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a magazine of planning, systems, and controls

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No matter how careful Sam was, the suit didn't fit.

Sam, you made the pants too long.

And the sleeves too short. And the lapels too narrow. And the cuffs too wide.

At the seat of the problem, there was an outdated paperwork system that didn't treat information as carefully as Sam treated his work.

It was clearly a job for Standard Register. We sewed up the system's loose ends faster than Sam could thread a needle.

We designed new forms. And a new system. So the information that started in the fitting room now gets to the cutting room in one piece.

You see, we specialize in making business forms and systems that get the job done right.

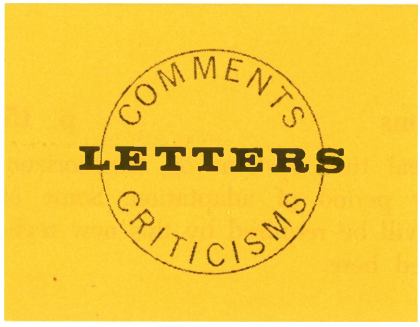
For more than 50 years, we've trained our men to know all about forms, systems and processing equipment. And the training never stops. So they're always up to date.

If you've got a paperwork problem, we've probably got a solution. Whether you employ tailors or toolmakers. Whether you're big, small or somewhere in between.

Just write The Standard Register Company, Dayton, Ohio 45401. We'll come up with the system that fits your needs.

A tailormade system, you might say.

The Standard Register Company



More about Exodus

By no means do I wish to detract from the splendid achievement of Messrs. Hoppins and Tadlock, but my recollection of the news stories at the time they released Exodus I (see news story, M/S May-June '67, p. 7) was not that IBM said "it couldn't be done" but that IBM wasn't interested in purchasing it for $100,000.

I can only guess at the economics involved, but it would seem that, since IBM's programing costs are buried in its hardware price (like every other manufacturer I know of; even SDS is experimenting with only a few languages), it would have taken IBM a substantially longer time to recover the $100,000 expenditure than it is taking Computer Sciences (which is engaged only in the outright selling of programing).

Perhaps IBM's rate of return would even have been lower than the range to which we stockholders have become accustomed.

I will be interested in seeing the market's response to Exodus II. (See news story M/S January-February '68 p. 10.)

JONATHAN MACY, *Treasurer*
The George Macy Companies
New York, New York

Need for vesting

The January-February issue of *Management Services* (p. 9) contains a review of a Financial Executives Institute paper contending that the private pension system is currently adequate.

While it has vastly improved of late, a specific weakness is vesting, which the institute claims is adequate. Although some portion of a pension is transferred when an employee changes positions, the methods of pension calculation currently used will severely reduce the amount attained. For example, I have used my current employer's pension schedule, which I believe to be representative:

Factors: 1. 1 per cent average five highest years of last ten times years service
2. .5 per cent of that average in excess of $4,800 times years service
3. Vesting is 25 per cent after five years and 5 per cent per year thereafter.

Assuming an employee started at $15,000 a year and received yearly $1,000 increases for 20 years, his pension would be as follows:

Average pay for calculation	$33,000
$33,000 x .01 x 20	= 6,600
$33,000 minus 4,800 =	$28,300
x .005 x 20	= 2,820
Total yearly pension	$ 9,420

If an employee changed jobs at the end of ten years and spent the next ten years under the same pension circumstances, his pension calculation would be as follows:

Employer 1	
Average pay	$23,000
$23,000 x .01 x 10 =	$2,300
x 50%	= $1,150
$23,000 minus 4,800 =	18,200
x .005 x 10 = $190 x 50% =	455
First Pension	$1,605
Employer 2	
Average pay	$33,000
$33,000 x .01 x 10 =	3,300
x 50%	= $1,650
$33,000 minus $4,800 =	$28,200
x .005 x 10 = $1,410 x 50% =	705
Second pension	$2,355
Total pension	$3,660

Even if any employee had the twenty years required for full vesting with the second company, his pension for thirty years of work would be (approximately) $11,000 versus (approximately) $14,000 with portability of credits.

This calculation demonstrates that the statement "Portability of pension credits is unnecessary" is in error.

That portability could provide the $6,000 a year difference in the sample above.

While I do not approve of increased federal encroachment on our lives, the pension practices in vogue are not yet all we might desire. It is my earnest hope that American industry will recognize this failure and correct it as they have so many in the past. We assent to government interference by not complying with human needs and demands. Let us be aware of this and forestall interference we might avoid.

T. PAWLICK
Lincoln Rochester Trust Company
Rochester, New York

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MARCH-APRIL, 1968

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Preauthorized Payments Necessary First Step Toward Less Checks, Less Banking Paperwork, Boston Federal Reserve President Says

Preauthorized payments—standing orders from depositors to pay recurring bills by direct deductions from their accounts—could well be the first concrete manifestation of the checkless society, it was indicated in a recent American Bankers Association workshop.

But even instituting such a simple system as preauthorized payments creates difficulties, it was agreed. George H. Ellis, president, Federal Reserve Bank of Boston, said that "It would be my own expectation that for the next several years while we continue to improve our payments mechanism the volume of checks will keep rising. Banks are becoming ever more persuasive in introducing customers to the virtues of checking accounts and checking accounts are the basic mechanism by which new programs such as preauthorized payments programs are installed.

"Under today's check payment system," he continued, "the accounting information contained in the check moves in the opposite direction to the actual payment. In the payments mechanism of tomorrow, accounting information will flow in the same direction as the payment."

Seven conditions necessary

Ellis listed seven conditions he felt necessary for the proper functioning of preauthorized payment plans in this country:

1. The payments mechanism must be an integral part of the banking system, not fragmented among nonbanking organizations.

2. Checks will continue to play the major role in the payments process for the foreseeable future.

3. Such changes as are directed toward the check must be aimed at the paper on which it is written, not the information it carries.

