR solution. Sometimes it seems that any good solution to a difficult problem meets the standard. Suddenly we find this standard applied retroactively, with Archimedes, Galileo, and others practicing OR although they did not know it at the time. The building of such a structure serves the ego of the pure practitioner and serves to keep the more timid out of the game.

Perhaps we need two kinds of players. On one side of the net should be the purists, with a scien-

tific point of view and research interest, who will follow the problem wherever it leads, largely for the problem's sake. From such endeavors come new ideas and breakthroughs of a conceptual nature.

On the other side of the net we need people with a business and profit point of view and with an interest largely in the ends rather than in the means. On this side the game is to follow developments closely to recognize opportunities to apply the techniques and to adapt and implement solutions in a practical manner. Those who have not tried the other side of the net, applying more scientific approaches to business problem solving—in a pragmatic way—are not only missing all the fun. They are missing opportunities to contribute to the successful operation of the business.

*Management by exception and various other techniques have been developed to help executives cope with the accelerating information load. Here's another approach—and an example of how it works—*

## KEY ITEM CONTROL

*by Howard G. Johnson*

*Price Waterhouse & Co.*

A TOP executive of a leading company looked at a pile of reports on his desk. He told an associate, "I take several reports home almost every night. Even so, I don't find time to read them all, let alone to study them. I just don't seem to have enough time."

This is not an unusual situation. The life of the typical top executive has become incredibly complex. The era of the professional manager has placed greater emphasis upon the use of objective control information and performance measures. In addition, the modern computer produces a great abundance of management data.

At one time a major problem of the top executive was obtaining management control information. Now the problems are often ones, first, of winnowing out the valuable data from the mass of less important information and, second, of interpreting, organizing, and absorbing the data so that it can lead to a meaningful program of action.

Unfortunately most reporting today is geared to the purposes of the middle manager or supervisor. The top executive receives either the same reports or a readily prepared summary of the information sent to middle management. Few reports are designed to satisfy spe-

cifically and expeditiously the informational needs of the top executive. Often those needs are not even recognized as differing in kind and quality from those of middle management.

Many executives consider these to be personal problems and set out to solve them as best they can. At one extreme, the executive solves them by flash reading or only glancing at most reports and telling his secretary to file them. At the other extreme, he solves them by grinding conscientiously through them all, thus increasing his working hours per day to intolerable proportions.

**EXHIBIT I**

**TYPICAL KEY ITEMS OF INFORMATION**

**For Key Item Control Reporting System**

**MANUFACTURING \***

- Material requirements and receipt schedule
- Material yield
- Inventory turnover
- Labor schedule
- Labor productivity
- Factory personnel turnover
- Facility load and equipment utilization
- Portion of orders shipped on time
- Planned product engineering changes
- Planned changes in production facilities
- Quality performance
- Unfilled supervisory and other positions

**MARKETING**

- Share of the market
- Expected growth of industry and market
- Extent of sales coverage
- New business and order backlog
- Sales performance and trends (by man, area, product)
- Competitive activity and features of competitive products
- Prices compared with competitors'
- Effect of price changes upon volume
- Customer complaints
- Promotional plans
- Market potential for new products
- Market potential of styling, materials, and other changes in existing products

**FINANCE**

- Return on investment and profit
- Profit effect of planned actions
- Breakeven points
- Departmental costs
- Capital expenditures
- Accounts receivable collection period
- Working capital
- Financing requirements
- Cost reduction and work simplification plans
- Investment analyses and plans
- Potential acquisitions
- EDP and other systems development plans

More often, however, top executives are wondering if these aren't companywide problems that should be attacked on a companywide scale. One technique that has been found useful in this area is called "key item control." In its simplest form it involves sharply focusing the reporting upon those key areas requiring top-level attention. In its more complex forms it moves from a reporting technique into a system for planning and managing the key control areas throughout the company. A brief outline of its principles and a case study of its use in a hypothetical company are offered in this article.

The ground rules for this system are, first, to plan and control those areas in which good or poor performance can materially influence the results of operations, and, second, to report that performance in the most easily understood and action-provoking manner. The key items requiring control might be of many types: financial data, such as return on investment and order backlog trends; quantitative statistics, such as labor productivity and personnel turnover percentages; and qualitative information, such as product styling and work simplification plans. The identification of key action indicators, not merely reference statistics, is vital to the success of the system. Establishing key item control for a company involves four basic steps.

**Identify key items**

The first step, identification of key items, is, of course, the foundation of the entire program. It requires time and effort to select areas that materially influence results of operations and continuing attention to ensure that revisions are made to meet the changing needs of management. Normally a top-level staff assistant or an outside consultant is required to help identify areas and coordinate and guide the development of the control system in an organized manner. Typical key items for a medium-size manufacturing company

are shown in Exhibit I on this page to illustrate the types of factors that might be identified for control by the system. Most of these items of information are available in the average company, but they are not subject to the proper degree of planning or singled out for top-level attention as under a key item control system.

The actual key items for a company have to be tailored to the company size and industry as well as to the specific objectives, background, and techniques of the top executives managing the company. Tailoring the selection to the executives is particularly important.

A good example of its importance is the case of a recent installation of a key item control system for a large company. The president had started with the company 40 years before and knew the business intimately. The executive vice president had been engaged within the last year or two. While he was an excellent administrator, most of his career had been in another industry.

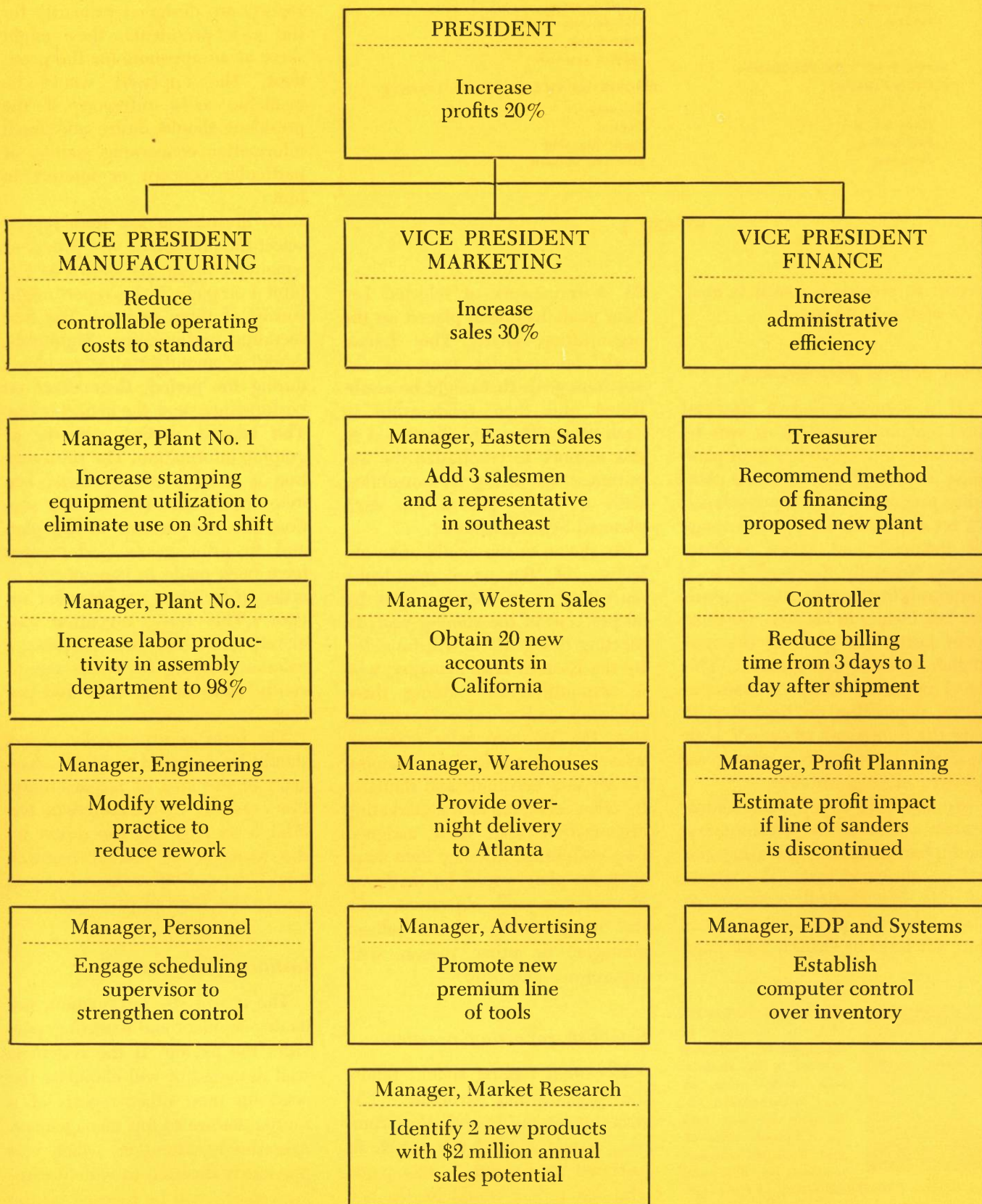
Obviously, their needs were different. The president needed only limited information—but information that focused sharply on performance in several key activities of the business. When a problem arose, he usually knew intuitively the contributing causes and how to proceed. He wanted his key item report to alert him to problems and unfavorable trends, but not to go any further.

On the other hand the executive vice president desired more extensive information. If sales went down in a particular area, he wanted to know if sales calls had gone down, if customer complaints had gone up, if the dealer organization had changed, what the status of customer inventories was, if competitive activity had increased, what marketing and promotional strategy was being followed, if any major customers had been lost, if the sales loss was in high-profit or low-profit product lines, and other similar information. He depended on the key item



ELECTRICAL PRODUCTS COMPANY

Organization Structure and Selected Key Item Goals





## ELECTRICAL PRODUCTS COMPANY

## Kinds of Key Item Reports and to Whom Sent

REPORT TO BOARD OF DIRECTORS REPORTS TO PRESIDENT	REPORTS TO VICE PRESIDENT— MARKETING
Manufacturing Marketing Finance	Eastern sales Western sales Warehouses Advertising Market research
REPORTS TO VICE PRESIDENT— MANUFACTURING	REPORTS TO VICE PRESIDENT—FINANCE
Plant No. 1 Plant No. 2 Engineering Personnel	Treasury Control Profit planning EDP and systems

## EXHIBIT 3

report to provide a complete analysis of the problem.

**Plan desired performance**

If a company has a financial profit planning system, it can be expanded to include key item planning as well. If not, a formal planning program should be developed to set objectives for the full range of financial and other performances. Normally the head of each responsibility is asked to set goals for key factors in his area. He must then justify his goals to the next higher level of management. This level approves them or restudies them, depending on how they fit into the framework of overall goals that this level itself is setting for its area of responsibility.

To illustrate a key item control system, assume a medium-size, multiplant firm manufacturing and selling electrical tools. The nature of this hypothetical company is shown by the organization structure set forth in Exhibit 2 on page

23. A framework of selected key item goals has been placed on the organization chart. This framework demonstrates some of the key item goals that might be established and their relationship to each other. They are illustrated in this manner to emphasize the importance of fixing responsibility with a single person for each planned accomplishment.

As shown in the exhibit, one objective of the vice president—marketing is to increase sales by 20 per cent in the coming year. In meeting this goal, he will be aided by the Eastern sales manager, who is responsible for adding three salesmen and a sales representative; the Western sales manager, who is responsible for obtaining twenty new accounts; and similarly by other members of the marketing organization with their assigned responsibilities. The key item management plan would be made up of numerous such objectives, each the responsibility of an officer, manager, or other person with supervisory authority.

**Establish reporting practices**

Key item reports should follow the organization structure. The structure of the hypothetical company would suggest the reports illustrated in Exhibit 3, this page. The first report would be the key item report to the board of directors. The remaining ones would be

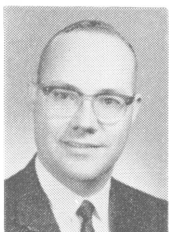
of the president and departmental reports to the vice presidents. The president should have a good view of performance for the period from his reports. Although the remaining reports are designed primarily for the vice presidents, they might serve as an appendix for the president. The appendix would be available as a reference if the president should desire additional information concerning matters of particular concern or interest to him.

To illustrate a key item report, select the position of vice president—manufacturing. As shown in Exhibit 4 on page 25, his report might consist of three sections. The first section, performance highlights, describes manufacturing problems during the period, their effect on performance, and the action taken. The second section consists of graphic information. The third section is a table of additional key items of information. In this section, the comparisons to the plan and to prior year's performance have been made in percentages in order to facilitate management review. The busy executive can merely scan the two percentage columns looking for items significantly more or less than 100 per cent.

The form of a particular report should be designed to fit the character of the area of responsibility. For example, as illustrated in Exhibit 5 on page 26, the report by the manager of market research might depend more heavily upon a narrative form of presentation.

**Institute control action**

The use of the information, not its development and reporting, provides the pay-off. If the system is well designed, it will eliminate the need for most other reports of a routine nature to top management. Accordingly, attention, which was previously diverted to widely varying reports, will be focused on the relatively few "big-impact" problems. This, by itself, often has a



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ML degrees from the University of Pittsburgh. He is a member of the New York State Society of CPAs, the Pennsylvania Institute of CPAs, and the American Institute of CPAs.

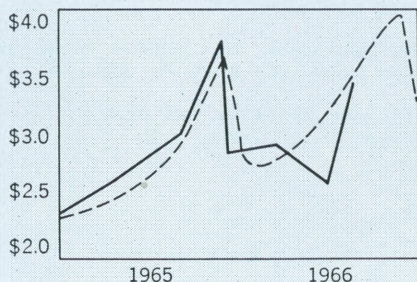
PERFORMANCE HIGHLIGHTS

Shipments increased as expected this month. However, Herron Manufacturing Co., one of our principal motor suppliers, was on strike until four weeks ago. Accordingly, we were not able to build inventory as planned in preparation for the added shipments. As a result, we had to go to a partial third shift for the assembly department and add a number of new employees

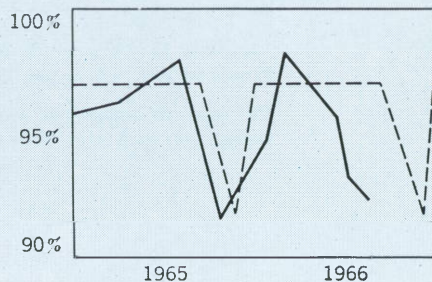
throughout the plants this month. The inexperience of the new employees and the lack of adequate supervision on the partial third shift led to decreased delivery performance and labor productivity, particularly in the machining department. These problems have been largely corrected and we expect improved performance next month.

KEY INFORMATION

Standard value of shipments (millions)



Percentage of orders shipped on time



----- Planned      ——— Actual

	Actual as Percentage of		
	Actual	Plan	Last year
<b>Year-to-Date Expenditures (millions)</b>			
Operating—controllable .....	\$15.61	102%	122%
Operating—uncontrollable .....	\$ 5.95	101%	109%
Capital .....	\$ 1.10	104%	81%
<b>% of Tools Passed Inspection</b>			
Month .....	97.6%	98%	99%
To date .....	99.4%	99%	100%
<b>% of Labor Productivity</b>			
Month .....	91.5%	93%	94%
To date .....	98.1%	101%	103%
Inventory Turnover .....	3.9 times	98%	100%

EXHIBIT 4

Example of a Key Item Report to President

dramatic impact on problem solving activities.

The actual control techniques might vary. The senior executive favoring formal methods of stimulating subordinates might schedule regular monthly meetings. These meetings might even be held in special chart rooms allowing visual aids to be used in discussing performance and future plans. Other executives might favor less formal methods. They might review the reports as time permits each month and follow up with sub-

ordinates during the normal course of their association.

One president followed a middle-of-the-road practice. A scheduled plane trip early each month was used to provide time for studying the key item reports. During the trip he wrote his questions, ideas for corrective action, and notes for follow-up in the margin of the report. Upon his return the vice presidents could expect a call to discuss their reports. In addition, when the reports were designed, a special section was in-

cluded at the president's request. The section had space for four or five sentences of narrative comments. Nothing could be included in the section except as specifically prescribed by the president. When he was particularly concerned about the results of a critical course of action or progress in correcting a troublesome problem, he would request reports on the matter for a specified period in the special section. It was a "super highlights" area for important matters to be brought to his attention



Periodic Market Research Report

PERFORMANCE HIGHLIGHTS

All projects continue on schedule except for a slight delay on No. 110, which was originally planned to be completed last month. Costs continue to be greater than planned due to the hiring of a new project manager and greater than expected travel expenses on Project No. 108.

PROGRESS ON MAJOR PROJECTS

Project Number	
No. 108	The report on the potential Canadian sales market for electric tools was submitted this month. Report recommended that the market not be developed at this time because of heavy marketing and distribution costs.
No. 110	The study of the deluxe line of electric drills disclosed wide interest in redesigning the handle to facilitate use and eliminate a potential shock hazard noted by some customers. The report of the study is being prepared and will be submitted next month.
No. 111	The study of the potential sales market for small electric saws continues. Questionnaires have been developed and will be used in interviews with jobbers and distributors during the next three months.
No. 119	The study of competitive lines marketed by Craig Electric Co. and Gar-Jon Corp. was started this month. The study is scheduled to be completed in four months.

KEY INFORMATION

	Project Summary		
	Actual	Plan	Last year
Projects Resulting in Products with			
Sales potential over \$2 million per year .....	2	2	1
Sales potential under \$2 million per year .....	3	5	4
	Actual as Percentage of		
	Actual	Plan	Last year
Operating Costs (thousands)			
Month .....	\$ 23	110%	116%
To date .....	\$168	103%	110%
Twelve-month Sales of Products Developed in Last Five Years (millions)	\$ 8.6	89%	110%

EXHIBIT 5

Example of a Key Item Report to Vice President—Marketing

during periods of special pressure. The success of key item control systems has been dramatic. One executive told us, "For the first time I feel that I really have my finger on the important things happening in the company." An interesting by-product was pointed out by an official of another large company. He stated, "The reports help me in evaluating my people. It is very revealing to note what they consider important. Some worry about little problems and miss big ones; others don't seem to understand the problems or their causes very well."

Key item control systems are just starting to gain popularity. As their results become more apparent and widely discussed, the time may arrive when total information systems will rarely be discussed without reference to a key item control system to organize the output data for effective use by senior executives. More detailed reports will still exist, but these will be recognized as what they are, information for middle management, and will rarely reach top management. By that time many computer systems will be programed to do much of the work of compiling

key item reports and making the preliminary analysis of problems and interrelated factors.