4. An increasing number of larger payments transfers will move over the Federal Reserve communication system. This will have a limited effect on the number of checks written, but it will substantially reduce the dollar volume of checks going through the check clearing process.

5. The most likely changes in the payments system are those which involve a minimum of institutional changes. The major problems of preauthorization involve organization and public acceptance, both of which would also pose problems in any more radical solutions. If these problems cannot be solved for a relatively simple problem like changing over to preauthorized payments, there is very little chance of their being solved for more complicated procedures.

6. There is an increasing difficulty in drawing a line between processing of banking information and its transmission since computers and communications between them are more and more frequently using the same stream of electrons. Eventually, improvement of the payments mechanism will probably require institutional changes that extend beyond the banking community.

7. A nationwide payment system will require cooperation between private enterprise and public institutions, acting in the interests of the public as well as the banking community. A crucial issue will be the determination of the most desirable mix of public and private equities.

Ellis, one of the closing speakers at the two-day workshop, summed up the experience of at least ten preauthorized payments plans now operating, all of which were reported on at the meeting.

Describing one such, the PECO plan developed by the Philadelphia Electric Company and First Pennsylvania Bank over a one-and-a-half-year period, J. Kenneth Reese, assistant vice president of the bank, said:

"For the customer, it means one less check per month to write, one less stamp to buy and stick on an envelope, one less envelope to lick, and he can't possibly forget to pay his electric bill or miss the grace period. In short, convenience and less homework."

27 banks in system

The plan now embraces 27 Philadelphia banks, in each of which Philadelphia Electric maintains a deposit account. The utility transmits a deposit ticket, an itemized computer listing of its customers who are patrons of the particular bank, and prepunched 80-column tab cards, which serve as Deduction Orders. The bank treats the Deduction Order exactly as though it were a check, subject to all normal check service charges. The amount of the Deduction Order is transferred from the individual's account to the Philadelphia Electric deposit account on the regular utility billing date.

"While the consumer realizes his benefits practically as soon as he enrolls (in the plan)," Reese said, "the advantages to both the utility and the participating bank do not take on significant proportions until a reasonable level of volume is reached."

This means that if banks are to profit from preauthorized payment schemes they must market and promote them very heavily, Reese went on, to stimulate great volume right at the beginning of the program.

However, even in its comparatively limited sphere, the PECO plan is already cutting down the load on bank paperwork channels, Reese reported. Under the scheme, with deduction orders for each bank limited to that bank's customers, the flow through normal interbank channels has been almost entirely eliminated.

ABA Calls Bank Credit Card Key to 'Less Check' Future

The bank credit card will one day lead to the checkless society—or what the American Bankers Association is now calling the "less-check" society.

That was the consensus of speakers at a national credit card conference conducted by the ABA.

Either a credit card or a revolving credit/check guarantee card program will lead to this goal, Robert A. Huss, vice president/marketing, Security First National Bank, Los Angeles, predicted. "The credit card must somehow be connected into the demand deposit account system which will provide the basic transfer mechanism that will make the checkless society possible. The revolving credit/check guarantee card approach must get rid of the check and leave only the card . . ."

Consolidation and compatibility of the various credit systems is the wave of the future, a number of speakers agreed. "I don't think the new generation of consumers will put up with the proliferation of credit cards, which causes our wallets to bulge," said Arthur T. Roth, chairman of Franklin National Bank, Franklin Square, N.Y. "With proper indoctrination they will ask —even insist—that their financial transactions be channeled through an existing service, their account at a full-service bank. The logic of receiving one statement once a month which records the bulk of their financial transactions will appeal to them."

Retailers burdened too

The proliferation of credit cards is also a burden to the retailer, Mr. Roth pointed out. "The merchant's original advantage dwindles with the number of cards he has to honor. It is getting fairly common to see four and five decals covering most of the doors and windows of stores and restaurants.

"At the same time, as each bank adopts a credit card, the merchant is asked to open an account to handle the transactions. Account-splitting is not the way to more profitable banking. I think the time is coming . . . when the merchant will have to be permitted to draw a draft on a credit card bank after sending in his sales slips or drafts, while keeping his account where he chooses."

One solution is technical compatibility of—and cooperation among —credit card systems. "We're going to have to do something about the hardware we're investing in and loading up the merchant with," Mr. Roth warned. "Some establishments now have three and four printing devices for charge cards. Each of these devices represents a cost of $30 or more."

Too much hardware

Other solutions include consolidation of plans and services. Connecticut National Bank, Bridgeport, Conn., has consolidated all its credit services into a single account, described at the conference by Vice President Alexander Kish. This master revolving credit plan, he said, offers all the specific advantages of a general credit card, an executive credit card, a travel and entertainment card, check-credit accounts, guaranteed checks, traveler's checks, short-term loans, and installment loans.

The result, according to Mr. Kish, has been simplified paper work and increased volume.

Another form of compatibility is that represented by the one-year-old Midwest Bank Card System, a combination of 13 major compatible credit plans encompassing more than 800 banks in Illinois, Indiana, and Michigan. Each bank has its own card (physically standardized for use in a single imprinter), but all cards are interchangeable.

The system, according to Robert M. Martindale, President, Midwest Bank Card System, Inc., includes more than half the nation's banks now offering credit cards.

Ultimately, according to Richard P. Cooley, president, Wells Fargo Bank, San Francisco, Calif., the trend will be toward a few national bank credit card systems. Over the next few years, he predicted, more banks will establish, form, or join credit card systems; interchange will be developed rapidly so that the bank cards will be honored and settlements accomplished on a national basis; more retail outlets will accept bank cards; and fewer credit cards will be needed by the consumer as the bank card becomes more of an all-purpose card.