Executives may still have reason to complain to their associates that they don't have enough time. It is hoped, however, that one unnecessary time waster will not be a stack of reports on their desks and a nightly schedule of report reading. Rather, it will be due to the pressure of planning and directing the various programs involved in running a successful company. This is where the senior executive's valuable time can contribute most to the performance of the company.

*Reports should be dynamic, a spur to meaningful and decisive action. Yet all too often they are dull, routine—and largely misunderstood. This article describes the basic types of report and gives some guidelines for improving all reports—*

## REPORTS THAT COMMUNICATE

*by Michael J. Reiter  
B. F. Goodrich Company*

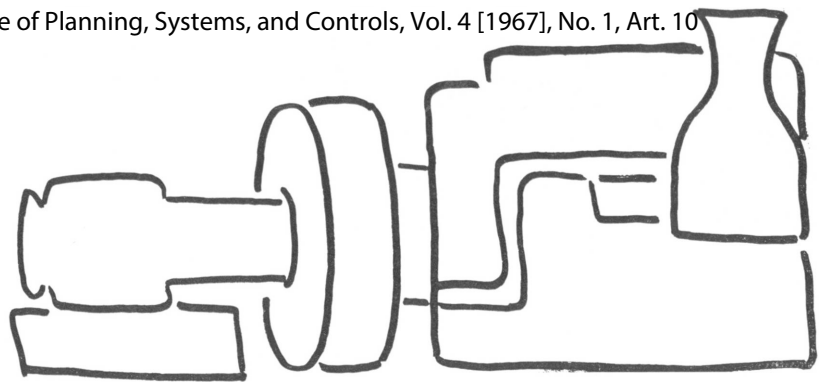
**M**ODERN accounting reports range far beyond the textbook classifications of balance sheet, income statement, and annual report. Much emphasis is being placed on preparation of reports that are highly analytical and interpretive. Today's accountant must be more than a gatherer of figures, more than an allocator of costs. Today's accountant must be a "management accountant." That is, he must have not only highly developed accounting skills and knowledge of accounting principles

but also a far greater insight into the overall functioning of the business than ever before.

To meet the needs of modern business, management is challenging the accountant to produce more reports, bigger reports, and better reports. The greatest challenge lies not in gathering the varied data, not in analyzing for hidden trends, but rather in being able to transmit this data with all its pertinent meanings to management. Liken the accountant to the football spotter. From his vantage point

the spotter watches the game. He sees a weakness in the opposing backfield. This information in the hands of his quarterback may mean the difference between victory and defeat. He picks up his telephone and relays the information to the bench. But on the bench the coach hears only static. There has been no communication. The key play is lost.

In this same way a business play can also end in a loss. For the accountant to have the information and be aware of a trend is not



A good report can identify for the foreman the specific part of the plant where the deviation occurs.

enough. To be able to communicate rather than just present is becoming a good accountant's prime skill. If he has this ability, he can increase the effectiveness of a management group by giving it the best tools possible with which to do its work.

### Scope of accounting reports

Accounting reports can be divided into three major groups or types: statistical reports, financial reports, and narrative reports. Under the heading of statistical reports we find reports on such facts as units produced, number of complaints versus sales, and waste. The financial report group includes reports of receivables, budget reports, and, that statesman of the accounting world, the annual report. The final group includes the research report and variance explanations.<sup>1</sup>

<sup>1</sup>C. E. Redfield, *Communication in Management*, University of Chicago Press, Chicago, 1958, p. 164.



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of B. F. Goodrich Foreman's Club and the Western Reserve Association for Foremen.

Accounting reports for management could instead be divided on a frequency basis—into periodic reports of performance and special reports for planning and policy making. The periodic reports, such as budget reports, monthly statements, and sales reports, have become fairly fixed in form and content through accounting convention and company policy. Most organizations have standardized these reports to the point of presenting them on printed forms. Although this practice may sacrifice some communication effectiveness, the volume of periodic reports necessitates some degree of standardization.

### Pyramid structure

The essential feature of periodic reports is that each is a supporting part of the report at the next higher level. Such an integrated system permits management by exception. A division manager can see which area of his organization—production, sales, or advertising—is causing a deviation. The production manager can pinpoint an off-budget department, and the general foreman can locate the specific part of the plant where the deviation occurs. In each instance the individual can direct his attention to the persons or operations at fault and initiate corrective action promptly.

Special reports are designed to

give detailed information on specific operations or problems about which management decisions must be made. The special report should expand or supplement data that may be found only in part in various periodic reports. Special reports may be required to give comparisons of performance data other than those comparisons generally used. These reports deal as much in "how" and "why" as they do in "how much."

Many long-range planning decisions, for expansion or for changes in product mix, for example, cannot be made on the basis of the information given in the periodic reports. The special studies required to obtain the needed data must be thorough, and their presentation must be highly communicative. In selecting the format and reporting style the accountant must take into consideration the end use of the report, the complexity of the problem being studied, and the needs and temperament of the person who will receive it.<sup>2</sup>

### Problems of reception

All of us, whether accountants, engineers, or managers, tend to assume that when we report data we have gathered or state even a

<sup>2</sup>W. C. Himstreet, *Business Communications*, Wadsworth Publishing Company, San Francisco, 1961, p. 319.



simple opinion it will be understood exactly as we meant it. Modern-day research in the field of communication clearly disproves this normal assumption.

Claude E. Shannon in 1948 presented a paper entitled "A Mathematical Theory of Communication" that laid the groundwork for the modern-day study of information theory or communication theory. This new field of study has shown us how much, or perhaps how little, we actually do communicate with our fellow man. Its theories, although enlightening, do not solve our communication problems for us. They do, however, point out the areas of difficulty and strongly emphasize the need for skill in the art of communicating with others.

Communication theory provides, in the "bit," a universal measure of the amount of information we can pass on to someone else. It tells us how many of these "bits" can be sent per second over different channels, be the channel oral or visual. Communication theory shows us how to state, or "encode," messages efficiently and how to avoid errors in transmission. This last is of great value to us; how to say what we mean.<sup>3</sup>

Communication theory tells us that the amount of information conveyed by a message is directly related to the receiver's uncertainty about what the source of the message will say. Here is an example: If you see what is obviously a one-dollar bill and a man tells you it is a one-dollar bill, the amount of information conveyed is negligible. If you see what looks like some kind of engine and are told its type, use, and other particulars, the amount of information conveyed is greater. The amount of information transmitted, then, depends in part on how uncertain the receiver is of what he will receive.

Of what value are these abstract theories and generalizations to the

accountant who must write a report? How can an accountant apply such concepts as "transmitter," "receiver," and "noise" to his work? How can he better communicate?

### Know the "noises"

The first step to better communication through reports is to know what "noises" cause poor reports. These "noises" may be personal traits, lack of communication skills, or outside distortions. Accountants of one major company were accused by a top executive of "using a pattern of rubber-stamp expressions. They write badly and their reports are complicated, obscure, and tiresome."<sup>4</sup> Such a comment is not one that an accountant should be proud of. Yet it does point up a common "noise" in the form of shopworn expression and poor writing style.

"Noise" can take various forms. For example, you are a sales manager whose orders are not being filled because of production processing problems. You receive a report that reads like a technical dictionary. Buried somewhere in the "noisy" verbiage may be the length of time required for solution of the problem and the anticipated level of production until then, the facts you need to know.

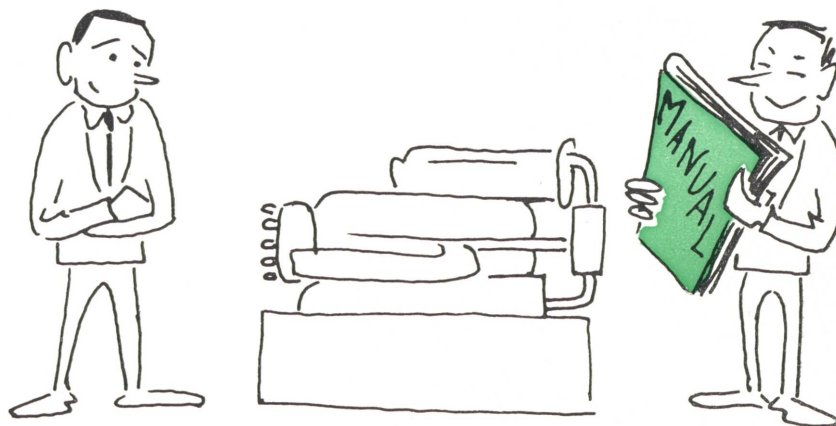
<sup>4</sup>P. Douglass, *Communication Through Reports*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1957, p. 379.

Yet you may tire long before you reach the page on which they are hidden. You are a victim of "noise." Another common example of "noise" is the qualified sentence: "Production is good, all things considered" or "Costs were fairly low, despite minor scrap problems."

Such distortions often result from accountants' lack of training in basic report writing. Many times such training on the high school and college level is relegated to the few courses in English that everyone is obliged to take. Courses in the field of accounting tend to deal with method and cover reporting only in terms of standardized forms. With more special reports to be done, the managerial accountant finds that not only are the figures important but so are the narrative comments on those figures.

Fear of authority and the "cover-up" attitude also produce distortions. Just how detailed should an accountant's analysis be? Information may well be lost because of fear of uncovering a skeleton in someone's business closet.

Distortion can also occur on the receiving end. The mere quantity of reports received may have become more important to the receiver than what the reports say; he rates a job by the poundage of paper produced. Or a manager may look upon a periodic report not as information on performance but as a prescription for conduct.



If one sees an engine and is told its type, use, and other particulars, the amount of information conveyed is fairly high.

<sup>3</sup>J. R. Pierce, *Signals, Symbols and Noise*, Harper and Row, New York, 1961, pp. 1-9.



Many reports, even though they carry vital information, bury it in such a mass of verbiage and inconsequential details that it is lost.

This is especially likely to occur with budgets and variance reports. The tendency is to change performance so as to have a better report without trying to get at the real cause of a variance.

The managerial accountant, as "transmitter," must tune himself to perform his reporting function well. Of prime importance is his ability to put himself in the place of the manager or executive who will use the report. The accountant must be able to envisage what the report is supposed to do. He must be aware of the problem involved, be it expansion or new products or whatever. He must detail the narration of his report to answer as many as possible of the foreseeable questions. The scope of his study must be such that all factors involved in and affected by the decision management will make are completely covered.

To achieve this high degree of problem orientation, the accountant must have a close working relationship with both the receiver of the report and those from whom background information and primary data are obtained. He must think in the frame of reference of the receiver. Semantic issues must be settled before the narrative section of the report is written. When the narrative discusses overhead, asset, or discount, will the execu-

tive reading the report include the same items under these headings as the accountant who writes the report? To avoid confusion the accountant must become an extension of the person requesting the report.

Assuming that you have the requisites of a good "transmitter" and that you are alert to possible distortion factors, you have only to pick the proper "signals." Your "signals" will consist of the format used for data tables and charts, the key segments of the analysis narrative, and, most important, the words and style used.

Data tables may be large or may be in small segments, each dealing with one cost segment or area of the report. The prime requisite here is to keep tables in meaningful order and readable. Charts may run the gamut from line charts through bar graphs to pie segment charts, depending on which will best convey the significance of the data presented. Clutter should be avoided. Charts and graphs should be easy to interpret and clearly labeled.

Words and style are of great importance, particularly in the special reports. A foundation of good grammar is essential for good reports. Another handy tool is an unabridged dictionary. Reports such as accountants prepare cannot be

polished by the average secretary. The standard writing techniques for tone setting, proper flow, emphasis, and phrasing are as basic to accounting reports as to any other writing. Reader attention will be held if the basic principles are followed. Brevity and conciseness are also essential. Many an important fact is lost in a mass of verbiage. The use of new and different words and phrases will give life to reports. The same old worn-out statements can be an anesthetic rather than a stimulant to action.

### **Guideposts to good reports**

A good report is not a matter of chance but almost a work of art. All of the rules in the many books written about reporting can be summed up in six key words. Good reports should possess *clarity*. They are clear and concise, are written in good style, and are easy to read. Good reports have *consistency*. They stay in the problem area and do not deviate. Meanings and terms do not change in mid-report. Good reports display *adequacy*. They are complete in all respects. Coverage is not slipshod. Good reports possess *timeliness*. Their data and interpretation are in the light of present circumstances and practices. Good reports have *adaptability*. They show recognition of the possible different viewpoints on the problem at hand by presenting data to analyze these views. And, lastly, a good report has *interest*. Gone are the rubber-stamp phrases and mire of useless words. The report takes and holds the reader's attention. It not only shows but it also tells.

The managerial accountant, in properly fulfilling his reporting function, displays skills in composition, human relations, general business knowledge, and communication as well as accounting. He *must* communicate the necessary information in the proper manner so as to achieve the best end result. He must be a dynamic part of the decision making team.

*Pioneering in computerized inventory control has paid off for Bergen Drug Company in more ways than one. Along with better service, faster turnover, and reduced costs, new "products" have resulted from—*

## **AN INVENTORY CONTROL SYSTEM WITH PROFITABLE BY-PRODUCTS**

*by Anthony A. Vallario  
Bergen Drug Company, Inc.*

**T**HE DISTRIBUTION industries have gone a long way in recent years to prove both the essentialness of their function and their understanding of their responsibilities. Expanded product lines, a result of technological research and consumer demand, have placed a heavy inventory burden on the retailer and complicated the logistic problems of the manufacturer.

Fortunately, those responsible for distributing goods from the manufacturer to the retailer have recognized the challenges that the

changing market place has created. Imaginative planning and creative marketing and operating techniques have helped solve the problems of both the retailer and the manufacturer. At the same time they have provided a solution to the wholesalers' problem of maintaining large enough inventories to provide prompt delivery of required items to retailers without incurring excessive overhead costs for themselves.

In the wholesale drug industry, for example, it is necessary to keep

on hand for same-day delivery upwards of 20,000 different items. Many of these items are of a life-saving nature. Out of stock or delayed delivery is not an acceptable alternative to the delivery in a matter of hours of the exact product prescribed by the physician.

Providing this kind of service requires the drug wholesaler to maintain sophisticated inventory controls not even dreamed of a few years ago. At Bergen Drug Company we have relied heavily on the computer to assure inven-





IBM 24 card punches (above) record purchases and payments made by customers of retail pharmacies that subscribe to Bergen Drug's TIPTOP service.

tory availability, increased turnover, improved inventory control, and prompt invoicing.

These adjustments in our purchasing and operating activities required by the present-day market have brought with them an unexpected but welcome by-product that has enabled us to inaugurate some new and profitable computer-oriented customer services. The first of these, TIPTOP, is an accounts receivable program for the retail pharmacy incorporating a method of reporting to the consumer his tax-deductible purchases. Two other computer services in related fields have recently been

introduced and show great promise.

Providing customer services has always been vital to the activities of Bergen Drug Company. This is perhaps attributable to the fact that the company was formed by a group of independent pharmacists who were dissatisfied with the service they were receiving from their wholesalers.

Conditions in the consumer market after World War II brought their dissatisfaction to the point of action. Something had to be done to help the independent pharmacist provide better service for the exploding population in Bergen County, at that time the fastest-growing area in New Jersey. As doctors prescribed an ever widening variety of antibiotics and other intensely promoted ethical drugs and chemicals, pharmacists were expected to supply any and all of them within a day and preferably within hours. The cost of maintaining such large inventories threatened to strangle the pharmacist financially. Furthermore, he had

to store the quantities needed to stay "in stock" on so many items.

As a way to relieve this inventory squeeze and to match the buying power and other advantages of the big drug chains and discounters, a group of Bergen County pharmacists united in 1947 under the leadership of the late Emil P. Martini, Sr., to form their own wholesaling organization, Bergen Drug Company, Inc. It has grown into a full-line, full-service wholesaler engaged in the distribution of ethical drugs and chemicals (55 per cent); proprietary medicines (18 per cent); and cosmetics, toiletries, personal health products, and products for better living (27 per cent). In addition to supplying an increasing number of data processing services we maintain a store modernization program and offer almost every type of counseling service to our customers. Our suppliers, which include every major drug manufacturer, number approximately 1,000.

Bergen Drug has two New Jersey divisions, one in Hackensack and one in South Brunswick, which service more than 1,000 pharmacies in New York State and New Jersey. Another division in Bridgeport, Connecticut, covers major markets in Fairfield, Litchfield, and New Haven counties. We also operate special warehouse facilities in Staten Island and New Haven in order to make pharmaceutical products available on a daily basis in these localities.

### *Pioneer*

As far as we can ascertain, Bergen Drug was the first wholesaler in the drug line to have computerized inventory control. Originally we used electric accounting machines—tabulator, key punch, sorter, reproducer, and interpreter. We installed our first computer, an IBM 305 RAMAC, in 1959. Shortly after, in 1960, we established our South Brunswick division. Data processing operations were centralized in Hackensack,



ANTHONY A. VALLARIO is director of data processing at Bergen Drug Company, Inc., in Hackensack, New Jersey. In this position he administers the system described in this article. Mr. Vallario attended the Academy of Aero-

navics, LaGuardia Field, New York. He is a member of the Systems and Procedures Association.

and the 305 monitored about 20,000 items of inventory for each division. As the volume at both locations increased, the 305 became "too small"; in 1962 we replaced it with an IBM 1401-1405 RAMAC installation.

The problem, however, was more than one of capacity. One of the limitations of the original system was the difficulty we had in communicating between divisions. Each day we had to truck an average of 10,000 punched cards from South Brunswick to Hackensack.

On the recommendation of a local telephone communications specialist, we installed Bell System 202A Data-Phone sets both at headquarters in Hackensack and at South Brunswick. This made it possible for IBM data transceivers to send machine data over the regular voice-grade Wide Area Telephone Service (WATS) lines. We found we could use for data transmission during idle hours the same WATS lines we used for taking customers' orders. There was no additional cost because the lines were leased on a flat monthly basis.

This improvement made possible a rapid exchange of information between Hackensack and South Brunswick. We could maintain up-to-the-minute information at Hackensack on stock levels in South Brunswick and avert "stock-outs" by shipping merchandise between warehouses.

### *The advent of IMPACT*

We were still a long way, though, from meeting the challenge of our continuing growth. We wanted to include on the computer in Hackensack inventory controls for still another new division in Bridgeport. It was evident, also, that our sales forecasting and inventory planning techniques were not sufficiently refined. We still had to keep what seemed to be excessive inventories for filling day-to-day orders in all divisions.