Banks, according to H. Frederic Hagemann, Jr., chairman and president, State Street Bank and Trust Company, Boston, Mass., should adopt a card that is machine-readable by being sensitized with a magnetic strip or prepunched in telephone company format. The availability of such a card and an inexpensive remote terminal device connected to a central information file over telephone lines would permit a bank to do several things:

"First of all, we can provide high-speed credit authorization for purchases above a merchant's floor limit. Secondly, we could alert the merchant to a 'hot card' situation or a delinquent account. If connection is made to our central file with every transaction, we could automatically notify collection personnel of a delinquent customer on the premises."

Student at Germantown High answers question with light pen.

Philadelphia School District Sets Up Central Computer Complex Tied to Three Schools For Student Instruction

The Philadelphia School District has begun to operate a computer-assisted instruction system in two high schools and one junior high school. Another junior high school is expected to go on the system in March.

Philadelphia is believed to have the first metropolitan school authority to make such widespread use of a computer-assisted instruction system.

The system is built around a central computer located at Philco-Ford in Philadelphia, and a "cluster" in each school. A cluster consists of a central processor, data storage facilities, and individual student terminals.

A student uses his terminal—a combination TV monitor and electric typewriter—to respond to questions concerning his lesson. The terminals have light pens, so that answers to multiple choice questions can be made by pointing at the correct answer on the screen with a light pen. More complicated answers can be made in text form on the typewriter.

Each school cluster is connected to the central computer at the Willow Grove plant of Philco-Ford's Communications and Electronics Division. The central computer is used for developing curriculum, storing courses, evaluating statistics, and keeping student and course records.

The clusters at individual schools are charged with tutorial tasks for the students. The processor receives course work each morning, which is placed on a large disk memory. As a student sits down at his terminal unit, he types in his identification. The processor then begins transmitting his lesson, picking up where the individual left off the day before.

All courses developed for computer instruction (to date, biology and reading; mathematics is still being prepared) include branching as a special feature. This permits each course to be custom fitted to the individual student. If a student is exceptionally fast, the local cluster computer can present materials in greater depth. If, on the other hand, a student's responses show that he doesn't understand a concept, the computer can present specialized programs to aid him.

The central processor at each cluster prints out a written record of each student's performance for the teacher. It also sends class results back to the central computer for storage and to update student and school files.

Retailers Who Use Computer-controlled Inventory Systems Increase Gross Profit Figures Very Significantly, New Study Indicates

Retailers who are using computerized inventory control systems have been able to increase their gross profit margins substantially over their figures under old manual systems, it was reported at the winter meeting of the American Marketing Association, in Washington, D. C.

Retailers increased gross profit by a median figure of two per cent, which could amount to an eventual net profit increase of 50 per cent, according to a study conducted by Charles D. Greenidge and Cyrus C. Wilson, assistant professors at the University of Colorado and Indiana University, respectively.

30 retailers studied

Their study, based on figures furnished by 30 apparel retailers employing the National Cash Register Company's "Total System" to maintain inventory and sales records, covered a six-year span. During the first five years of the study, when conventional, manual inventory control procedures were used, each merchant's gross profit margin as a percentage of his sales was calculated for the year.

Using these historical figures the researchers then projected what the ratio would have been for the sixth year assuming the merchant had continued using his old inventory system. The same simulation was made based on sales-inventory ratios and with gross profits considered as a percentage of inventory investment.

The simulated figures were then compared with each store's actual performance for the sixth year when it was using computer-controlled inventory methods. The difference was attributed to the new inventory methods.

Safeguards were set up to ensure that other extraneous factors did not affect the sixth-year changes. "The main control problem is determining whether variation in performance during the (sixth year) is the result of improved information or of some other variable," the report explained. "Outside the laboratory, many intervening variables can influence results. . . In this study, it was crucial to question the retailers at some length to attempt to uncover explanations, other than improved information, that would account for the variation between observed and simulated results. This involved asking the retailer about local economic conditions during the test year which might have had an unusual effect on his business. Or whether or not the competitive situation had changed. Or whether he, as a manager, had made any changes in his technique other than those associated with the system. The end result . . . is the investigators' subjective conclusion that for the sample retailers the introduction of improved information probably accounts for the observed variations."

All regions represented

The 30 retailers were drawn from 20 states representing all regions of the country. Stores were located in cities ranging in size from less than ten thousand to more than one million.

About two-thirds of the merchants were in downtown areas; the rest were evenly divided between shopping centers and individual suburban locations.

Major reason for the profit improvement, the study surmised, was the improvement in the precision and timeliness of management information. Before going to the Total System, inventory records for the 30 stores covered a median of 16 product categories. With the new system, the median figure climbed to 180. Also reports are now available monthly, and information is available 3 to 5 days after the end of the month. Formerly reports were much less frequent and there was a 20-to 90-day lag in getting them.

An anticipated greater stock turn, based on a higher ratio of sales to inventory, was not realized during the first year under the system, the report states. The researchers theorized that retailers would have to dispose of slow-moving items, probably at a loss, to achieve this, and it seems probable they were unwilling to do this.

Inventory rises initially

As a result, inventory tends "to increase immediately after improved information becomes available."

However, this study noted that retailers who have difficulty organizing their work may "gain much from the discipline which the system imposes on them" and from the orderly format of the monthly inventory reports produced by their data centers.

Data for the Total System is captured at the point of sale by a cash register or adding machine equipped with optical font type or a punched paper tape attachment. The data are sent to a data processing center which provides the management reports. (See "Accounting-EDP Center," M/S, May-June '65, page 34.)

The Greenidge-Wilson report was selected for presentation at the AMA meeting after having won an association - sponsored dissertation research competition. It was begun by the authors while they were students at Ohio State University, on a grant from the National Cash Register Company.

Recruiter Gives Methods To Forestall Executive Loss

The pool of middle management executives, persons in the 35-45 age group, will shrink through the middle of the next decade.

This is just the time when the demands for such executives are expected to reach new highs, warns William H. Billington, Jr., of Billington, Fox & Ellis, Chicago-based recruitment firm.

The low birth rate prevailing through the depression years of the 'thirties accounts for the dwindling amount of executive talent coming into the medium age group. The continuing corporate expansion and the growing complexity of company operations is the reason for the rising demand for such executives, he believes.

The two forces together post a clear problem for firms trying to maintain their executive force, Billington said, since competition for such executives, already sharp, will probably grow worse.

"With competitors who would like to raid your executive staff and executives who wouldn't mind being lured away, top management has good reason to lie awake nights and worry," he said.

Mr. Billington noted these common company dissatisfactions he has found among executives willing and sometimes even eager to discuss new job openings:

- Lack of responsibility in their present position

"A good executive hungers for a chance to achieve results," said Billington, "yet I'm amazed at the number of companies that still treat younger executives like office boys."

- Slow promotion in the present spot
- Topheavy organization chart

Executives with extremely high potential chafe under management structures in which jobs are too rigidly defined. The executive has no leeway to carve a niche based on his unique abilities.

- Lackluster atmosphere

Some extremely security-conscious men may bask in a company with an extremely slow pace, but most aggressive executives prefer challenge and excitement.

- Inconsiderate management

This shows up particularly strongly among executives who are continually being transferred through the "corporate provinces" and begin to feel out of touch with the home office. Family complaints and pressures aggravate this situation.

- Inadequate compensation package

More and more executives are becoming sophisticated enough to look beyond salary alone, to weigh the total structures of the benefits and perquisites open to them.

"Today's professional managers are quite willing to move if they begin to harbor doubts about the value and future of their present jobs," Billington said. "Management should be cognizant of the skills they have in their firms, develop them further, and, overall, let their key people know that their contributions are recognized and appreciated. The best defense is a good offense."

Honeywell Head Calls For Cooperative Effort To Employ Ghettoites

Government and industry must work together to eliminate the "ten-mile gap" between the unemployed of the ghetto and available jobs in industry, Stephen F. Keating, president, Honeywell Inc., told a luncheon session of the 43rd Annual New England Conference, which was held in Boston this winter.

The ten-mile gap is geographical in that "the people who need work are at the city's center—the plants are in the suburbs." But it also is psychological because of the "wide cultural gap between the ghetto environment and the industrial environment."

Unskilled jobs exist, but ghetto people do not apply for them, Mr. Keating said. Part of the solution is more plants in the cities; part of it is more intensive recruiting and on-the-job training. But education is also needed to make ghetto inhabitants want to work, persuade them to travel to jobs, and show them how to find the jobs that are available. This requires effort by more than industry.

'Meaningful' jobs needed

Individual companies, Mr. Keating pointed out, can speed the assimilation of hard-core unemployables through specially designed recruiting programs that offer meaningful—not just menial—jobs to the disadvantaged. But business, labor, government at all levels, and religious and educational leaders must work together to help "people understand that an education is worth the effort, that jobs are worth working at, that crossing the ten-mile gap is enormously worthwhile."

GM's Frigidaire Unit Will Attempt to Forecast Retail Sales

General Motors' Frigidaire Division is launching a new computer-based program to anticipate sales needs at retail dealers and to be prepared to meet them through automatic restocking of factory warehouses.

As the program progresses, it will move on to automatic restocking of dealers who order in carload lots, and finally to dealers who order in smaller quantities.

The whole program, perhaps optimistically, assumes the computer can forecast the sales demands—and whimsies—of a notoriously fickle audience, housewives.

The Frigidaire appliances to be processed over the new network include refrigerators, ranges, garbage disposers, dishwashers, dryers, and room air conditioners.

Frigidaire will use a new IBM System 360 Model 65 to weigh and balance a mass of information: sales activity, market forecasts, economic indicators, and regional preferences. Market forecasts are based on the past two years' sales averages, continually updated and subjected to exponential smoothing.

Dealers record daily sales

Basic information will come from the dealers themselves, who are being equipped with registering devices that record day-to-day sales information, including the number of units and types of merchandise sold, directly on punched paper tape. These tapes will be forwarded to the nearest of 25 regional data centers. There they will be relayed automatically to Frigidaire headquarters in Dayton, Ohio, as the basis for a national sales report on dealer activity.

"For example, these reports will tell us how much or what kind of merchandise is moving by geographical areas, how many units are available in a given color and model and how long the supply is likely to last," said William Dalton, Frigidaire director of distribution and production control. "We can then make the decision to change the inventory level for areas or reschedule the units into our production cycle."

Honeywell Adds New Unit to 200 Series; Offers Five Accounting Packages

Honeywell Electronic Data Processing has expanded its Series 200 family of computers by adding a ninth complex, the Model 110 central processor.

The 110, introduced simultaneously in New York, Chicago and Los Angeles at the end of January, is the smallest unit in the Series 200 family, and is designed to provide quick conversion to electronic data processing at minimum cost. The complete "package" includes hardware, software, personnel training, and complete systems support.

The 110, according to Honeywell, is completely compatible with all other units in the Series 200 family. Thus, as a customer moves on from the 110, he can gain additional main memory, increase his central processor cycle time, add peripheral units, and increase computing speed without expensive reprograming.