Our ultimate refinement in data processing was IMPACT, a new, more sophisticated computer-based

inventory control and data communication system. From the beginning our use of data processing equipment, from the original EAM installation to the computer, had given us better control of our inventories than we could have obtained through manual counts and clerical routines. We were turning our inventories over about seven times a year whereas the median turnover in our line is usually about six. We also had records from previous years that were easily available for analysis. These were among the reasons IBM invited us in 1961 to become part of a pilot project called IMPACT (Inventory Management Program and Control Techniques). We were one of five wholesalers, and the only drug wholesaler, invited to participate in this pioneering system developed for wholesalers by IBM and the Arthur D. Little Company.

Our IMPACT system combined a 1401-1405 computer with a 1009-

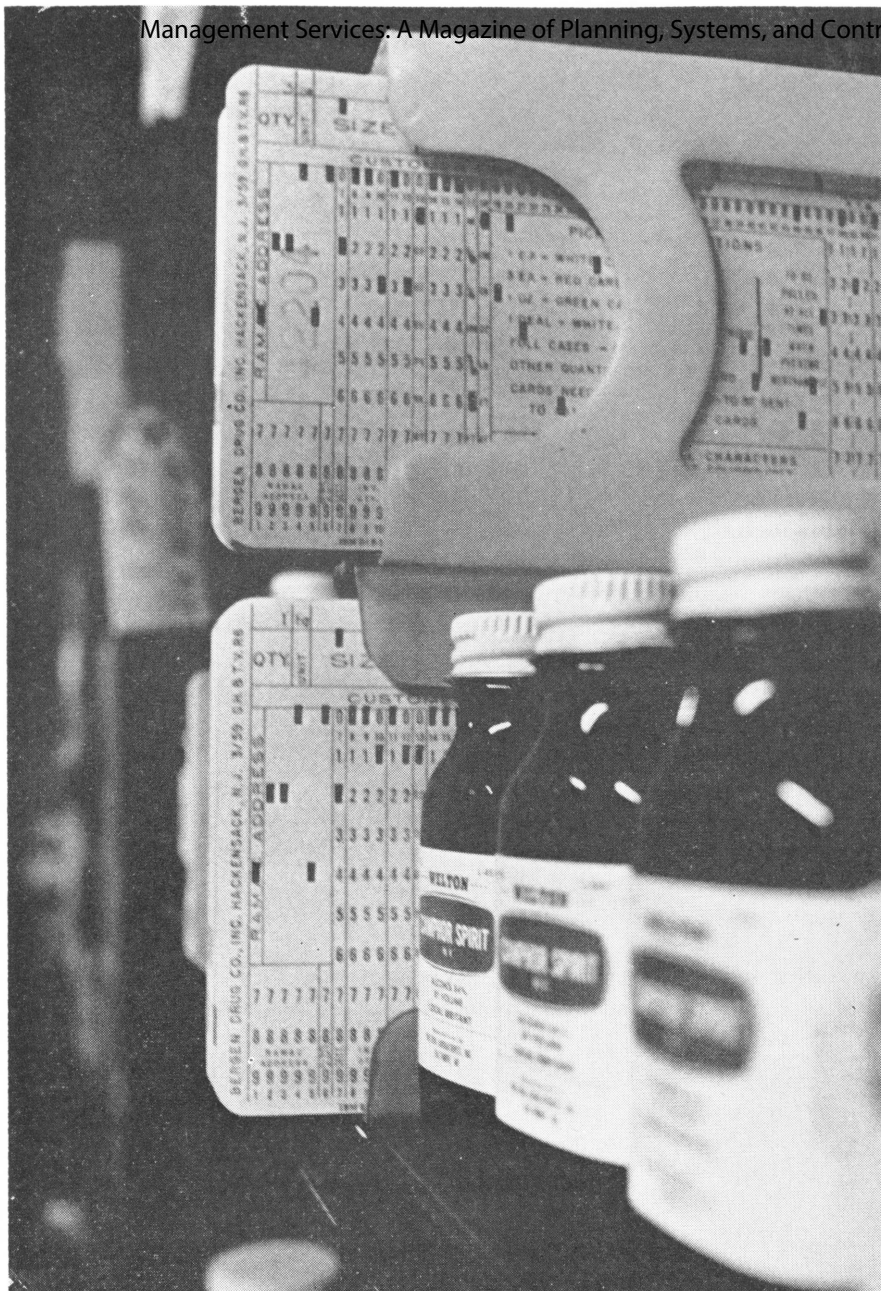
1013 Teletype processing unit to keep track of inventory, add or deduct items from inventory records as they were purchased or sold, and indicate when stocks exceeded or fell below a certain level. The system also recorded seasonal variations in demand for particular products, forecast required inventory levels, and adjusted orders accordingly. It automatically tabulated sales to customers; priced, totaled, and printed customer invoices; and recorded the inventories in individual divisions. This permitted us to plan for our inventory requirements accurately and meaningfully and gave us prompt and accurate answers to three vital questions: When should we buy? How much should we buy? How is the system functioning?

Cooperating with IBM to plan the system, our head buyer, Arthur McAnney, worked with an IBM representative for a whole year on a study of stock movements for the

The author (standing at rear) supervises operation of TIPTOP, an accounts receivable control program to which more than 1,000 pharmacies now subscribe.







A pre-punched data card (above), placed in a holder beside its merchandise in the stock room, is pulled when an order is picked. Together with a header card containing customer information, it becomes order input to the computer.

previous two years on an item-by-item basis. Since we had been using less sophisticated data processing equipment for years, we had an accumulation of recorded experience. This study provided the basic data needed so that the new program could come up with accurate sales forecasts. The data also gave us a sound basis for a program to maintain a perpetual balance of inventories.

While this advance work was going on, we formed plans to tie the three warehouses to the computer by teleprocessing equipment

using our WATS lines. Day-by-day data on stock movement could then be fed into the central computer for automatic processing. This link in computer communication was established in its latest form in South Brunswick in June of 1963 and in Bridgeport in September of 1963. It completed our present information and control system.

#### **How IMPACT works**

Here's how the data processing system functions at computer head-

quarters in the Hackensack office: Telephone sales personnel receive orders both from salesmen and directly from customers. These orders are forwarded to the stock room for order processing. For an item on order, a related pre-punched card (from a card holder placed beside the merchandise) is pulled and placed in a container in the order basket at the same time the item is selected. We use a bin-denominated system for handling the orders.

Once these cards are pulled, they are assembled with a "header" card (selected when the order is received), which contains the customer's name, address, and other control data. The cards are fed into the computer, which automatically prepares and delivers an invoice with the order, which by that time has been packaged.

Invoices in the Bridgeport division, because they must be ready for same-day delivery with the order, are prepared without the main computer on an IBM 403 tabulator in Bridgeport. At the South Brunswick division, however, customer service is arranged in such a way that the invoice is prepared on a 1401 card system. Both divisions now transport their cards to Hackensack for inventory updating and report preparation.

As information is received in Hackensack, inventory records are brought up to date automatically by the computer. The present control system is composed of three distinct sets of computer programs tied together in a comprehensive unit. The three programs are forecasting, reviewing, and purchasing.

Forecast reports are produced every ten working days. The forecasting program establishes reorder points for the coming ten-day period. These reorder points are automatically reviewed by the computer as each forecast is produced; when necessary it recomputes them on the basis of any new consumption patterns uncovered by the review. The reviewing subsystem then automatically causes the actual purchase order to be written

A subsystem of the purchasing program balances all cost factors to come up with the most economical order quantity for the specific time and circumstances and computes the reorder point on the basis of available stock.

**Results from IMPACT**

When we began to install the IMPACT system, we considered ten inventory turns a year a reasonable and desirable goal. We had been averaging about seven turns a year, which is better than average for our line of business. On the items now controlled by the IMPACT program we have managed to reach twelve turns a year. This level, because of billing terms in our trade, is the most advantageous we can achieve. Because of our increased depth of control we can safely carry less merchandise on our shelves in relation to sales volume.

With inventory at lower levels in relation to sales we feared we might have more frequent stock-outs, but this has not been the case. Before IMPACT we used to provide about 97.5 per cent service. Within three months after the new installation and procedures went "on stream" the service level actually improved to 98.5 per cent and has remained in that vicinity ever since.

This has been possible because the IMPACT system continually responds to changing conditions in all three of our markets and reports changes as they occur. Not only is each item clearly charged, but cost-to-purchase and cost-to-maintain figures are always current.

The new system changed the roles of our six buyers. They used to spend three-fourths of each working day just reviewing items of inventory for reorder. Now only two buyers are needed to monitor the system, on a part-time basis, and the remainder of their time and effort can be spent in investi-

**Improved sales and profits**

The following table compares sales and profit results since the system was installed in 1962:

August 31	Net Sales	Net Income before Taxes
1962	\$19,038,401	\$ 631,276
1963	19,770,329	735,485
1964	21,167,441	761,247
1965	23,006,293	933,994
1966	24,076,516	1,108,866*

\*unaudited

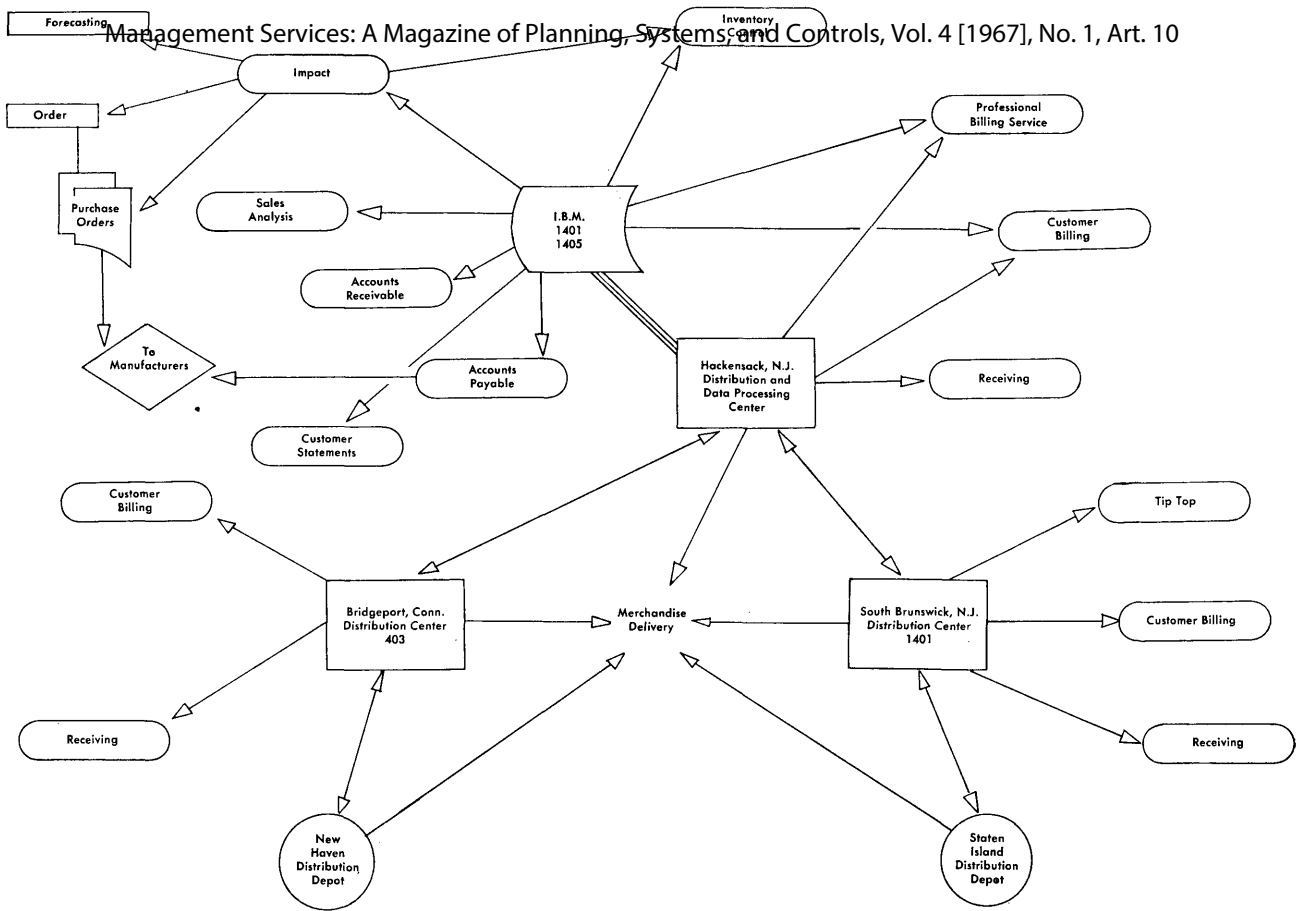
Although IMPACT cannot be given the whole credit for the financial and operating improvements during the past four years, it has helped us to progress, particularly in our major function: service to independent pharmacists. Complete orders promptly delivered make for loyal customers; IMPACT has made this high level of service possible . . . and profitable.

**Extra services . . . and profits**

With the unused capacity of the 1401-1405 we developed several other services for our customers that enabled them to solve some of their problems and that gave us profitable computer by-products.

The first of these, mentioned earlier, was TIPTOP (Tax Information Plan and Total Owed Purchases). The plan is an accounts receivable control program for pharmacies with a built-in monthly and annual tax information service for the pharmacist's customers. Each month the pharmacies that subscribe receive statements for their customers of purchases and payments made and balance owed plus a separate summary of tax-deductible pharmaceuticals. This is an attractive service that community pharmacists can offer free to their customers. We even provide advertising material to promote TIPTOP; it helps pharmacists build their sales through increasing the volume of goods bought on credit. It is known that the average cash

**Complete orders  
promptly delivered  
make for loyal customers;  
IMPACT  
has made this  
high level of service  
possible . . .  
and profitable.**



**CENTRAL INVENTORY CONTROL USING DATA PROCESSING**

customer spends between \$30 and \$40 a year with his pharmacist, while the charge customer spends about \$120.

The subscriber to TIPTOP pays us, his wholesaler and data processor, a fee based on the number of charge accounts he has. A market research organization found that our fee is quite a bit less than the cost of the usual retail receivables control system used by the average pharmacy. In actual use TIPTOP has attracted new customers and more business to pharmacies and has more than paid its way. It also frees pharmacists from bookkeeping routines and allows them to concentrate on more effective merchandising.

The TIPTOP program caught on so quickly, even though we "soft-sold" it, that we have franchised its use to nineteen other wholesalers. It now is in use in 42 states serving more than 1,000 pharmacies and 650,000 charge cus-

tomers. By next year the number of stores is expected to reach 3,000 out of a total of 54,000 pharmacies in the United States.

TIPTOP has been operating long enough, now, for us to see its effect on the financial operations of subscriber pharmacies. Their sales have increased anywhere from 12 to 60 per cent, and they have been able to reduce the collection period of their receivables by 5 to 15 per cent.

As the system spreads we are offering national advertisers the opportunity to stuff the monthly statements with special promotions of products available from TIPTOP subscribers.

### **CIA**

Another recently developed plan offers subscribers to TIPTOP an accounts receivable financing service which we call CIA (Cash In Advance). It enables pharmacists

with money tied up in receivables to get it in advance of normal collection procedures.

### **Billing service**

PBS (Professional Billing Service), a new billing system for doctors and dentists, was created to free them from some of the bookkeeping and paperwork that Medicare has recently multiplied.

Although these new computer by-products have not yet contributed substantially to annual sales, they have furnished more than their share to profits. We have set up a new, wholly owned subsidiary, B. D. Data Processing Corp., to develop and market these services. Since TIPTOP's origination in 1964 it has already required a second 1401, and just recently we had to put in a new generation IBM 360 to make "room" for new growth and profits from better customer services.

*Obviously, the company will want to make the decision—lease or purchase—that will cost it least. But this usually involves a whole series of calculations. Here's an entirely new approach—*

## **A DECISION CURVE FOR LEASE OR BUY**

*by Kyojiro Hata*

*Peat, Marwick, Mitchell & Co.*

**I**N RECENT years the lease rather than purchase of industrial equipment has become a popular method of financing capital investment. There are many reasons for this trend, among them the tax advantages that may accrue from making the full cost of the equip-

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The author wishes to express his appreciation for the valuable suggestions and constant encouragement in the preparation of this article which was provided by Charles W. Hoppe, manager, management controls department, Peat, Marwick, Mitchell & Co.

ment's use a business expense and the fact that leasing frees capital for other, presumably more profitable, uses.

For some companies one or more of these considerations may be so overwhelming as to virtually dictate the choice of leasing instead of buying. For most, however, the decision will rest on a comparison of the cost of leasing with the cost of ownership.

The cost of leasing is easy to determine. But calculation of the cost of ownership presents more

complex problems. Two of its major determinants, the residual worth of the equipment at the end of the period under analysis and the investment return that will be foregone if the equipment is purchased, are uncertain and must be estimated. No one can be sure either how soon a piece of equipment will become obsolete or what his company's reinvestment rate will be.

It is self-evident that leasing will tend to be more attractive than purchase when the rate of return

a company can earn on its own capital is relatively high and/or the residual worth of the equipment is low. Because these values are uncertain, however, it is desirable to calculate the effect of a number of possible combinations of these two determinants. To avoid these tedious calculations and, in fact, to permit a decision to be made without the estimation of the exact value of the determinants, we have developed a new analytical approach.

A breakeven curve was drawn as a function of the residual worth and the discount rate. Then estimated ranges or statistical expected values of these determinants were applied to the curve, enabling management to evaluate any combination of residual worth and prospective investment return simply by reading points on the graph.

In this article this graphic method of balancing residual worth

against the discount rate and the concepts underlying it are illustrated by means of a hypothetical case of financing railroad equipment. The example is used to develop equations for determining the residual value needed to equate the cash outflows needed under the purchase option and the lease option and then for calculating this breakeven residual worth on a present value basis at various discount rates. Finally, various methods of estimating the probability of attaining given rates of return on alternative uses of money and of realizing a given residual worth at the end of the project life are discussed.