Five general accounting packages are included in software available with the 110. These basic applications include a general payroll program, an accounts payable system, a general ledger package, an inventory reporting system, and an accounts receivable program.

The 110 offers an easy way for a small business to move into electronic data processing, reported W. J. Devers, Honeywell EDP Division product marketing director. "It is also an easy way for users of tabulating equipment and competitive small computers to convert to a full computer system at very little additional monthly cost."

System for Maintaining Mailing Lists Offered By California Firm

A computer-based information system, especially designed to help large organizations manage, maintain, and analyze mailing lists, is now available from the Don James Company, a division of Information Projects Corporation, Los Angeles.

Called Computer Marketing/Mailing (CM/M), the package system can be operated on any computer, according to the company's president, Don James.

Included in the package are the system setup, a set of nontechnical forms for operating the system, an operating manual, and, if desired, the necessary computer programs. The company will also customize and adjust the system so that it will meet precisely the needs of each customer.

One single CM/M file will hold all of an organization's mailing lists. Addresses can be selected by several hundred combinations of criteria, allowing corporate marketing departments great flexibility in making targeted mailings.

Further information about the CM/M system may be obtained from the Don James Company, 5455 Wilshire Boulevard, Los Angeles 90036.

GE, RCA Enter Time Sharing Service Center Field at Same Time

General Electric has created a new International Information Services Department to stimulate development of on line-time sharing computer service businesses around the world.

The new group, which will have its headquarters in Bethesda, Maryland, will work with elements of GE's International Information Systems Division and with the company's foreign computer affiliates, Bull-General Electric, Olivetti-Gen-

eral Electric, and De La Rue Bull Machines, Ltd.

GE has already established time sharing service centers in Toronto and London. Further centers are now planned in Paris and Sydney.

RCA joins field

Almost simultaneously with the announcement that GE will actively promote the creation of time sharing service businesses abroad, the Radio Corporation of America and Commercial Credit Corporation reported the formation of a new, jointly owned company to operate time sharing centers in this country.

The new venture, as yet unnamed, will be 60 per cent owned by Commercial Credit, 40 per cent by RCA. Initial investment will be around $10 million for equipment and office space.

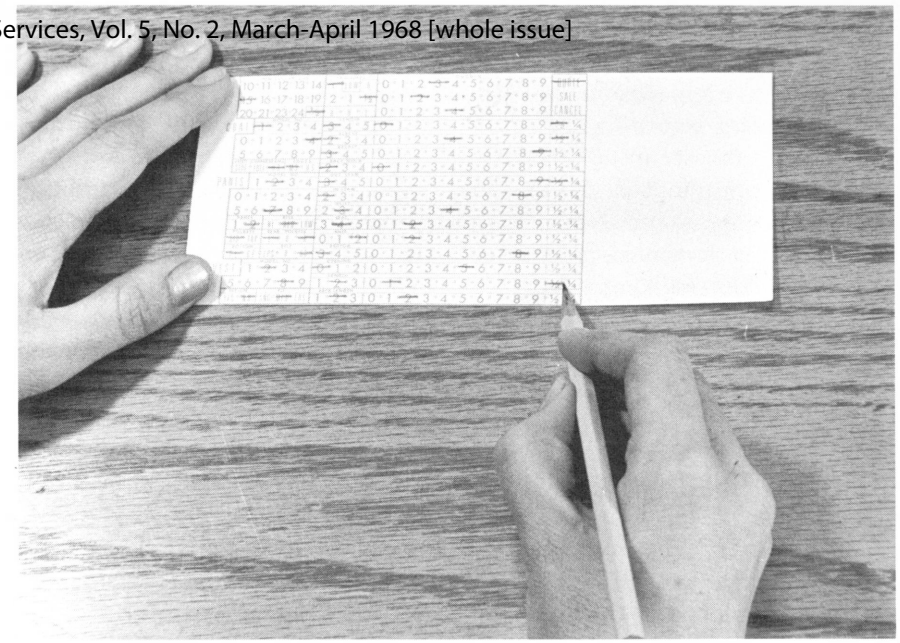
The centers, the first of which will open in Baltimore this year, will use RCA Spectra 70 model 46 computers. Ten other cities are expected to succeed Baltimore as locations for centers.

The greatest initial market for the new concern's services is expected among engineering organizations, universities and technically based businesses. According to spokesmen of RCA and Commercial Credit anyone who can do high school algebra can use the centrally located computer.

Ford Will Put Parts Catalog on Micro-images

Ford Motor Company's Autolite-Ford Parts Division is planning to transfer its entire parts catalog to a micro-image dissemination and retrieval system. The system can incorporate 2,560 pages of printed information on a single 4- by 6-inch transparency.

Based on National Cash Register's PCMI process, it will involve the leasing to Ford dealers of readers for the retrieval of the micro-image information. NCR will produce the basic transparencies and will periodically update them for distribution to dealers.



Input preparation for Transactor requires no special skills, so that all office personnel can use it without queuing.

New Data Input-Output Terminal Will Use Pencil-marked cards as Input Medium

A new simplified data input-output terminal that can accept pencil-marked cards as input has been developed by a Canadian firm, T-Scan Ltd., Toronto.

The new unit, called a Transactor, makes it possible for the first time for any number of untrained people to make queries of and get replies from a central computer, the developers claim.

They point out that their unit permits untrained people to prepare the input cards off line. The cards then serve as entry into the input unit for on line transmission to the central computer.

This opens the possibility of anyone in an office querying an airline, for example, about space availability. It could also be used for ordering procedures where several scattered locations must draw supplies from a central point.

The main advantage, the manufacturers maintain, is the system's simplicity of operation. Whereas the conventional input-output terminal demands an operator trained to key or punch information (who, of course, is the only one who can use the unit at the transmission time), the Transactor can accept a whole sequence of pencil-marked cards prepared by a variety of people, and will reply in typed form to each query. The reply is printed at the rate of 20 lines a minute directly on the original inquiry card.

Cards tailored to jobs

For each application, the T-Scan (the original inquiry) card layout is tailored to the operational requirements of the user. T-Scan operators mark the cards by putting pencil strokes across preprinted multiple choice statements or questions. Any type of standard office pencil can be used, and sequence of marking is unimportant. Errors can be corrected by simple erasure and remarking.

T-Scan Ltd., the manufacturer, says it anticipates the development of portable Transactors in the future. This would permit industrial sales personnel to give immediate answers to queries from customers on a sales call. It could also be useful to consultants, draw-

ing on a centralized bank of information, the manufacturers point out. Payroll computations, balance statements, tax return figures could be given almost instantaneously while the consultant is still on the client's premises.

Transactor transmissions go over standard telephone lines.

Computer Sciences Begins Data Processing Services in South

A multistate savings and loan association data processing service has been launched in the South by a nonbanking organization, Computer Sciences Corporation.

The complex is based on the computing facilities owned by Computer Sciences at Huntsville, Alabama. These are linked to electronic terminal consoles in subscriber savings and loan offices.

To date, Computer Sciences has only two Huntsville subscribers, but the organization expects to extend operations into Birmingham, Atlanta, Memphis and Chattanooga within the next several months.

The entire complex will be linked by telephone circuits.

Eventual capacity of the system is several million savings and loan customer accounts, said Richard A. Lucas, Huntsville computer center manager for Computer Sciences.

Under the system, savings and loan tellers have direct communication with the central computer via their terminal consoles. The consoles resemble standard accounting machines.

Main advantages to subscriber savings and loan groups, besides faster customer service, is better control over their own business, said E. W. Dickey, president of the First Federal Savings and Loan Association, Huntsville, one of the subscribers.

Aiding in better control, he said, would be the fact that on any given day, management will know precisely the amount of funds available for investment or loan. Information will also be readily accessible on prepaid and delinquent accounts, and on the day's transactions.

The computer will also furnish trial balances, compute interest on savings accounts, and, in addition, prepare many of the reports needed by management and government agencies.

Computer Sciences, a pioneer in the operation of computer-remote console linkages, is a West Coast concern. Its Huntsville facility in the past has been mainly a support arm of the Marshall Space Flight Center there.

Air Force Contract Taken from IBM Goes to Burroughs

That controversial Air Force computer contract has been awarded again, and the winner is not IBM, which received the contract last spring even though it was not the low bidder; not Honeywell Inc. which appealed the award and forced reopening of the bidding; but Burroughs Corporation.

The Air Force had called for competitive bids to supply 150 business-type computers. (See news story, M/S July-August '67, p. 6.) IBM got the order even though its $114-million bid was some $60 million higher than Honeywell's because, the Air Force said, the service's method of "life-cycle costing" indicated savings on training, repairs, and maintenance over the life of the contract with IBM that would offset its higher purchase price.

Honeywell complained vigorously, and the General Accounting Office intervened, forcing the Air Force to repeat the selection process. Burroughs' winning low bid was $60 million, $6 million higher than Honeywell's original low bid. The Air Force's saving on the contract, it pointed out, was further reduced by about $18 million because of the eight-month delay and the cost of re-evaluating competitive computer systems.

Rem Rand Brings Out New Desk-top Copier For Sale or Lease

Sperry Rand's Remington Rand Office Machines Division has announced a new desk-top electrostatic copier that can produce up to 30 copies of a document per minute.

The Remington R-2 copier takes only seven seconds to make its first copy and can produce additional copies in two seconds each—about as fast as the originals can be fed into the machine.

Reliability claimed

Remington is offering the R-2 to buyers with one year's free service, which, according to the company spokesmen, proves the ability of the machine to hold up under heavy, continued usage.

Other features of the R-2 include a visible document feed system, automatic multiple copy feature, automatic paper trim that produces the right size copy paper for any document up to 11 by 21 inches, and the ability to be used on ordinary electrical current.

The R-2 electrostatic copier sells for $1,150 and can also be obtained on a lease or rental basis.

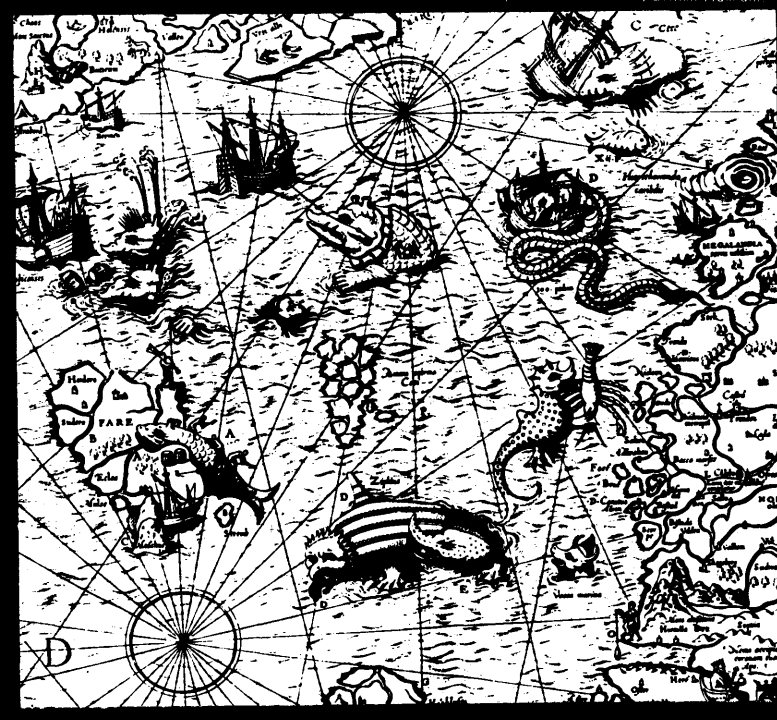
Ohio Bell Starts New Accounting System

Ohio Bell Telephone Company is installing a $2-million UNIVAC 494 real-time computer system for customer accounting.