**Comparative cash flows**

In our hypothetical railroad example the alternative methods for acquiring the use of new equipment being considered by the

management are long-term (fifteen years) lease and purchase under an equipment trust. The equipment trust, a trust created to buy equipment and lease it to the user, is the most widely used method of financing the purchase of railroad equipment. For most practical purposes it is equivalent to purchase, but since it avoids direct ownership by the railroad, it keeps the new equipment from being subject to existing mortgages. Typically, the equipment trust requires a 20 per cent to 25 per cent down payment and payment of the balance and interest annually or semi-annually over a period of ten to fifteen years.

The assumed conditions for the railroad example are as follows: The original value of the contemplated investment is \$1 million. Depreciation is calculated for tax purposes by the sum-of-the-years-digits method, a method that is

**EXHIBIT I**

CASH FLOWS OF EQUIPMENT TRUST										
Years hence	(1)	(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9)
	Down payment	Principal payment	Interest payments		Net interest after tax	Depreciation effect		Net cash outflow after tax (1)+(2)+(4) -(6)	P.V.F. (10%)	Present value of cash flows
			Interest payable			Depreciation expense	Tax deduction			
0	\$200,000							200,000	1.000	200,000
1		\$ 53,333	51,134	26,589	113,333	54,400	25,522	.909	23,199	
2		53,333	47,667	24,786	105,238	50,514	27,605	.826	22,802	
3		53,333	44,200	22,985	97,143	46,629	29,689	.751	22,296	
4		53,333	40,734	21,181	89,048	42,743	31,771	.683	21,700	
5		53,333	37,267	19,379	80,952	38,857	33,855	.621	21,024	
6		53,333	33,800	17,576	72,857	34,971	35,938	.564	20,269	
7		53,333	30,334	15,774	64,762	31,086	38,021	.513	19,505	
8		53,333	26,867	13,971	56,667	27,200	40,104	.467	18,729	
9		53,333	23,401	12,168	48,571	23,314	42,187	.424	17,887	
10		53,333	19,934	10,366	40,476	19,429	44,270	.386	17,088	
11		53,333	16,468	8,563	32,380	15,543	46,353	.350	16,224	
12		53,333	13,001	6,760	24,286	11,657	48,436	.319	15,451	
13		53,333	9,534	4,958	16,191	7,771	50,520	.290	14,651	
14		53,333	6,068	3,155	8,096	3,886	52,602	.263	13,834	
15		53,338	2,601	1,353	—	—	54,691	.239	13,071	
<b>Total</b>	<b>\$200,000</b>	<b>800,000</b>	<b>403,010</b>	<b>209,564</b>	<b>850,000</b>	<b>408,000</b>	<b>801,564</b>		<b>\$477,730</b>	

Explanations:  
 Column (3) Total interest for each year is the sum of the two semi-annual interest payments on remaining balances at 6½% per year.  
 Column (4) 48% of interest expense will be recovered through tax deduction.  
 Column (5) 14 years sum-of-the-years-digits depreciation method.  
 Column (6) Taxable income will be reduced by the amount of depreciation. As a result, tax payable will be reduced by 48% of depreciation expense amount.



commonly used by Management Services, Vol. 4 No. 1, January-February 1967 [whole issue] usually results in the maximum tax benefit in early years. Eighty-five per cent (regarded as reasonable and typical) of the original cost will be depreciated in fourteen years.

The equipment trust carries an effective interest rate of 6½ per cent. The principal will be paid in equal semi-annual installments over a fifteen-year period. The interest will be payable semi-annually.

The lease alternative is for fifteen years with no option to purchase. The total rent is equal to the original cost of the equipment plus fifteen years' interest at 6 per cent on the average outstanding balance (half the original cost). The payment schedule calls for payment of four-ninths of the total in the first five years, three-ninths in the second five years, and two-ninths in the final five years—in equal semi-annual payments with in each five-year period. The lessor takes the depreciation tax benefit.

The lessee has taxable income throughout the fifteen-year period.

**Cash flow schedules**

The cash flow schedule for the equipment trust alternative under the assumed conditions is shown in Exhibit 1 on page 38. The cash flow schedule for the lease alternative is shown in Exhibit 2 on this page. Unlike conventional cash flow presentations, these analyses do not take into account income and operating costs pertaining to the new equipment because these factors are not affected by the method of financing.

Comparison of Column 7 in Exhibit 1 with Column 3 in Exhibit 2 indicates that the net cash outflow after tax for an investment of \$1 million would be \$801,564 for the equipment trust and \$754,000 for the lease. There would seem to be a differential of \$47,564 in favor of the lease arrangement. However, we have not yet taken into consideration the residual worth of the equipment or the discount rates.

Years hence	CASH FLOWS OF LEASE					Present value of cash flows	
	(1) Rent Payments		(2) Tax deduction through rent expense (48% of 1)	(3) Net cash outflow after tax (1)-(2)	(4) P.V.F. (10%)		
	Principal portion	Interest portion					
1	\$ 88,889	+	40,000	61,867	67,022	.909	\$ 60,923
2		↓				.826	55,360
3		↓				.751	50,334
4		↓				.683	45,776
5		↓				.621	41,621
6	66,666	+	30,000	46,399	50,267	.564	28,350
7		↓				.513	25,787
8		↓				.467	23,475
9		↓				.424	21,313
10		↓				.386	19,403
11	44,445	+	20,000	30,934	33,511	.350	11,729
12		↓				.319	10,690
13		↓				.290	9,718
14		↓				.263	8,813
15		↓				.239	8,009
Total	1,000,000	+	450,000	696,000	754,000		\$421,301

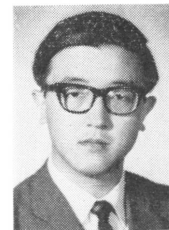
EXHIBIT 2

Under the assumed lease agreement the equipment is returned to the lessor at the termination of the lease arrangement to determine however, the equipment is still available for use after the fifteenth year and therefore will have what might be termed a "residual worth" to the company. The residual worth must be measured against the \$47,564 differential in favor of the lease arrangement to determine what might be called the "break-even residual worth," the point at which the two will coincide. Any excess of residual worth over the cash flow differential will tend to favor the equipment trust; any excess of the cash flow differential over the residual worth will tend to favor the lease agreement.

The term "breakeven residual worth ratio" also is employed in the analyses that follow. This, as the reader might infer, is the ratio of the breakeven residual worth (in our illustration \$47,564) to the original investment (in our illustration 4.76 per cent, representing the ratio of \$47,564 to the original investment of \$1 million).

The residual worth does not nec-

essarily coincide with either the remaining undepreciated value of the equipment for tax purposes or the undepreciated book value reported to regulatory agencies, for in this analysis we are trying to measure the economic benefit that a company will get from the equipment on hand at the end of the fifteenth year. Therefore, the residual worth also differs from the expected net dollar receipts (after taxes) from selling the equipment. It is, rather, the dollars that a company would have to spend to obtain the equivalent services. If the equipment is in short supply and great demand after



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BREAKEVEN RESIDUAL WORTH RATIOS (AFTER DISCOUNTING)	
P.V.F. Discount rate (%)	Breakeven residual worth ratio (%)
0	4.8
2	6.1
4	8.3
6	11.6
8	16.5
10	23.6
12	33.4
14	47.3
16	66.2
18	90.6

EXHIBIT 3

to be received, or paid in the future, or how much you have to invest today to get \$1,000 in one, two, or any number of years hence. To the individual who puts money in a savings account the present value of \$1,000 a year hence will be \$953.81 ( $\$1,000 \times 1/1.05$ ) because \$953.81 put in his savings account today will become \$1,000 a year later. Present value factors (P.V.F.) are generally expressed as follows:

$$P.V.F. = 1/(1 + r)^n$$

n: Year(s) hence  
r: Discount rate

fifteen years, it may be quite valuable. If, on the other hand, it is obsolete at that time, it may have only scrap value.

**Discounting cash flows**

There is an additional factor to be taken into consideration, however, before our basic analysis is complete. This is the discount rate applicable to the cash flows shown in Column 7 of Exhibit 1 and Column 3 of Exhibit 2 to convert them to present values.

It is generally recognized that \$1,000 today has a value different from that of the right to receive \$1,000 a year hence. The extent of the difference in value will depend on the different opportunities a person or company has to utilize available money. To a person who always puts his extra money in a savings account (at, say, 5 per cent interest a year), \$1,000 cash today probably has the same value as the right to receive \$1,050 a year later and \$1,102.50 ( $\$1,050 \times 1.05$ ) two years later. On the other hand, a businessman who has the opportunity to invest the money with a 20 per cent return per year may be indifferent to whether he gets \$1,000 cash today or \$1,200 a year hence. Discount rates for the two persons should be 5 per cent and 20 per cent, respectively.

The present value factors to be used in the following calculations represent the present value of \$1

Logically, the present value concept should be applied to our analysis. All cash flows should be converted to their present values so as to be really comparable. Although some might prefer a discount rate reflecting the cost of capital, in this case, I believe, the available investment opportunity to utilize the funds freed as the result of leasing is the most realistic and practical basis for determining the discount rate.

The final columns of Exhibits 1 and 2 show the discounted cash flows under the equipment trust and lease financing alternatives, respectively. They were determined by applying a P.V.F. of 10 per cent, assuming that all cash flows occur at the end of each year. The new breakeven residual worth ratio, R (after discounting), is calculated as follows:

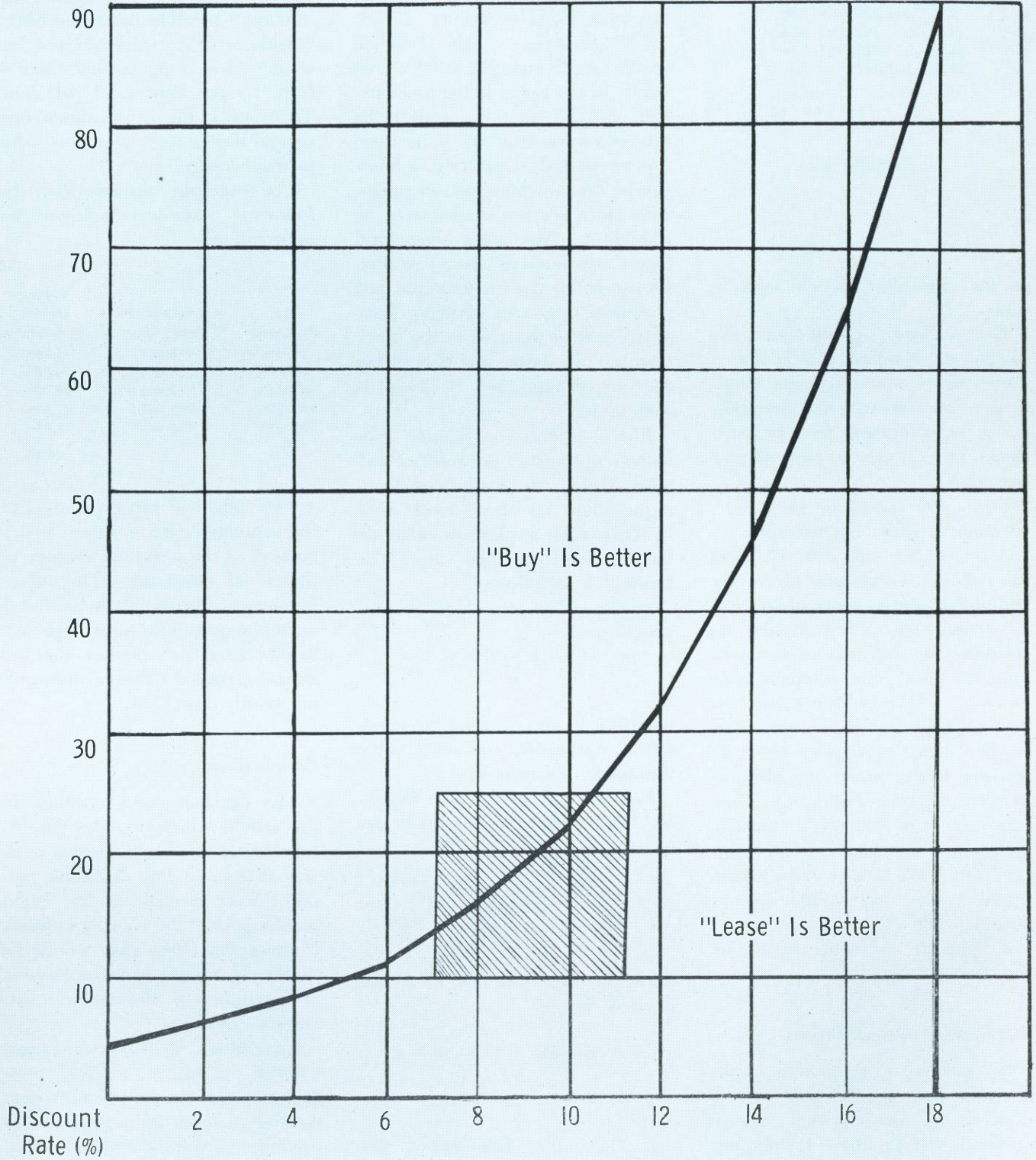
Present value of total equipment trust cash outflow	Present value of residual worth of equipment
\$477,730	-
[0.239 × (1,000,000 R)]	
Present value of total lease cash outflow	
= \$421,301	
R = 0.236 (23.6%)	

The fifteenth-year P.V.F. (0.239) is applied to the residual worth because it is equivalent to a cash inflow at the end of the fifteenth year. When discounted at 10 per cent, the breakeven residual worth ratio is nearly five times as large

**Logically, the present value concept should be applied to our analysis. All cash flows should be converted to their present values so as to be really comparable.**



RESIDUAL  
WORTH  
RATIO  
(%)



"LEASE OR BUY" DECISION CURVE

EXHIBIT 4

STATISTICAL EXPECTED VALUE OF ESTIMATED RATE OF RETURN CALCULATION		
4.0%	×	.0625 = 0.25%
7.5	×	.2500 = 1.88
12.5	×	.5000 = 6.25
17.5	×	.1250 = 2.19
22.5	×	.0625 = 1.41
		11.98%

EXHIBIT 5

as the equivalent pre-discounting ratio.

Exhibit 3 on page 40 shows the breakeven residual worth ratios under various discount rates. From these calculations the decision curve for equipment trust or lease shown in Exhibit 4 on page 41 was developed.

From the curve, decisions can be made quickly. For example:

Assume that you estimate that the residual worth ratio of certain equipment fifteen years hence will be 40 per cent of the original investment. In that case, unless you estimate that your company can reinvest available funds at an average after-tax rate of more than 13 per cent, equipment trust financing is the preferable alternative. On the other hand, if you are sure that your company's reinvestment rate will be no less than 9 per cent after tax, you can establish a policy that all equipment expected to have a residual value of less than 20 per cent should be leased.

**Estimating probabilities**

It is difficult to estimate a specific value for the residual worth ratio or for the discount. Three probability estimation techniques are suggested for estimating these uncertain determinants under the appropriate circumstances.

**Block technique**—The block technique consists of picking the ranges within which the residual worth and the rate of return are likely to fall. Statistically speak-

ing, this implies that the same probabilities to all points in the range. It is appropriate when it is not known at which points within the range the actual values are most likely to occur.

For example, if the residual worth ratio is thought to fall somewhere in the range between 10 per cent and 25 per cent and if the rate of return after tax is between 7 per cent and 11 per cent, a block can be drawn where the two ranges coincide. (See the shaded area on Exhibit 4.) The areas above and below the decision curve can then be compared. In the example just presented, the area favoring lease is larger than the area in the block favoring buy, indicating that within the ranges specified a lease is preferable.

**PERT technique**—If three estimates (optimistic, pessimistic, and most likely) are made, the technique that is often used with PERT can be applied to calculate the statistical expected value. The formula is as follows:

$$\text{Expected value} = \frac{(A \times 2) + (B \times 2) + (C \times 4)}{8}$$

where A, B, and C equal the pessimistic, optimistic, and most likely estimates, respectively.

For example, assume the following three estimates of rate of return:

- A = 7%
- B = 18%
- C = 10%

Then the expected rate of return is equal to

$$\frac{(7 \times 2) + (18 \times 2) + (10 \times 4)}{8}$$

or 11.25 per cent.

If the same calculations are made for the residual worth ratio, it is easy to determine whether the intersection of the two statistical expected values is above or below the curve.

**Statistical expected value technique**—Those interested in further elaboration of the estimating proc-

ess may prefer the statistical expected value technique. To estimate an average rate of return on investment, determine for the next fifteen years the maximum and minimum possible rates—the range outside which you would not bet at any odds. Suppose this range is from 25 per cent to 3 per cent. Then break the range down into several blocks and assign your odds for each range.

For example, assume that the following odds were selected for each range:

Rate range	Your odds for each range	Odds in terms of probabilities
3%-5%	16 to 1	6.25%
5%-10%	4 to 1	25.00%
10%-15%	2 to 1	50.00%
15%-20%	8 to 1	12.50%
20%-25%	16 to 1	6.25%
		100.0%

The statistical expected value of the estimated rate of return is calculated as the weighted average of individual estimates. (The calculations are illustrated in Exhibit 5 on this page). The same approach can be used to calculate the statistical expected value of the residual worth ratio.

**Conclusion**

The decision curve outlined in this article, which provides graphic representation of a breakeven analysis of lease or buy decisions, permits decision making by "sight scanning." For the visually minded, it saves the effort that would be required to carry out the arithmetic of a number of alternative calculations.

In addition, it relieves management of the tasks of explicitly stating an assumed rate of return that will be available on capital and of predicting a specific residual worth. Thus, the decision maker can deal in parameters.

This technique could be adapted by any company for any lease or buy decision—either for a decision on specific equipment or for development of a general lease or buy policy.

*The accounting function can improve the marketing function greatly—if past misunderstandings and poor communications can be overcome. This article suggests some specific areas where closer coordination can benefit the company profit picture—*

## ACCOUNTING'S ROLE IN MARKETING

*by John W. Barry*  
*John W. Barry & Associates*

**F**OR THE management seeking to enhance corporate profitability, marketing is one of the undeveloped frontiers. Marketing as a function should have its own productivity and profitability standards, and an alert accounting staff can play a major part in developing them. However, it takes some special understanding on the part of financial executives to function effectively in this role.

As is well known, the marketing function has been undergoing major changes during the last decade

or so. These changes are symbolized by the new name—this function used to be called sales—and by the growing adoption of the so-called marketing concept.

### *Three aspects of marketing*

In its fullest sense the marketing concept has three aspects: (1) customer orientation, that is, study of customer needs and wants before the selling process (if possible, before the manufacturing process) begins; (2) an organizational struc-

ture in which all marketing activities are performed by the marketing department and in which the chief marketing executive is accorded a status equal to that of the top financial or manufacturing executive; and (3) emphasis on improving the profitability and productivity of marketing operations.

As a number of studies have shown, the marketing concept has been adopted to a large extent by both large and medium-size manufacturing companies—but not nec-





A major function of the marketing concept is customer orientation—determining what the potential customer wants before selling begins.

essarily to the same extent in all its aspects. Most generally accepted are the first two aspects, customer orientation and high status for the top marketing executive. Attention to the third aspect has lagged.

One recent study<sup>1</sup> showed that while virtually all the companies surveyed measured product profitability, only two-thirds measured territory profitability and only a little more than half assessed customer or salesman profitability.

### Barriers

This points up obvious opportunities for the accounting function. The accountant should proceed with the utmost caution, however, for there are long-standing differences between the two areas. Their relationship is traditionally characterized by lack of mutual understanding and indifferent (if not downright poor) communications.

All too often accountants regard

the marketing function as mostly selling, and the marketing men have an image of the accountant as “just a scorekeeper.” Sometimes the accountant deserves that label.

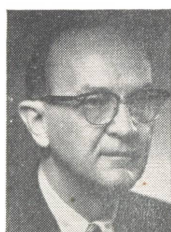
Consider the approach taken by a beverage company a few years ago. An analysis of sales costs showed that the cost of maintaining old sales volume (selling to established customers) was 4 per cent of that sales volume while the cost of getting new volume (obtaining new customers) was 50 per cent of that volume. When these findings were noised around, the company decided to abandon seeking new business. In a short time it

went broke. Can't you hear the sales-oriented people saying, “I could have told you so?”

The attitude of sales executives was epitomized in a recent speech by the sales vice president of National Cash Register Company. He said, in essence, “I don't know any better way to ruin a good sales organization than to start emphasizing profits. First thing you know, more attention is put on cost-cutting than on business-getting, and when creativity is diverted this way, the business suffers.”

### Bridge-building

Actually, of course, it is possible to put creativity into both business-getting and cost control. (Please note that we are interested in cost control, not necessarily cost-cutting.) Before a financial executive attempts to establish new cost control concepts in marketing, however, he should build a bridge—perhaps a new bridge—between the finance and marketing functions. The best way to build such a bridge is by undertaking to help the marketing people do a better job in the same terms as those in



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<sup>1</sup> Michael Schiff and Martin Mellman, *Financial Management of the Marketing Function*, Financial Executives Research Foundation, New York, 1962.

which they themselves conceive of their job.

**Training sales force**

One good approach to this problem is through sales training. The accountant's first reaction to this suggestion may well be, "What do I know about sales training?" But a financial man who participates in any way in final purchase decisions may know a good deal and be in a position to make a significant contribution.

Here is an example cited by Dr. Michael Schiff:<sup>2</sup>

A corporation had a large force of industrial sales engineers who were thoroughly familiar with the technical capabilities and applications of their products. However, the buyers' final decisions were made more in financial terms than in terms of technical capabilities.

Dr. Schiff worked with these sales engineers to help them develop understanding of the funda-

mental concepts of capital asset acquisition decisions. He taught them how to make a total presentation covering both the technical features and the financial considerations—the investment returns on a payback and discounted flow basis. Thus, the prospective customer got a total business analysis of the advantages of the acquisition, thorough enough to use in raising the funds to finance it.

**Bridges created**

All this was not done easily. The salesmen had to learn to understand depreciation, cash flow, investment, the tax aspects of various depreciation methods, and the like. In some cases Dr. Schiff has made a financial man a permanent part of the sales team to help in this kind of work. Giving help in sales training has paid off in more than increased sales; in these companies real bridges—carrying profitable two-way traffic—exist between accounting and marketing.

Another bridge-building device is to have a member of the controller's staff in the marketing department who has line responsibility to the marketing manager but a close working relationship with the controller. Such arrangements are not uncommon in manufacturing departments; they are less frequently used in marketing.

There are many ways to build

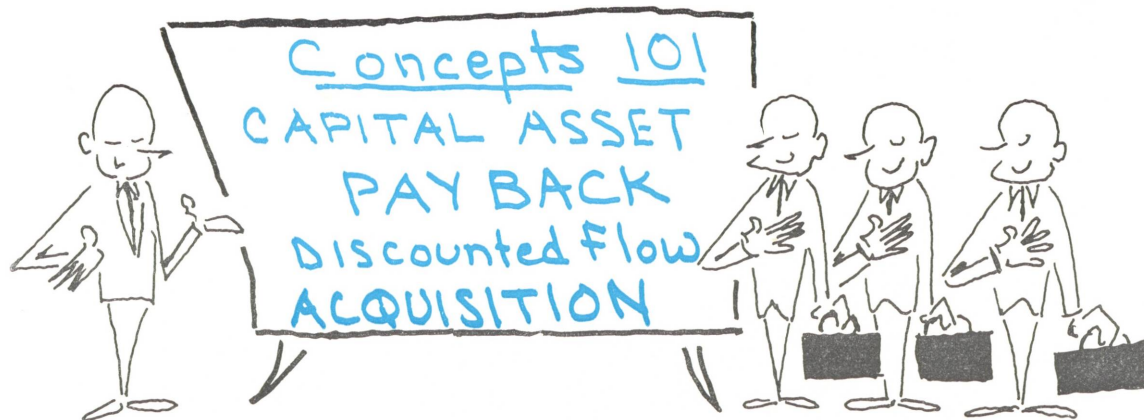
closer, more productive relationships between accounting and marketing. The important thing is to make a beginning. Before trying to sell most kinds of profitability ideas, the financial man would be wise to see whether he can first make a contribution to marketing effectiveness in the marketing manager's own terms (and the sales training approach is as good as any). His counsel on profit planning, controls, and reports will be both more knowledgeable and more welcome if he first makes this effort—and makes it successfully.

What are some of these profit-enhancing ways accountancy can contribute to marketing profitability? A number of them are suggested by the profit-analyzing deficiencies mentioned earlier: distributor profitability, marketing channel profitability, salesman profitability, customer profitability, and the like.

**Territorial profitability analysis**

One of the most constructive—if it is undertaken in conjunction with the market research department and the traffic department—is to prepare territorial profit and loss statements. This is an old but an under-utilized technique. It involves setting down all the sales costs and profit factors applicable to each sales territory, including advertising, transportation costs,

<sup>2</sup> Dr. Michael Schiff, chairman of the accounting department at New York University, and his brother Jack, professor of marketing at Pace College, have done more to build bridges between the accounting and marketing functions than anyone else. Many useful suggestions can be found in the book cited earlier and in Dr. Michael Schiff's "The Sales Territory as a Fixed Asset," *Journal of Marketing*, October, 1960.



Sales engineers were given an accounting orientation, allowing them to make a total presentation covering financial considerations as well as technical features.



territory's market potential.

Every marketing man knows that some sales territories make money and some break even. He knows that still others contribute needed volume or represent investments for the future. He probably has a rough idea of what actions he wants in given areas and which areas he wants to leave alone.

However, a rough idea isn't enough. Too many marketing executives make decisions by reflex, relying solely on rule-of-thumb judgments. Those who don't analyze each of their territories from time to time are overlooking a sound device for improving the profitability of their operations. They are also overlooking a key way to win support for their decisions from above and from below.



Investigation and analysis of actual market potential in each geographic area will often result in redistricting and remanning of sales areas.

#### **How to do it**

To analyze profit and loss by territory, set down all the sales costs and profit factors applicable to each territory, together with data on each territory's market potential. (The last-named is often left out, although it enters heavily into the marketing manager's thinking. However, his peers and subordinates may suspect him of making decisions in a vacuum if he does not show it.)

For each territory, list the following elements down the lefthand side of a sheet: sales potential, current sales, production cost of product(s), transportation costs, direct selling costs, indirect selling costs, and local factors (such as nearness to competitor's plant, local competition, sales or inventory taxes). Then, to the right of that column, enter the figure that shows how things stand right now. To the right of the second column, list the targeted objectives for each of the elements (with the dates on which you expect to hit the target). In the final righthand column, list the actions you think necessary to achieve your immediate objectives in each area.

analysis will require the combined efforts of the market research department, the traffic manager, and the sales accounting people. This is, in fact, one of its chief benefits. When each of these people sees how the information he provides leads to a marketing decision, he is much more likely to support that decision. The traditional battle lines that tend to separate these functions will melt away.

This kind of analysis clearly points up whether the marketing manager should increase or decrease the sales effort and sales expense dollars entrusted to him—and what the stakes are and the returns should be in each case. Properly done, it differs little from the Schiff principle of treating each sales territory as a fixed asset. The accountant, the marketing manager, and the market research man who collaborate on this kind of an analysis usually complete it with enormously increased respect for one another.

#### **Examples**

One decision made as the result of such an analysis concerned a Midwestern state. Its sales potential for the company making the analysis was high, and so was the expense for national advertising, which was, of course, allocated on the basis of circulation. Personal sales efforts were only nominal, however. As a result, sales were quite low, and the territory showed a loss. When these facts were exposed, the decision was to hire enough salesmen for this Midwestern market to achieve at least a breakeven level of sales.

A territorial analysis, of course, needs to be done only once every few years. In general, it should be performed only when there are fresh and informative data available on market potentials.

Here is a case in which territorial profitability analysis helped turn a company around to better profitability:

A company made electrical prod-



Long production runs may keep manufacturing costs down. But they can also result in losses through large inventories of slow-moving goods.

ucts for industry. Its annual sales were slightly over \$25 million, but it carried a heavy debt load, and profit margins were uncomfortably narrow. The chief marketing executive, a relative newcomer, decided his area needed the most attention. He began probing for soft spots.

Years before, when the company was founded, there was little money for hiring salesmen. Accordingly, management had hired independent agents, offering them a commission rate high enough to ensure their interest in pioneering the company's products. A few years later, in certain sparsely populated areas where no agent could be induced to take the line on a commission basis, direct salesmen were hired.

#### **Commissions unrealistic**

Since this choice of marketing channels had been largely fortuitous, the marketing executive's first step was to analyze territorial potentials and sales costs. His analysis confirmed many previous suspicions, uncovered a few surprises, and, most important of all, justified certain necessary steps.

Some samples from the chart he worked up are shown in the exhibit on page 48.

The original commission rates may have been low for new products, but they had become unrealistically high now that the

products no longer required much pioneering. Territory No. 14 (covered by a direct salesman) probably represented the ideal situation: The 40 per cent market penetration was considered as high as was realistic to shoot for, and the 4 per cent cost seemed to be the lowest that was consistent with good coverage of the market.

The actions taken were all orthodox as well as humane. The agents in Territories No. 1 and No. 16 (as well as some other agents in territories showing similar figures) were given realistic sales volume and expense quotas. Eventually, both became direct factory branches, retaining the best of the old personnel.

The salesman in Territory No. 14, with 40 per cent market penetration and a 4 per cent sales cost, was given a substantial bonus. The salesman in sparsely populated Territory No. 18 was encouraged to become an independent agent and was given a sub-office in another part of his territory to supervise. The marketing vice president helped him obtain two good product lines from noncompeting companies to sell. The commission rate was dropped slightly. Territory No. 18 probably still remained unprofitable to the company, but management decided not to risk having a marketing vacuum near an adjoining high-potential market area.

As a result of building up the

kind of sales force required to meet the company's current market needs, sales rose 30 per cent over the next two years, and profits increased by 50 per cent. During the same period creditors began to give the company better interest rates on the money they had loaned. The turnaround was completed within 30 months.

#### **Physical distribution**

Similar analysis—with similar results—can be made of the profitability of individual salesmen, of products, and of such special factors as various aspects of physical distribution. Here is another case in which accounting collaborated in a marketing turnaround—in this case as a result of a physical distribution system analysis.

This company produced some 7,000 items, about half of which were industrial supplies. The industrial supplies division had yearly sales of about \$8 million, nearly all through a chain of company-owned branch warehouses.

With such a wide product line, management had emphasized long production runs to keep manufacturing costs down. This seemingly laudable policy had, unfortunately, put the company in a loss position. Large inventories of slow-selling goods had accumulated. Out-of-stock situations arose frequently. Deliveries of bread-and-butter products were slow, and



TERRITORIAL ANALYSIS					
Territory	Total annual industry potential	Annual company sales	Percentage of penetration	Field sales cost	
				\$	%
No. 1 Agent	\$20,000,000	\$1,000,000	5%	\$130,000	13%
No. 16 Agent	5,000,000	1,000,000	20%	130,000	13
No. 14 Direct Salesman	1,000,000	400,000	40%	16,000	4
No. 18 Direct Salesman (sparsely populated)	200,000	120,000	60%	18,000	15

*Annual cost of owning the excessive, poorly balanced finished goods inventories equalled gross profit margins on some product groups and exceeded them on others.*

customers were going elsewhere to get them. Coordination between manufacturing and sales was non-existent. Salesmen were getting too little of the right goods to sell and too much merchandise they couldn't move.

The marketing vice president decided to act. Since his top management had always stressed cost analysis in evaluating new moves, he decided to do likewise.

1. With the controller, he developed accurate data on the cost of owning finished goods inventories, product group by product group. Not surprisingly, it averaged about 25 per cent of value per year.

2. He developed careful estimates of the amount of business lost by the branches because of lack of the merchandise on order from the plants. He supplemented this by internal studies showing the cost of handling back orders.

3. Finally, with the help of his branch managers, the marketing vice president conservatively estimated the business lost the past year because customers had shifted their business elsewhere and because salesmen had dissuaded some of them from ordering chronically out-of-stock items.

When all his figures were ready, he sent the president a short, well documented report. It showed, almost incontestably, that:

1. The annual cost of owning the excessive, poorly balanced finished goods inventories—both in factory warehouses and in branches, both those ordered and those shipped unordered—equalled gross profit margins on some product groups and exceeded them on others.

2. The branches were incurring excessive costs because of heavy ill balanced inventories, lost business, and back orders, and these excess costs approximated the difference between budgeted sales costs and actual sales costs.

The second part of the marketing executive's memo outlined his proposed and already partially tested remedial program. Over the next few months, all its major elements were put into effect, as follows:

1. The company plants agreed to abandon the practice of shipping unordered goods to the branches.

2. Based on sales forecasts, minimum and maximum stock levels and standard order quantities were established for all the products carried by the branches.

3. Numerous changes were made in the procedures for handling branch stock orders on the plants. Orders were still placed monthly, but they were staggered throughout the month. Orders from the most distant branches were scheduled for placement early in the

month, while those for nearby branches were scheduled for later in the month. As a result, plant shipping rooms began to complete the filling of branch stock orders within 48 hours of receipt instead of the three or four weeks that had prevailed before. This improvement was made possible largely by a steady, uniform flow of work in the plant shipping rooms and by the use of new stock replenishment order forms matching factory warehouse layouts, which reduced order picking time.

The marketing executive's system was not intended to be a sophisticated one initially, and many refinements, such as improving sales forecasting techniques and setting up each branch as a profit center, were left to be added later. Even so, the results achieved within about eight months from the time the marketing vice president started his studies were dramatic:

- Sales increased 18 per cent, as a result of better merchandise availability.
- Finished goods inventories were cut nearly 60 per cent and their annual carrying costs were reduced by some \$200,000.
- The number of out-of-stock and back-ordered items was reduced substantially, enabling the branches to regain some previously disaffected customers.

The longer-term improvements were also gratifying. Production management, having had its attention called rather forcibly to the importance of total costs rather than just manufacturing costs, initiated a major effort to improve one of the root causes of the problem: its production scheduling.

### *Broad-based study*

Here is an example of an analytical study that covered various aspects of the marketing function:

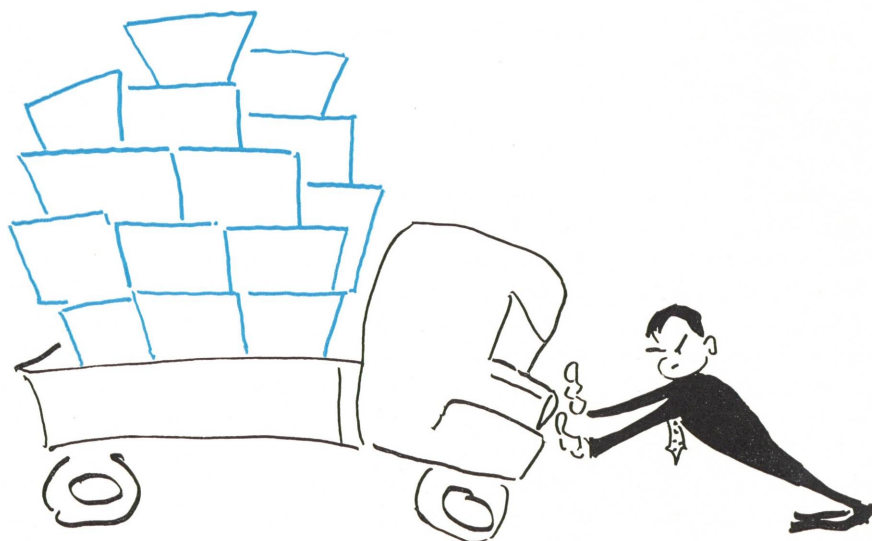
A company made power generation specialties sold to public utilities, private power generation facilities, and certain process industries. It was a long-established firm, and its products enjoyed an exceptional reputation for quality. However, profits were low. For years annual sales had remained at a relatively static level of about \$8 million. There was little awareness of a marketing problem at all until the company hired a brilliant young industrial engineer, who improved production scheduling so substantially that considerable excess productive capacity was disclosed. Management became disturbed about the idle facilities and manpower, and the company's marketing manager decided to find out just what was wrong.

It was generally known that the

key individuals specifying the purchase of power generation specialties in customer organizations were the piping draftsmen and designers. However, the marketing executive found that neither he nor his salesmen were as familiar as they should have been with the details of the selection and decision making processes that took place in the drafting rooms.

Investigation showed that these decision makers in the drafting rooms considered the company's catalogs inconvenient to use and often not complete. They had not been modernized in some years. The first step, therefore, was to obtain an appropriation to get the catalogs up to date and complete.

The chief engineer was given this assignment, heading a task force that included one of the younger home-office sales executives who had had recent, intensive drafting room experience. Three chief draftsmen in the employ of friendly nearby customers were persuaded to serve as an informal advisory committee. One of them was a man with unusually inventive ideas on how to make both the selection and the drafting procedures easy and foolproof. They served with the approval of their employers and were compensated for their time. The catalog that finally evolved—in record



Finally, as part of a remedial program, the company plants agreed to abandon shipment of unordered goods to the branches.