When the system is fully operational, a customer will be able to obtain up-to-the-minute information on the status of his account, and operating departments will be able to obtain instantaneous information on the status of telephone equipment inventories held by the various customer accounts.

The system will cover northern Ohio, including Cleveland, Akron, Youngstown, and Toledo.

By kind permission Trustees, British Museum



The way some people think about mental retardation, you'd think we are still back in the dark ages.

Many people still think that mental retardation is a shameful condition caused by "bad blood" or something else equally outlandish.

Many people still think that all retarded children and adults should be put out of sight. Out of touch with normal people.

It's time to get rid of these old notions. Once and for all.

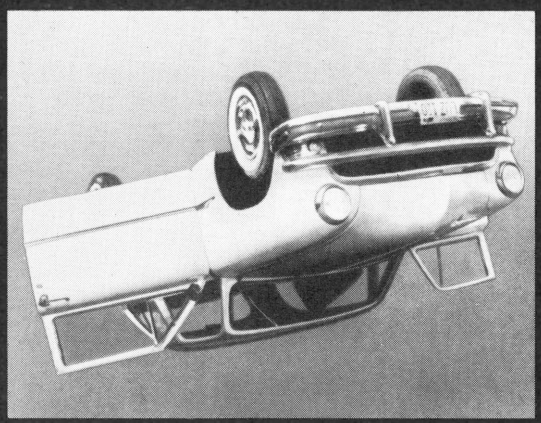
Although some of the retarded require care in institutions, the vast majority need to be helped and challenged by the world. Not hidden from it.

In fact, at least 85 percent of the retarded can learn enough to become fully or partially self-supporting. But only if you give them proper schooling, job training, job opportunities—a chance to live like the rest of us.

How can you help? Urge your civic, church, social or fraternal organizations to sponsor activities for them. Like week-end athletic programs. Or take them on outings, hikes, fishing trips. Nothing frustrates the retarded more than being left out of activities other people enjoy.

Write for a free booklet to The President's Committee on Mental Retardation, Washington, D.C. 20201.

Employee turnover,



the kind that took the lives of nearly 25,000 trained workers last year.

Whose business is it? Business' business. For humanitarian reasons, certainly. But aside from the waste of human life, off-the-job traffic deaths last year cost American industry about $1½ billion in time, training and production.

Progressive companies like Coca-Cola, Dow Chemical, Continental Can...and hundreds of others...are doing something to reduce this loss of trained personnel. They are sponsoring the National Safety Council's Defensive Driving Course for their employees.

What about you?

By setting up a Defensive Driving Course in your company, the lives you save may be your own employees'.

Special Projects—Public Information 68.1
National Safety Council
425 North Michigan Avenue
Chicago, Illinois 60611

Please mail me full details on the Defensive Driving Program.

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The on line real time EDP system creates a whole new series of control problems. How is privacy ensured when a whole series of stations have access to the computer? What can be done about overloads on computer capacity? Here are some of the answers —

NEW GENERATION EDP CONTROL CONSIDERATIONS

by Robert F. Moloney
Xerox Corporation

FAST-RESPONSE data processing systems, generally referred to as "real time" or "on line systems," have made rapid progress over the past several years. Much of this progress can be attributed to the introduction of third generation computer equipment and supporting software capable of handling the complexities inherent in these systems.

The traditional control concepts, painstakingly built up over the past decade for batch-type operations, are no longer adequate. The use of communication facilities operating in an on line mode, duplex equipment configurations, multiprocessing, and multiprograming necessitates the development of additional control techniques if these systems are to process all data accurately and efficiently.

The purpose of this article is to discuss some of these new control requirements which systems analysts, programers, and auditors should be considering in the design of any real time system. These controls are considered in this article in four categories: on line controls, data protection controls, diagnostic controls, and emergency procedures.

On-line controls

The use of communication lines to transmit data in systems of this type requires the use of an on line terminal device by which messages are transmitted to or received from a computer. The most important consideration when operating in this mode is to ensure that the data being transmitted are received and

properly processed. It is always possible for messages to be lost or garbled or perhaps for a line or terminal device to go out of order during transmission. To prevent this from happening the system should provide program routines to check on messages sent through the system. These routines should provide for at least the following:

Message Identification Handling Procedures to ensure that each message is properly handled—Every message received at the data center should be identified by a message header showing such information as message number, terminal, date, and action code. This information is necessary for the initializer routine to route the message to the proper program for processing. If a message with an incorrect header is received, it should be routed to a control group for corrective action or rejected with a request to the originating terminal for retransmission of the entire message.

Message Transmission Controls to determine that all messages transmitted over the lines are received—This is done by assigning each message a number, usually within a block, and subsequently verifying the sequence of the message numbers received. Unaccounted-for numbers are considered exceptions to be investigated. Another control is the confirmation by the computer or terminal of all messages received.

One such system used a combination of these two methods. Each location was assigned sequential numbers 000 through 999. As an item was transmitted to the computer, it was assigned a message number, which was stored internally by the computer. Periodically a routine checking of these numbers would produce a report of out-of-sequence numbers and those remaining unused. These were forwarded to each originating location, which checked them against a log maintained for that purpose. Lost messages were retransmitted. Additionally, every message received by the computer was confirmed. This told the operator downline that it had been received by the processor and enabled him to verify the accuracy of the data.