\* The first step, therefore, was to make the catalog up to date and complete.

time—was clear, complete, and attractive; contained numerous innovations; and is now widely regarded in the industry as a model of ease and convenience.

Sales potentials were estimated—the company had not undertaken forecasting in any serious manner before—and the company's sales results were compared with them. This led to the discontinuance of certain manufacturers' representatives who had obviously been lethargic in their activities on the company's behalf, the opening of two new company sales offices in new market areas, and considerable redeployment of sales manpower to accord better with the opportunities for sales. In addition, several house accounts were assigned to the field sales organization to assure more effective coverage.

These moves to improve coverage of the market created opportunities to promote several salesmen. This also helped to stimulate morale.

Two other changes were made that improved the field sales organization. The first involved training; the second, compensation. With the assistance of the most successful company salesmen, the marketing department prepared instructional material to guide the sales office managers in showing their men how to explain the use of the new catalog. This new material also showed how the salesmen could be more helpful to the men in the customers' and prospects'

companies who were responsible for specifying the choice of power generation specialties. The importance of continuing to cover purchasing executives was also stressed, of course. In revamping the compensation setup, a simple sales incentive plan was installed to replace the previous salary-only policy. It provided a commission on sales over quotas agreed to by the marketing manager and the individual men.

Some of these actions paid off quickly, but most required a few months to show results. The significant achievements were these: a sales increase of 20 per cent; an increase in pretax profits that was more than commensurate with the sales increase, since the increased volume was produced on existing, already depreciated facilities; and full use of the company's previously idle manpower and machinery.

#### Other areas

There are many other ways in which accountancy can help marketing, outside the obvious areas of budgeting and forecasting:

Analyses showing profitability at varying sales volumes

Class of trade profitability

Product-group profitability for product managers (making certain to distinguish between those costs they can control and those they can't)

Analyses for special sales managers. (Nearly every business has

some of these—national accounts manager, government sales manager, etc.)

The accountant can be very useful in helping the marketing executive determine—and not in too theoretical terms—the most profitable product mix. He also can cost out practical alternatives the marketing manager should consider, different channels of distribution, for example. This sort of analysis is probably done best when the controller has his own man in the marketing department.

Typically, the marketing department is one in which many essentials are nebulously defined. Authority is usually clearly delegated, but responsibility for profit is seldom clear-cut; often the marketing man has little more than profit awareness to go on.

Even more than other departments, marketing tends to be deluged with reports it cannot utilize. Accounting should try to cut down the number of these and devise ways to make those that survive more actionable.

Marketing has, in the main, paid relatively little attention to the profitability and productivity of its own operations. There are enormously fruitful opportunities for the accounting and controllership functions to contribute to improvement in this area. But, to be listened to, to hope for action, be sure you first have a good understanding of your company's marketing activity. An approach modeled after techniques used in manufacturing will almost certainly get you into hot water.

If you can possibly find the opportunity to do so, first see if you cannot make the marketing function more effective in its own terms—this usually means getting more business—by cranking some basic understanding of customer and prospects accounting into your salesmen's thinking and into their sales presentations. This effort can be rewarding not only for its own sake but also for the doors it will open to let you help make the marketing function more profitable.

*Uncertainty—unlike risk—is commonly assumed to be entirely unrelated to probabilities. Yet with the proper techniques and the judgment of mature executives a range of probabilities can be established based on subjective opinions—*

## LESSENING THE DANGERS OF UNCERTAINTY

*by Leon W. Woodfield  
Brigham Young University*

A DECISION to invest is concerned with a choice among the available alternatives and is always subject to unknown elements concerning the future. The lack of complete data, however, should not limit the attempt to forecast and to use the forecast as a guide for action.

The reliability of the estimates will, in part, depend upon whether the individual is faced with a *risk* or an *uncertainty* situation. Dr. Shewhart wrote the following: "What can we say about the future behavior of a phenomenon acting under the influence of unknown or chance causes? I doubt that, in general, we can say anything. For example, let me ask, 'What will

be the price of your favorite stock thirty years from today?' Are you willing to gamble much on your powers of prediction in such a case? Probably not. However, if I ask, 'Suppose you were to toss a penny one hundred times, thirty years from today, what proportion of heads would you expect to find?' Your willingness to gamble on your powers of prediction would be of an entirely different order than in the previous case."<sup>1</sup>

As this statement indicates, certain decision areas may be treated

by the mathematics of probability. In these areas the chance or probability of occurrence of a certain event can be measured objectively. The knowledge of the future event is imperfect. However, because of the existence of objective verifiable data the probabilities of the alternatives can be determined. This kind of circumstance should be referred to as risk. Some examples of risk taking are playing blackjack for money and buying insurance (preferring a small expense to a small chance of a large loss).

When the knowledge of the outcome of future events is imperfect and the probability of the event cannot be objectively determined, the area of ignorance should be re-

<sup>1</sup> W. A. Shewhart, *Economic Control of Quality of Manufactured Product*, D. Van Nostrand Company, Inc., Princeton, New Jersey, 1931, p. 8.



ferred to the decision making process.”<sup>3</sup> The decision to invest in an asset involves the future since by its nature the asset to have value must benefit future periods of time. The importance of skilled decision making in the area of capital budgeting is adequately demonstrated by referring to the successes and failures of business organizations as reported periodically in financial reports, magazines, and newspapers.

There are numerous methods that can be used in estimating the worthiness of capital expenditures. These include, among others, the payback method, which will indicate the length of time required to recover the initial investment; the accounting average rate of return, which indicates an estimate of a rate of return based on the cost of the asset; and discounted cash flow methods.

Of all the methods currently in use the discounted cash flow methods appear to have the best theoretical justification. Assuming that the data are accurate, these methods can indicate the excess of the present value of a stream of future benefits over the cost or can give the rate of return that is to be expected from the investment. The information required is by its nature subject to uncertainty; however, a condition of certainty is assumed or at least implied in the very fact of using these methods.

Even though current methods in use assume that estimates of the future are correct, the existence of uncertainty is recognized implicitly and is adjusted for in various ways—by modification of the desired rate of return, by assignment of differential handicaps, by application of informal judgments, by selection of arbitrary payback periods, and by sensitivity analysis (analysis of the effect that a given percentage change in each cost, price, and sales factor would have

investment of a project). These methods of adjustment are deficient in that they do not provide an estimate of the likelihood of obtaining a particular value. As Harry V. Roberts has noted, “The most serious deficiency in the present state of knowledge about capital budgeting is the absence of a satisfactory framework for incorporating uncertainty into the analysis. Much of the ultimate success or failure of analytical methods of capital budgeting will hinge on future developments in the treatment of uncertainty.”<sup>4</sup>

### Use of subjective data

Whenever a person is involved in uncertainty, he is dealing with a subjective phenomenon since there are not sufficient historical data upon which a mathematical probability can be based. Subjective probabilities can be determined; however, the expectations cannot be established with objective certainty.<sup>5</sup>

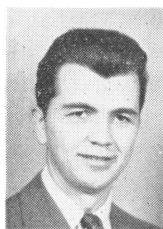
“Subjective probability technique” is a means by which an individual quantifies his attitudes toward the investment opportunity. John H. Norton has noted that subjective probabilities could be determined by asking the person directly to express his judgments as to the chance of an event’s occurring.<sup>6</sup> A second method has been suggested by Robert Schlaifer: An individual is offered the choice between an uncertain event and a reference event (standard lottery)

<sup>4</sup> Harry V. Roberts, “Current Problems in the Economics of Capital Budgeting,” *Elements of Financial Administration*, ed. John O’Donnell and Milton S. Goldberg, Charles E. Merrill Books, Inc., Columbus, Ohio, 1962, pp. 278-84.

<sup>5</sup> Milton H. Spencer and Louis Siegelman, *Managerial Economics—Decision Making and Forward Planning*, Richard D. Irwin, Inc., Homewood, Illinois, 1964, p. 8.

<sup>6</sup> John H. Norton, “The Role of Subjective Probability in Evaluating New Products Ventures,” *Symposium Series 42 “Statistics and Numerical Methods in Chemical Engineering,”* vol. 59, American Institute of Chemical Engineers, New York, 1963, pp. 49-54.

<sup>2</sup> For a discussion of alternative approaches to the theory of choice, refer to Kenneth J. Arrow, “Alternative Approaches to the Theory of Choice in Risk Taking Situations,” *Econometrica*, vol. 19, no. 4, October, 1951, pp. 404-37.



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<sup>3</sup> Joel Dean, *Managerial Economics*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1951, tenth printing 1960, p. 568.

having an equal reward. The point at which the individual is indifferent to the choice between the uncertain event and a given percentage of the total lottery tickets is his probability estimate for the uncertain event.<sup>7</sup>

Methods used to obtain the subjective probability may be successful in quantifying the person's estimate in the problem; however, they do not add to the validity of the judgments that are required. The possibility of poor estimates on the part of the individual points up the need to obtain the judgment of mature persons having experience in related situations. Even though subjective probabilities are judgments that cannot be objectively verified, it has been demonstrated experimentally that subjective probabilities can be amazingly accurate (the estimates made reflect the actual conditions known to exist in the experiment) when opinions of mature persons are sought.<sup>8</sup>

The problem of uncertainty should be recognized in capital budgeting projects undertaken for study. The subjective estimates should be made explicitly. Since uncertainty is a factor that must be adjusted for, the estimates required will be made. It is better and safer if they are made in an explicit form.

When the model (for capital budgeting decisions) described in this article was applied to situations in business organizations, uncertainty was considered in an explicit form. The model used the Monte Carlo method. A range of values and subjective probabilities was obtained for each factor used in determining the internal rate of return. The data were obtained from individuals having experience and knowledge of the capital budgeting procedures being used by each company. The proposals ana-

**RANGE OF VALUES AND SUBJECTIVE PROBABILITIES  
MACHINERY PROPOSAL**

	Dollar or year	Cumulative subjective probability
I. Estimated useful life	10 years	25%
	15	65
	20	100
II. Estimated investment required	\$64,640	50%
	61,560	75
	58,480	100
III. Gross benefits years 1-3	\$29,370	34%
	26,700	67
	24,000	100
Fourth year (illustration of distribution for years 4-20)	\$31,670	11%
	31,420	23
	31,090	34
	28,800	45
	28,570	56
	28,290	67
	25,930	78
	25,760	89
25,490	100	
IV. Operating expenses	\$ 7,400	10%
	6,000	30
	5,000	100
V. Asset replacement	none	
VI. Value of asset at the end of its useful life end of tenth year	\$38,780	40%
	36,930	60
	35,080	80
	27,180	90
	25,850	95
	24,560	100
End of the fifteenth or twentieth year	none	

TABLE

lyzed were those being considered currently by the business organizations interviewed.

A computer was used to simulate the capital budgeting decisions. However, for the purposes of this article, the illustration of the application of the model will be simplified if the use of a hand calculator is assumed.

The distribution of each variable was assigned numbers ranging from 0 to 99. The size of the group of numbers assigned was dependent upon the subjective probability of the factor under consideration. For example: If there was estimated to be a 15 per cent chance that the sales would be X dollars, numbers 00-14 were as-

signed to that particular level of sales. This same procedure was duplicated for each factor having a range of values. By the use of random number tables, factors such as the level of sales, cost, and estimated useful life were obtained.

Based on this information a range of rates of return, with their likelihoods of occurrence, was determined; however, in order to obtain an estimate of a possible range of rates of return and their likelihoods of occurrence, a number of experiments (determinations of individual rates of return) had to be made. The number of trials used was limited to one hundred since a larger number of experiments did not materially affect the

<sup>7</sup> Robert Schlaifer, *Probability and Statistics for Business Decisions*, McGraw-Hill Book Co., Inc., New York, 1959, pp. 12-13.

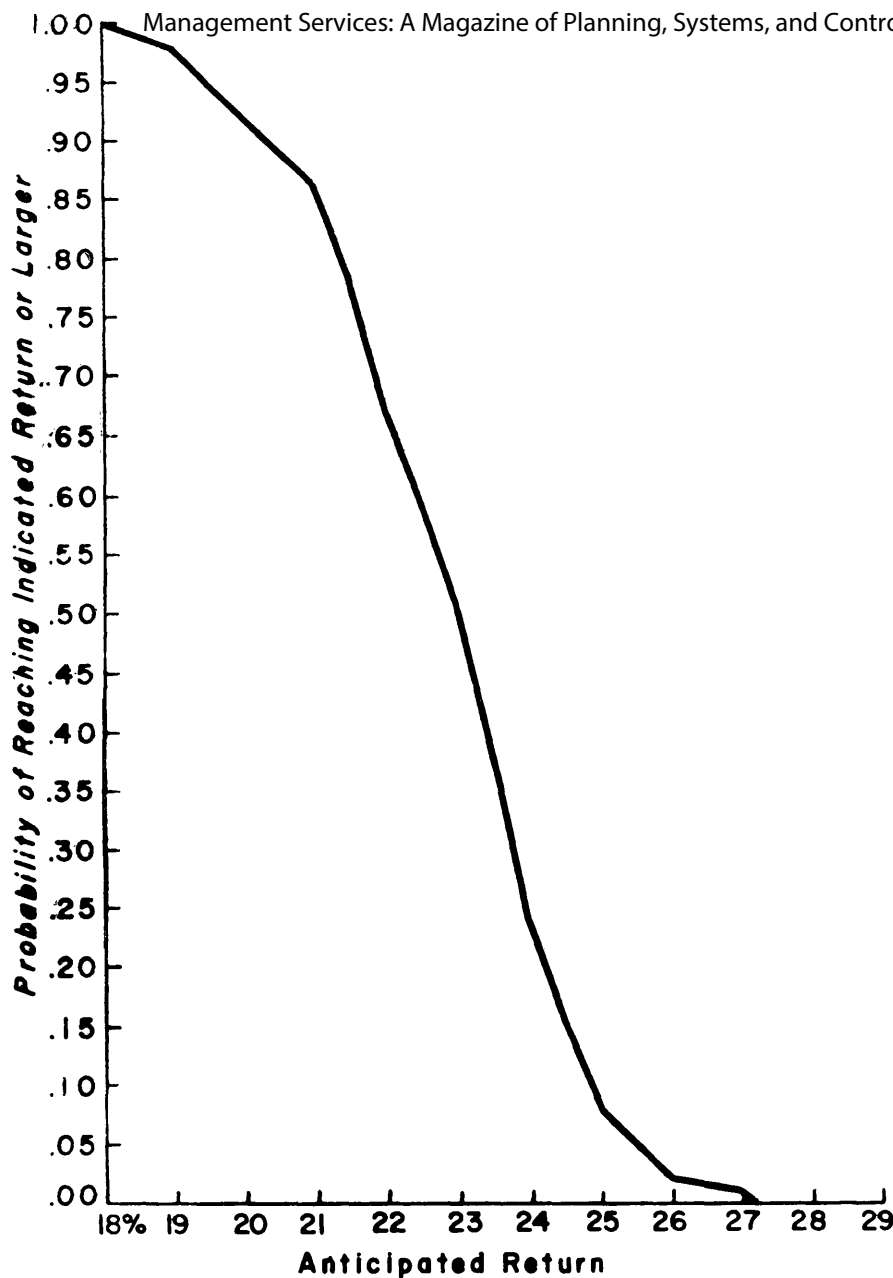
<sup>8</sup> Norton, *loc. cit.*

**Use of data**

The information obtained from the application of this model aids in the evaluation of the outcome of predicted economic events. It furnishes information that permits analysis of the effect of factors on the rate of return and of the alternative outcomes of a commitment to invest funds. The importance of duration of life, initial cost, etc., as facts bearing on the rate of return can be determined. This can be demonstrated by referring to the data obtained and summarized in Exhibit 1 and in Exhibit 2 on page 55.

Exhibit 1 is a summary of the proposal to acquire a major item of machinery. An investment of between \$58,000 and \$65,000 promised an estimated rate of return of between 18 and 27 per cent. By reviewing the information output of the model it was determined that the major factors affecting the return were the estimated useful life and the initial investment. The variations in gross benefits, operating expenses, and salvage value had only a minor effect on the results.

Exhibit 2 summarizes the proposal to invest in a new retail outlet, which would distribute existing products produced by the organization studied. The rates of return to be obtained were between 1.9 and 11.6 per cent. The variation in the future benefit was a result of all factors used in the computation of the rate of return. The major elements causing the lower rates of return were the resale value and the projected useful life. The subjective judgments for the resale value ranged between \$50,000 and \$150,000, with an equal probability being assigned to each value within the range. The estimated useful life was between five and fifteen years. A variation in the termination value (assuming all other factors were held constant) caused a change of 3 to 4 per cent



MACHINERY PROPOSAL  
EXHIBIT 1

results of the study that was made.

The analyses of two capital budgeting proposals to which the model was applied are illustrated in the exhibits. One of them was the acquisition of a major item of machinery, the other, an investment in a new retail outlet. The range of values of the proposal for the machinery acquisition is shown in the table on page 53. Items having a limiting effect upon the factors used in the model were considered in arriving at the estimates of the variables. For example, the level of plant capacity and the limita-

tions of demand were considered in determining the level of sales and expenses, and obsolescence was considered in the estimated useful life of each asset.

The data received from the application of the model consisted of the rates of return and the factors used in the computation of each rate of return. By summarizing the rates of return obtained, a range and the frequency of each were determined. A probability equal to the frequency of occurrence was then assigned to each rate of return. The probability was then

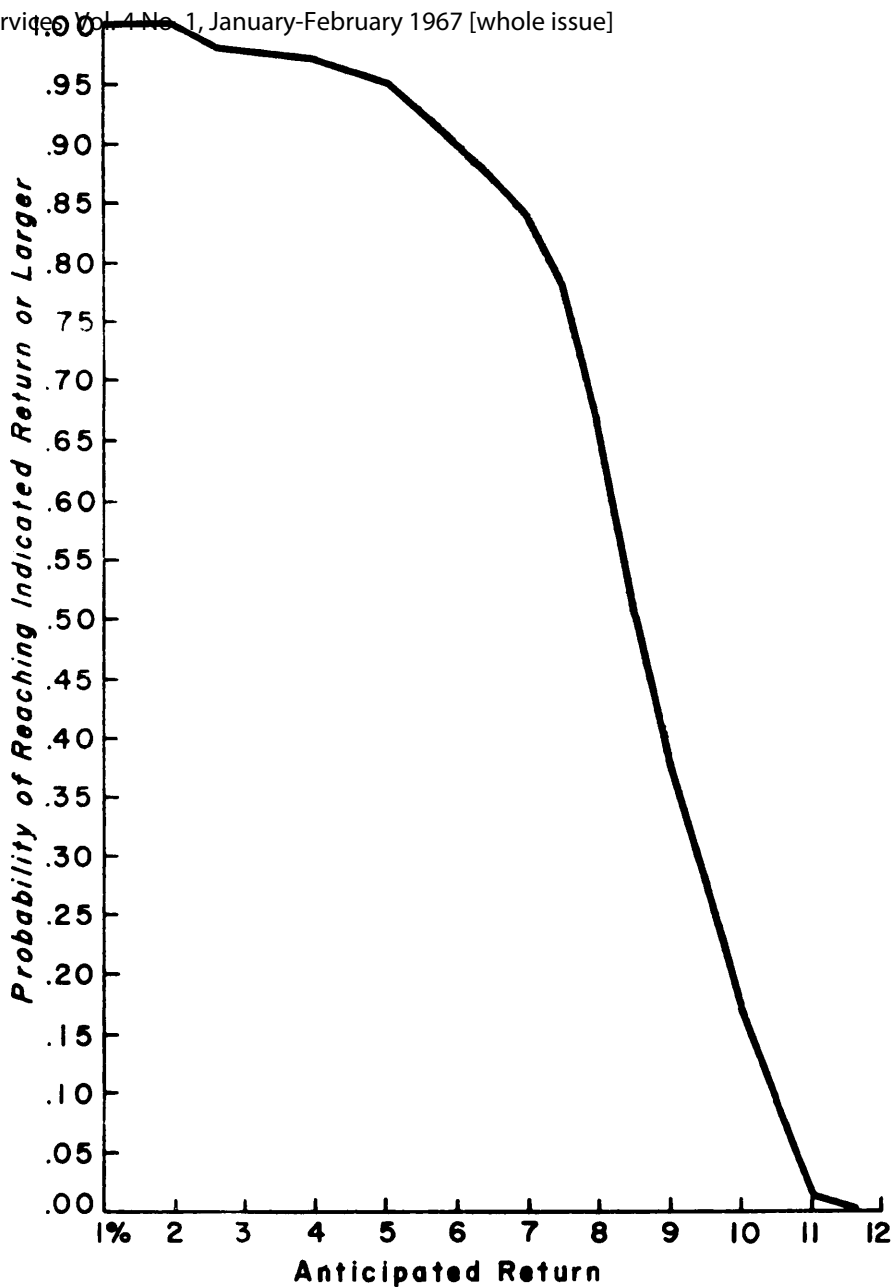
in the expected return. There was an expected variation of \$20,000 in the initial costs of the asset; however, this did not materially affect the promised return since the probability of the extreme value was small.

Probability estimates such as these are subjective in nature and are subject to human error. Because the results are no better than the original estimates, the individuals who make the estimates should be persons of experience in the areas affected by the asset proposal. The mechanical application of the model after it is once established could be handled by a clerk.

The need for reliable estimates is not a weakness of this particular model any more than it is of any tool currently being used to aid in this type of decision. To obtain reliable data from any proposed method, whether it is the payback method, accounting rate of return, or some other, requires estimates, and the results can be no better than the estimates furnished. In using this model, however, the subjective probabilities are assumed to be realistic. As was noted, studies have been made which indicate that this assumption is valid.<sup>9</sup> This problem is currently being reviewed and studied by the author.

The proposed procedure furnishes information that is not available with the more common capital budgeting methods. A single-year payback was used as the standard for acceptance of one acquisition proposal studied. The analysis, via the proposed model, not only demonstrated a payback period of one year but also showed that there was a 50 per cent probability of obtaining a return of 111 per cent. In another case a proposal that was looked upon with favor by management had only a 6 per cent probability of a positive return.

Being able to determine the range of rates of return, the prob-



RETAIL OUTLET PROPOSAL

EXHIBIT 2

ability that a given return will be realized and the factors materially affecting the profitability of the outcome aids in the evaluation of the aftermath of the predicted economic event. The availability of this data also enlarges the scope of the analysis so that it is possible to balance the relative value of the possibility of a substantial gain or loss against an alternative investment opportunity that is relatively certain.

The employment of the model encourages improvement of capital budgeting procedures being

used within the company. The incremental costs of applying the model were found to be immaterial in most cases.

There was awareness within each company interviewed that continuous effort to improve capital budgeting procedures should be a policy of management. New tools and techniques should be applied to improve both the quality of data and the management of capital budgeting. One of the most critical needs for improvement is in generating ideas for alternative uses of capital funds.

<sup>9</sup> Norton, *loc. cit.*



## what people are writing about

### BOOKS

**Controlling Overhead** by HARRY TIPPER, JR., American Management Association, New York, 123 pages, \$4 to AMA members, \$6 to nonmembers.

*This unusually sensible little book is directed primarily to top management. Its message will not be news to accountants, but it is worth repeating.*

In theory, as the author of this book points out, overhead costs should decrease, in relation to sales,

as volume increases. This has been true of manufacturing overhead and even of distribution overhead, but it has not been true of that large and amorphous category of expenses that the accountant usually classifies as general and administrative.

This problem cannot be solved, the author warns, by periodic drives to economize on telephone and travel expenses. Except for such relatively uncontrollable expenses as taxes and real estate, the bulk of general overhead expense is people.

Departments made up of specialists in law, personnel, accounting, data processing — even cost

control — spring up and expand. Unlike the manufacturing manager, who wants to keep his costs low, the staff manager always seeks expansion. The sanctity of specialization makes it difficult to even out workloads. The psychological need to staff for maximum rather than average work demands leads to chronic overstaffing. The desire to build indispensability into staff work leads to ever more elaborate procedures. And in the absence of objective criteria who is to say that these people are not really required?

The best solution, in this author's view, is a kind of internal "market-place." The total cost of any item

### REVIEW EDITORS

In order to assure comprehensive coverage of magazine articles dealing with management subjects, MANAGEMENT SERVICES 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 SERVICES. Unsigned reviews have been written by members of the magazine's staff.

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RUFUS WIXON, *University of Pennsylvania, Philadelphia*

of controllable overhead should be authorized by, and charged to, the person "consuming" that item. If a service is bought by managers, it is economically justified. However, Mr. Tipper cautions, this system will work only if the "customer" has a free choice whether to use the service and whether to buy it from internal or external sources.

Mr. Tipper goes on to outline a program for controlling overhead. Essentially, it consists of budgeting, responsibility accounting, work simplification, and continuing systems analysis.

All this is familiar enough to the experienced accountant. Seldom, however, are these basic principles as clearly and simply presented as they are in this book. For the accountant it will be a valuable refresher; for his boss, a possible eye-opener.

**Capital-Expenditure Planning and Control** by MILTON F. USRY, Bureau of Business Research, The University of Texas, Austin, 1966, 261 pages, \$3.

*This study, adapted from a doctoral dissertation, is an attempt to define "the essential requirements of a capital-expenditure planning and control program." Its most noteworthy feature, however, is a detailed description of the methods that are used by a major oil company.*

One of a series of studies in accounting by the University of Texas Bureau of Business Research, this paperback is based on intensive investigation of the capital investment planning and control system of Continental Oil Company plus a review of published theory.

Discerning the lack of "an overall approach" to capital budgeting—in academic theory if not in business practice—the author seeks to develop a "conceptual framework" for "the implementation of all of the aspects of a program." This

framework consists largely of a listing, with brief discussion, of the principal steps in the planning and control of capital expenditures. These include "three foundation components on which implementation activities should be built," namely, "awareness of company objectives and the development of strategic planning, framework structuring, and objective criteria," and nine "implementation activities": search, budgeting, request for expenditure, in-process control, follow-up, coordination, formalization, evaluation, and screening.

These steps seem somewhat obvious, hardly requiring elaborate research to identify. So do many of the author's observations about them.

But, whatever the value of the study's contribution to theory, its description of Conoco's methods is unquestionably useful. This material makes up the bulk of the report. In addition to general review of the oil company's organization structure and capital expenditure planning and control procedures, it includes four detailed case studies. Two illustrate the company's approach to routine capital expenditures (a producing well and a service station), and two describe nonroutine projects, the construction of a pipeline and refinery and the addition to the product line of a new petrochemical. All are profusely documented with company forms.

For an executive or consultant interested in how a large, successful company deals with a common problem—and who is not?—this modestly priced volume is a worthwhile investment.

**Total Systems: Characteristics and Implementation** by C. C. WENDLER, Systems and Procedures Association, Cleveland, 1966, 123 pages, \$4 to members of SPA, \$6 to nonmembers.

*This little research study is an attempt to identify the character-*

*istics of "total systems" in business and the fundamental principles of installing them.*

The author of this report, an accounting professor, has adopted a rather novel approach to defining the total systems concept—that of a popular vote. After reviewing the published literature he drew up a list of characteristics of a total system and a list of fundamental tenets underlying their implementation. These lists were submitted to a group of presumed experts for a vote on the relative importance of the items.

In addition to reporting the results of this survey, the book briefly outlines the steps that should be followed in setting up a "total" system as defined in the survey. This section of the study, based on secondary sources, is didactic in style.

The author's fundamental tenets are extremely general: "Management must understand the total systems concept. Management must understand that the impact on organization structure can be far reaching." His more specific recommendations also have an air of abstraction; they are based on reading, not experience. Indeed, the whole book has an air of having been written in a vacuum; the would-be designer of a management system will look in vain for any reference to actual progress in this field.

The definition of a total system is probably the book's chief contribution. However, since this is really a semantic rather than an operating problem, the book is likely to be more interesting to the theorist than to the practitioner.

**Effective Writing for Engineers, Managers, and Scientists** by H. J. TICHY, John Wiley & Sons, Inc., New York, 337 pages, \$5.95.

*There are many guides to writing for the amateur writer, and*

Management Services; A Magazine of Planning, Systems, and Controls, Vol. 4 [1967], No. 1, Art. 10  
*even the least of them could be useful for most businessmen and accountants to study. This one is one of the best.*  
*the knowledge of the accountant or consultant but may do a lot for the sophistication of his smaller clients.*  
his book is full of recommendations that the small businessman turn to his accountant for help.

In this age of paperwork nearly every professional man finds himself doing more writing than he ever expected—or wanted—to do. The author of this book, a professor at Hunter College, has spent many years working with these reluctant writers, and she understands their point of view.

As a result, the emphasis in this book is on the real weaknesses of most writers who write to serve their professions rather than to sell their writing—failure to think, to plan, to organize, to outline. Not until the ninth chapter does the author get down to points of grammar, diction, and style.

She is specific in attacking common errors of grammar and such misconceptions as these:

Business writing must be heavy and dull.

Every paragraph must begin and end with a topic sentence.

Never repeat a word.

Write the way you talk.

But her real contribution is positive. "When I was a neophyte consultant," the author reports, "I thought it unnecessary to tell writers to plan before writing, instead of afterwards. In fact, I used to cite Plan Ahead signs as examples of tautology. But I know better now. . . . Planning is not the second, third, or fourth step; it must be the first." This book tells how to plan, how to start, and how to revise. With it as a guide—and a lot of hard work—any professional man or executive could learn how to write effectively.

**Data Processing for the Small Business** by BYRON L. CARTER, Macfadden - Bartell Corporation, New York, 1966, 190 pages, \$.95.

*This paperback, a well written sales pitch for the use of computer service centers, will add little to*

Thanks to the computer service bureau, electronic data processing is a "utility" today, as necessary for and as available to the small business as electric power and telephones. And, now that sales registers and other routine business machines can automatically capture data in optical font characters or on machine-readable tape, it is a utility that nearly every business can afford.

That is the thesis of this book by a sales executive of National Cash Register Company. And he makes a good case for it.

The book is really addressed to the small businessman. No attempt is made to explain what a computer is or how it operates. Instead, the author describes the steps in and advantages of automating inventory and merchandise management, sales analysis, accounts receivable, revolving credit and credit management, financial and tax reports, and other such workaday tasks. The book is genuinely applications-oriented (primarily to retailers since that is the market NCR stresses); complexities discussed are those of the business operation not of the computer. Liberal use is made of capsule case histories of restaurants, apparel stores, and other merchandising organizations.

A chapter on where to go to get help lists trade associations and other sources of information. There is a brief glossary of data processing terms.

The book will be sold through standard paperback retail outlets. In addition, one of its sponsors, The Benjamin Company, will handle distribution to trade associations, banks, and others that may want to use the book as educational or orientation material for employees, customers, or the public. Accountants and consultants might also find it useful for that purpose. Mr. Carter is a CPA, and

## MAGAZINES

**The Allocation, Characteristics, and Outcome of the Firm's Research and Development Portfolio: A Case Study** by EDWIN MANSFIELD AND RICHARD BRANDENBURG, *The Journal of Business*, October, 1966.

*Despite greatly increased interest in the economics of research and development in recent years, we still know comparatively little beyond the factors influencing a company's level of total expenditures devoted to R&D activities. The authors report on the results of a detailed two-year case study of a large company's R&D portfolio, in which they investigated the allocation of R&D funds among possible projects, the characteristics of projects carried out, and the probable outcome of these projects.*

The R&D portfolio of the central research laboratory of one of the nation's largest equipment manufacturing companies was chosen for this case study. The conclusions of the study are based on data concerning 72 major applied research and development projects during 1963 and 1964, which accounted for about 5 million dollars of the laboratory's 20-million-dollar total budget.

### *Allocation decisions*

After describing briefly the organizational aspects of the decision making process in the laboratory, the authors attempted to explain the relevant factors determining the allocation of R&D funds to particular projects. This problem was broken down into two questions: (1) What determined the amount that the various department managers proposed to spend on given projects? and (2) What

determined the extent to which the laboratory management modified the department managers' proposals?

### **Prediction models**

To answer these two questions, the authors developed and tested two similar prediction models. The models were built around the two major pieces of information generated within the company: estimates of a project's profitability and the probability of its success. Despite the restrictive assumption of a purely profit-maximizing behavior subject to a budgetary constraint on the part of laboratory managers, the models predicted about 50 per cent of the observed allocation of R&D funds. Organizational variables, such as risk taking or aversion, the nature of information flows, and conflicts between the scientific and professional goals of company scientists and the strictly commercial objectives of the firm, accounted for the unexplained half. (The authors state that their findings may be made still more tentative by a number of other simplifying assumptions in the models and by the fact that the empirical results of the second model are based on a non-random sample of projects.)

### **Portfolio characteristics**

As to the characteristics of the firm's R&D portfolio, the authors found that most of the reviewed projects were expected to be completed in four years or less and that the results were expected to be applied only a few months later. These estimates tended to be overly optimistic, but even when this bias has been corrected for, the above expectations should not be increased by more than 50 per cent and the probability of technical success should still be above 50 per cent. Technical success by no means ensures commercial success, however, so that the risk involved is substantially greater than is indicated by these estimates. The

estimated rate of return from successful R&D projects was generally very high, in most cases exceeding 100 per cent.

The rest of the paper considers the degree of correspondence between estimated and actual technical success of projects and between budgeted and actual expenditures of a project. It also discusses the accuracy in predicting the probability of success and the principal reasons for the failure of projects. The major conclusions of this section are as follows:

### **Conclusions**

1. Only about half of the projects were carried out as originally planned; the rest were either delayed or dropped. Of the projects not carried out only about 16 per cent failed because of unforeseen technical difficulties. This seems to indicate that the bulk of applied research and development in this laboratory involved relatively small technical risks and confirms the view that slippage is more often caused by human than by adverse technological circumstances.

### **Schedule slippages**

2. For the first time data on slippages in schedule have been gathered for commercial research and development. The average slippage factor of delayed projects (the revised time to completion divided by the originally estimated time to completion) was found to be about 1.30. As failure rates and slippages in schedule are often used to measure the extent of uncertainty in research and development, the authors point out that in these cases the extent of technical uncertainties involved is likely to be greatly exaggerated. Whereas the unadjusted failure rate would indicate that the average probability of technical success was about .50, it was really about .75.

3. Actual expenditures for R&D projects reflected changes in the objectives and staffing of certain projects, which led to about 20

per cent lower expenditures than expected in one half of the cases and to at least 20 per cent higher expenditures than expected in 15 per cent of the cases.

4. Although a direct relationship between the estimated probability of success for a given project and its eventual outcome could be presumed to exist, the relationship proved too weak to permit any accurate predictions.

This study should prove of interest not only to economists but also to all others concerned with budgeting in the area of research and development.

HEINZ A. BURGSTALLER  
*University of Illinois*

**Effective Conversion to Direct Cost System** by CURTIS W. SYMONDS, *Financial Executive*, September, 1966.

*The author of this article believes that too many of the companies adopting direct costing in recent years have done so without properly analyzing the factors that must be considered to ensure the maximum benefit from such a system. He briefly discusses what he believes are the essential steps in planning an orderly transition to direct costing that will permit rapid and complete utilization of its potential.*

The fundamental value of direct costing lies in its recognition of two essentially different types of cost: "fixed" or "period" costs and "variable" or "direct" costs. It allows a company to analyze quickly the effects of changes in sales volume of different products, to determine breakeven points easily, and to see the extent of fixed overhead commitments more clearly. Since more complete analysis of variable costs provides much of the value of direct costing, it is generally not appropriate for companies with a high proportion of fixed costs such as public service companies.



The problems of planning for a direct cost system can be minimized by giving continuous consideration to the final objective of the system. Special attention should be given, however, to the timing of the conversion to direct costing. According to the author, two or three months should be enough time to complete the transition, and the obvious advantages of completing the changeover as of the beginning of a new fiscal year are usually not important enough to justify a significant delay in the adoption of a new, improved system.

### System design

Mr. Symonds advocates designing the desired outputs from the system first, then constructing a chart of accounts that will most readily provide the desired information. He illustrates, as a possible output, a profit and loss statement broken down according to product lines, exhibiting both actual and budgeted figures, and discusses the benefits of such a statement. He resolves the problem of classifying costs as either fixed or variable by arbitrarily defining as fixed any cost at least part of which is fixed for a year or more. The author's experience in electronic component manufacturing indicates that only about five per cent of the costs so classified vary materially with volume.

### Inventory valuation

The final step in the conversion of an accounting system is the valuation of inventories at their new costs, with the excess of the absorption cost value over the new inventory value charged to a "Fixed Overhead in Inventory" account, which can either be written off or (preferably) carried on the books as an asset. Periodic adjustment of this asset account can be a means for converting inventory values to an absorption cost basis for external reporting.

As a final consideration in his discussion of direct costing, the

author disputes the charge that such a system can lead to improper pricing decisions. He claims that direct costs, properly interpreted, can lead not only to more scientific pricing techniques but also to better utilization of capacity. An illustration of one means of using direct costs in this way is provided, using a chart that shows the ratios of sales price to direct unit costs required to provide a given rate of return at various levels of production capacity.

STEPHEN L. MEYERS  
*University of Pennsylvania*

### How to Lose Money with Cash

by JOHN A. GRISWOLD, *Financial Executive*, August, 1966.

*This article is an outgrowth of a larger study by Dr. Griswold (Uses of Funds in American Manufacturing, Credit Research Foundation, National Association of Credit Management). His contention is that American manufacturing business has failed to use excess cash productively.*

The author of this article studied the operating results of 640 manufacturing companies in 70 industries for the years 1950-64. The basic criterion was return on investment, broken down between profit on sales and investment turnover; the basic analysis was supplemented by further comparisons to explain significant variations. The principal results were as follows:

#### Results

1. Return on investment (net income before interest but after taxes) fell from 13 per cent in 1950 to 10 per cent in 1964.
2. Profit on sales fell sharply from 1950 to 1952, then rose slightly but erratically through the rest of the period. The change in profit margin did not explain the fall in return on investment.
3. Investment turnover declined

almost continuously through the period, from 15 in 1950 to 11.5 in 1964. (Investment includes net fixed assets plus current assets.) Sales, however, increased slightly faster than net fixed assets and considerably faster than inventory (presumably because of emphasis on inventory control). Cash and receivables, considered together, increased nearly twice as fast as sales; this change was the primary cause of the fall in investment turnover. Most of the increase was in receivables; days' sales outstanding increased 40 per cent over the period.

4. A comparison of cyclical movements showed that increases and decreases of receivables tended to follow similar changes in cash with a lag of about a year. Moreover, the expansion of receivables only took place for the cash-rich companies; the cash-poor held down credit.

#### Better use

The author's conclusion is that the presence of excess cash has led manufacturers to grant more liberal credit terms, in effect, interest-free loans. The article does not consider what effect the liberalization of credit may have had on sales; carrying additional receivables apparently has not been reflected in the profit margin.

Dr. Griswold believes the interests of manufacturing industry would have been better served by using the excess cash for modernization of plant and equipment.

PARK E. LEATHERS, CPA  
*University of Pennsylvania*

### Does 'Zero Defects' Really Work?

*Dun's Review*, August, 1966.

*A reporter throws some cold water on the bubbling popularity of the newest quality control gimmick.*

Zero Defects, a technique for promoting quality consciousness

throughout an organization, seems to be sweeping industry. In the past two years, *Dun's Review* reports, it has been introduced in some 7,500 to 12,000 plants—with claims of huge savings.

This article treats the concept and the claims with refreshing skepticism. It notes such complaints as these: Sometimes quality problems are technical, not human. Efficiency, in terms of use of time, may drop if workers spend too much time inspecting themselves or others. When penalties for error are imposed, the old urge to cover up pops up. Foremen complain about excess pressure. What happens after the initial enthusiasm wears off?

Is Zero Defects, one consultant asks, "an admittance of a weakness in our industrial activities and an attempt to handle a basic management function with a 'gimmick' rather than a sound, logical approach?"

This is, as author George Berk-witt notes, a question for management to ponder.

#### **Merchandising, Management Controls**, September, 1966.

*This special issue is devoted to management problems of department stores and other retailers. Two of the articles are reviewed here.*

*Profit Planning for Retailers* by JAMES T. POWERS — Planning is essential for profits, yet many retailers prepare budgets on the basis of simple calculations that assume a direct relationship between sales and profits. This process is projection. It should not be called planning.

This article discusses the relationship between the organization structure and planning. The traditional departmentalized retail organization structure discourages profit planning. The department managers and buyers are concerned only with their own merchandise

and receive little guidance from management.

The author defines profit planning as having everyone within an organization working toward one predetermined goal known to all. Top management must set the company goals and direct lower management toward these goals. The factors to be considered in profit planning are listed and explained.

Three devices are discussed: (1) sales forecasting, which is based on estimated changes in consumer disposable income and management's expectation of change; (2) return on investment analysis, which includes comparing inventory turnover with profit; and (3) breakeven analysis, which will help determine the effect of errors in forecasting. Other useful tools are cost accounting, which relates revenues and expenditures to physical activity, and the establishing of a chart of accounts based on management responsibility. The author also recommends the use of charts and graphs, particularly for nonaccounting management.

#### **Organization**

*Organizing for Merchandise Control* by JAMES T. POWERS discusses the advantages and disadvantages of the three typical organization forms found in the retail industry. These three forms are as follows: (1) the traditional department store merchandising organization; (2) the merchandising organization with intermediate warehousing operations; and (3) the chain organization. Organization charts are presented to illustrate each form. The procedure used for ordering, buying, and controlling merchandise under each form is explained, with particular attention given to the effects on the buyers, i.e., whether they become customer-oriented or vendor-oriented.

The author reviews the intermediate warehousing operation at length, explaining its growth in popularity as well as noting some of the obvious pitfalls. The food

industry and discounters are examples of those making advantageous use of intermediate warehousing.

The organization form should be logically selected and not allowed to just happen. This selection should be based upon the size of the company and upon the decision of whether the profit center will be the location or the commodity.

EUGENE H. SAULS, CPA  
*Michigan State University*

#### **How to Get the Right Information, In the Right Place, At the Right Time** by MARSHALL K. EVANS, *Management Review*, August, 1966.

*Information-handling problems should be analyzed in the same orderly fashion used to attack problems in other vital areas of a business. The author develops a framework of basic considerations for analysis of an information problem, together with five steps for setting up an information system.*

The function of information, within the business context, is to aid in the making of choices among alternative actions. Management is often disturbed by the mushrooming costs and complexities of providing the needed information. A solution suggested by the author is an analysis of the information requirements of the business, followed by the design of a system that will meet those needs economically and effectively. Four key considerations should be taken into account in setting up an information system:

1. *Size and complexity of the business*—The information required and the system needed to provide that information are dependent upon the size and complexity of the business. The chief executive of a small company can cover and assimilate all of its critical, functional areas without the aid of a

company with multiple product lines, a complex marketing arrangement, etc., will require a well developed formal information system. Careful consideration must be given not only to current size and complexity but also to future information requirements as the business expands.

2. *Key decision areas of the business*—The sensitive areas of the business must be identified. What areas are vital to the success or failure of the business: Production? Marketing? Inventory? If responsible executives are to receive the information they need, they must take the time to define what is important. Information specialists are not in a position to view the business broadly and identify the critical areas. Only top management can identify these areas.

3. *Organization structure and delegation practices*—Designing the information system on the principle of responsibility accounting can have a markedly favorable effect on management efficiency. The information networks should provide for relevant data to flow to the lowest executive level at which decisions are made.

4. *Relating information to action*—The principle of management by exception should be utilized in establishing information needs. A busy executive should concern himself only with the exceptions and the deviations from plans.

### Key steps

With these basic considerations in mind, how should top management go about setting up a suitable information system? Five key steps are suggested:

1. *Select a project leader*—A person should be selected who will take the responsibility for carrying the project through to completion. Preferably, this should be the person who will later be responsible for administering the new system. Recent technological developments are leading to centralized information activities. This calls for a

management executive who can pull together all the information needs of the company and build them into a well integrated information-handling system. It is natural and logical to assign this kind of responsibility to the controller.

2. *Think through your information requirements*—Utilizing the information requirements established by top management, time should be spent in acquainting the project leader with the manner in which the information is used in decision and action.

3. *Enlist your management team*—The subordinates of top management should become involved in the project by identifying their key responsibilities and the information needed to carry them out. All of the key people should meet with the project leader and acquaint him with their own information needs.

4. *Design the new system*—The new information system should be designed to produce action reports on a timely basis. The plan should include the type of raw data needed, how data are to be processed, and the types of reports to be prepared. Selection of the equipment after the system is designed will prevent the acquisition of equipment with excess capacity. The author feels that it is possible to predesign the system because of the wide variety of data processing equipment available today.

5. *Review and adopt the plan*—Top management should review the proposed system with the project leader. The adequacy and efficiency of the system should be carefully examined and corrections made if necessary. Following review and approval, the project leader should be given the responsibility and the authority to implement the program under a definite time schedule.

CHARLES D. BARON, CPA  
University of Illinois

“Cost-of-Capital Standards With Debt and Equity Financing,”

More than one cost-of-capital standard is advocated in capital budgeting whenever a set of investment proposals have significantly differing individual levels of business risk — particularly where a few of these may entail very little business risk.

This article discusses an important aspect of the current and very difficult problem of specifying operational means for the determination of a firm's cost of capital. The specific end in view is the utilization of the cost of capital as a rate of discount in the implementation of one of the quantitative methods for making capital budgeting decisions. No attempt is made either to reconcile or to resolve the ongoing debate between those supporting the Modigliani-Miller thesis and those advocating the traditional financial thinking with respect to the question of the effects of financial leverage on a firm's cost of capital.

### Single standard?

Dr. Nelson asserts that, regardless of which way that particular debate is resolved, another important question exists and has been somewhat neglected. The question he has in mind is whether a *single* cost of capital standard for the firm in question is adequate to the task of discounting anticipated streams of future services in order to determine their present value. This question becomes quite significant whenever the proposed alternative investments are *non-homogeneous* with respect to *business risk*. Nelson's answer is that the single rate is not appropriate under the postulated condition with respect to business risk. His conclusion is that where proposed investments have a “virtually certain return” then the appropriate cost of capital standard for such proposals ought to be the firm's “nominal cost of debt funds” (i.e., the marginally

"least-cost" source of funds). More risky projects would be discounted by the weighted-average cost of capital, as generally suggested. The article is mainly concerned with explaining and supporting the author's conclusion.

### **Major premises**

The major premises employed by Nelson in reaching his conclusions are these: (1) He assumes that a given enterprise management is seeking, perhaps concurrently with other goals, to maximize the value of the stockholders' investment; (2) in order to succeed in achieving the stockholder wealth maximization goal, each capital investment proposal must have a positive present value after *all marginal* cash inflows and outflows forecast for the given project have been discounted by the firm's weighted-average cost of capital; (3) although the optimal procedures for actually calculating a firm's cost of capital are as yet unresolved (theoretically as well as empirically), the range of answers, derivable from the various suggestions currently under consideration, is sufficiently narrow so that any of them will yield standards which are useful in the administration of practical business affairs; (4) each capital project "has a unique degree of business risk"; (5) investment in projects where the benefits to be received are "virtually certain" will not materially affect the firm's overall cost of capital (a) if these projects are financed by debt, and (b) if these projects will constitute a relatively small proportion of total resources employed after the investment is made.

### **No empirical support**

The footnote citations provided in the article sample some of the more significant components of a large and expanding literature on this general topic. Unfortunately no empirical support for either Nelson's conclusion or his premises is supplied in the article.

Dr. Nelson perhaps weakens his own thesis somewhat by pointing out that the quantity of projects having a "virtually certain return . . . will not be numerous." This invites dismissal of the whole question on the grounds of immateriality. However, the general nature of the question remains and is significant; that is, whether projects of *differing degrees of uncertainty* should be discounted using a single overall cost of capital — or should they be discounted using two (or perhaps more) stratified costs of capital?

For anyone who is currently concerned with this area, this article seems to be well worth reading.

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*University of Florida*

**View Your Customers as Investments** by EDWARD C. BURSK, *Harvard Business Review*, May-June, 1966.

*This author suggests that customers are assets—even if not very controllable ones—and that marketing decisions should be analyzed in terms of the return on the investment in these as well as other assets for which such analysis is more conventional.*

The basic role of marketing is to bring about change—in the market, in consumers' minds, in sales, in market share, in profits, etc. Thus a business will incur costs to introduce a new product, to hire new salesmen, for additional advertising, and so forth, but often ignore channels of distribution, i.e., customers per se. Yet customers represent valuable investments of money, time, and effort. A company's investment in customers is just as real as its plant, equipment, inventory, and working capital. The fact of the matter is that customers are more valuable since they are more closely related to the company's existence, growth, and profitability over time. Investments in other assets are not made for their own

sake but for the purpose of servicing the company's real investment—which is, of course, its investment in its customers.

Mr. Bursk suggests that it is possible to quantify this investment in customers. All proposed marketing strategies, he recommends, should be evaluated in terms of the effect on customer investment. He presents two illustrations, a wholesale drug company and a retail food concern, and analyzes their customer investment.

### **Wholesaler**

Assume that a wholesale drug company has annual sales of \$5 million on a capital investment of \$1½ million. There are 400 customers; gross margin is 15 per cent or \$750,000, less variable distribution costs of \$350,000, which leaves \$400,000 as the contribution to fixed overhead and profit. The \$400,000 may be looked upon as the return on investment represented by the customers. Assume further that the required rate of return is 10 per cent. Then the average customer is worth \$10,000. In other words, there are 400 investments, each of which is worth, on the average, \$10,000. All of this adds up to a total customer investment of \$4 million.

### **Capital expenditures**

Any expenditures the drug company makes to improve these assets called customers are capital expenditures although in accordance with presently accepted accounting methodology they would be expensed rather than capitalized. Nevertheless, once customers are recognized as investments, there is no reason why attempts cannot be made to quantify the money and effort that is currently being spent first to win and then to keep their patronage.

### **Two proposals**

Consider two of many possible marketing proposals. To continue



with the above illustration, the drug company is considering the wisdom of adding more salesmen to its present force of ten. A new salesman can, on the average, add forty customers—but will they be worth \$10,000 each? In the typical business, 25 per cent to 35 per cent of customers account for 65 per cent to 75 per cent of all sales, and new customers are more likely to be worth less than \$10,000 each. Hence your return on investment as a percentage will decline. Another proposal is to improve the effectiveness of the existing sales force through sales training. If sales training costs \$10,000 a year but improves sales effectiveness by 10 per cent, sales will be 10 per cent better, but costs will be only about 3 per cent more; thus the return on investment will be improved. The latter is a better alternative. In real rather than assumed situations the analysis may not work out this way, but this, according to Mr. Bursk, is the basic method by which marketing proposals should be analyzed and by which these decisions should be reached.

**Retailer**

For the second example, assume that a food retailer's average customer buys about \$20 worth of groceries per week or \$1,000 per year. Gross margin is 20 per cent less servicing costs of 5 per cent, leaving 15 per cent or \$150 as a contribution to overhead and profit. At a 10 per cent rate of return the average customer is worth \$1,500. As there are 1,000 customers, total customer investment is \$1½ million. If the retailer offers trading stamps, the cost will be 2 cents per sales dollar or an additional investment of \$20 per customer per year. Sales per customer will have to increase from \$1,000 a year to \$1,154 a year to break even, according to the author's calculation, which is shown below:

$$\begin{aligned}
 (.15x - .02x) \div .10 &= \$1,500 \\
 x &= \$1,154
 \end{aligned}$$

Here, as in the wholesaler illustration, size of customer is im-

portant. Some customers may be buying most of their food at this store, and trading stamps will not increase their purchases. Others who divide their purchases among several stores may be induced to increase their purchases. For example, suppose 500 customers do all their buying here at the rate of \$1,600 annually; 500 do some of their buying at this store at the rate of \$400 annually but could be induced by trading stamps to increase their purchases to, say, \$900.

**Investment comparison**

Before and after customer investment would be as shown in the following table:

<b>Before Trading Stamps</b>	
500 Investments @	
(.15 × \$1,600) ÷ .10 =	\$1,200,000
500 Investments @	
(.15 × 400) ÷ .10 =	300,000
<b>Total Customer Investment</b>	<u>\$1,500,000</u>
<b>After Trading Stamps</b>	
500 Investments @	
(.13 × \$1,600) ÷ .10 =	\$1,040,000
500 Investments @	
(.13 × 900) ÷ .10 =	585,000
<b>Total Customer Investment</b>	<u>\$1,625,000</u>

This should not be interpreted to mean that the move would necessarily be as productive as indicated above. If the store's mix of customers is different, the investment may decrease rather than increase. Alternatively, the same amount of money invested in lower prices, added service, etc., might increase investment value even more. In real situations the necessary facts and figures would be available, at least in estimated form, even if not in the form of actual data.

**Useful concept**

The essential message of Mr. Bursk's article is that customer investment can be a useful concept for analyzing marketing situations of certain kinds, particularly those where marketers depend upon continuing patronage.

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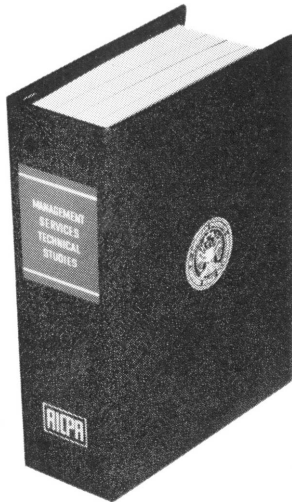
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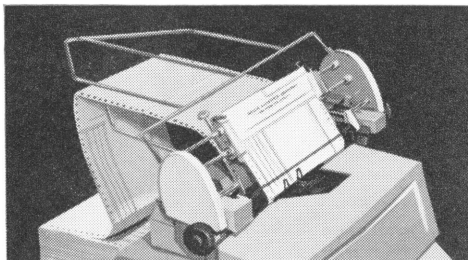
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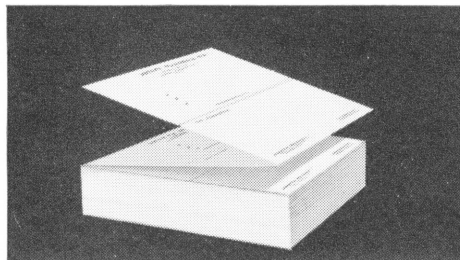


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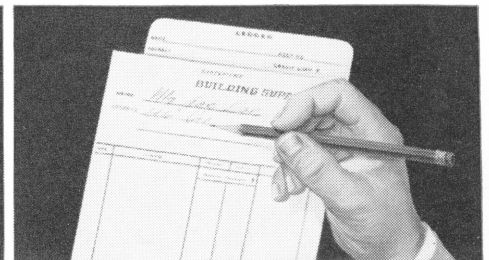
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