Rerouting Procedures to handle messages sent to downline stations which are not operating—When this happens it is necessary to provide routines to reroute the message to another terminal or store the message internally in the computer until such time as the down terminal restarts operation. The procedures for dealing with this type of operation are sometimes called "willful intercept." (The action to be taken when the computer breaks down is not discussed here since this topic will be covered under the category of emergency conditions.)

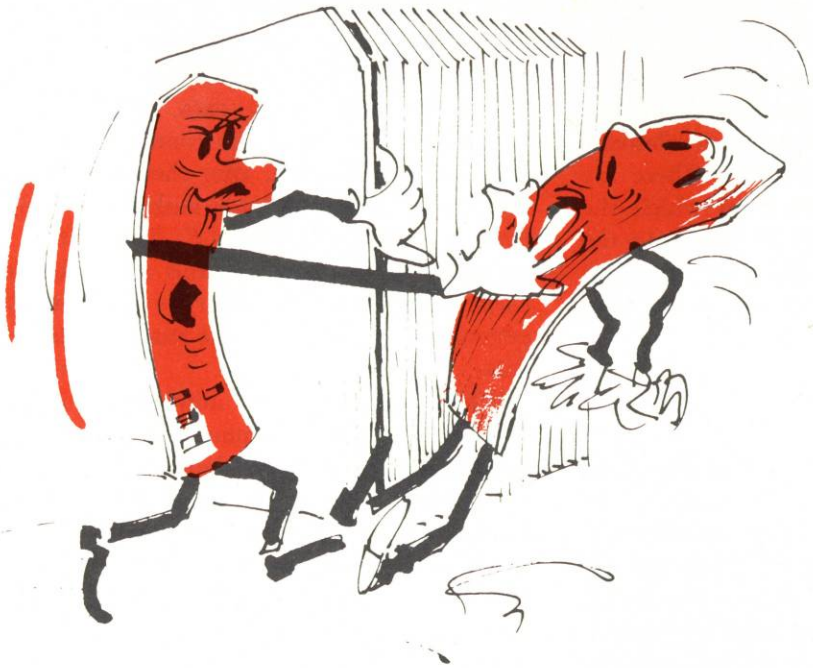
Check Characters to detect transmission errors—Two data verification procedures generally used to check the accuracy of transmitted data are the character and message parity checks. The character parity check, with which most accountants are familiar, verifies the accuracy of each character transmitted. The message parity check is a check digit compiled at the originating terminal, based upon the number of bits in the message sent, which is tacked on to the end of that message. The receiving terminal, similarly, compiles a check digit based on the number of bits received, and both check digits are compared. If they agree, a "transmission correctly received" signal is sent to the terminal or processor. If the communication lines have introduced errors, the system should provide for an alert signal to the terminal notifying it of the error or, preferably, for the automatic retransmission of the entire message.[1] In the latter case, if the error condition still exists the terminal should be alerted.

The system can verify that all messages transmitted have been received by giving each message a number; the computer checks the sequence to ensure that all are in.

Data protection controls

The on line capability inherent in a real time system creates a problem of data protection. Information stored in the files may be made available to terminal operators at their request. This raises the question as to what procedures are necessary to prevent data from

[1] For a more thorough discussion of this topic refer to IBM Corporation, "Message Control System Concepts," Reference C20-1609, p. 5.



Unless some provision is made to ensure that only one transaction can update a file at a time, file changes created by transaction A will be lost when transaction B, occurring simultaneously, is recorded.

being accidentally destroyed or used by unauthorized personnel. The question is especially critical when the information involved is highly confidential or the system operates in a time sharing mode. The problem becomes even more complex in a multiprogramed system: What assurance is there that program segments read into core storage will not be accidentally loaded over data currently being processed?

For purposes of this discussion data protection includes those measures incorporated in the system to prevent concurrent updating of stored files, unauthorized use of stored files, and accidental destruction of data in core storage during processing by the computer. Applicable control considerations are discussed in the following three sections.

Concurrent Updating—The normal types of errors which can occur during the transmission of data over the communication lines do not pose serious problems as the majority of these can be discovered through the use of a strong edit routine and the incorporation of the on line controls previously discussed. But what about the problem of concurrent updating, as when two transactions in a multiprogramed system attempt to update the same file simultaneously. For instance, transactions A and B retrieve the same file and update it. If the updated version of the file resulting from transaction A is stored first, it will be lost when transaction B is stored. What is needed is a procedure which permits only one transaction to update a file at a time. In the IBM system software package this is referred to as "exclusive control."

"Exclusive control" can be achieved by requiring each transaction to "request" permission of the supervisory program to update a file. If the file is available, the supervisory program grants the request and the transaction updates it. During this time no other transaction is permitted access to this file.

Data Security—The prevention of unauthorized access to stored data can generally be accomplished by the use of lockwords, authority lists, and dedicated communication lines. Lockwords, sometimes referred to as "keywords" or "passwords," consist of several characters in a data file which the input transaction or inquiry must match in order to gain access to the file. The use of this device to control file references may be further refined by supplying several lockwords. For instance, one set of characters may permit the file to be retrieved for reading purposes only (read-protect), and still

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another set may permit both reading and writing.

When using lockwords, consideration should be given to the type of terminal used. If the lockword appears on each document printed by the terminal, it may defeat its own purpose since it becomes relatively easy to compromise it. There are devices available from which the lockword can be entered into the system in a non-print mode. This type of terminal should be used where feasible.

Authority lists

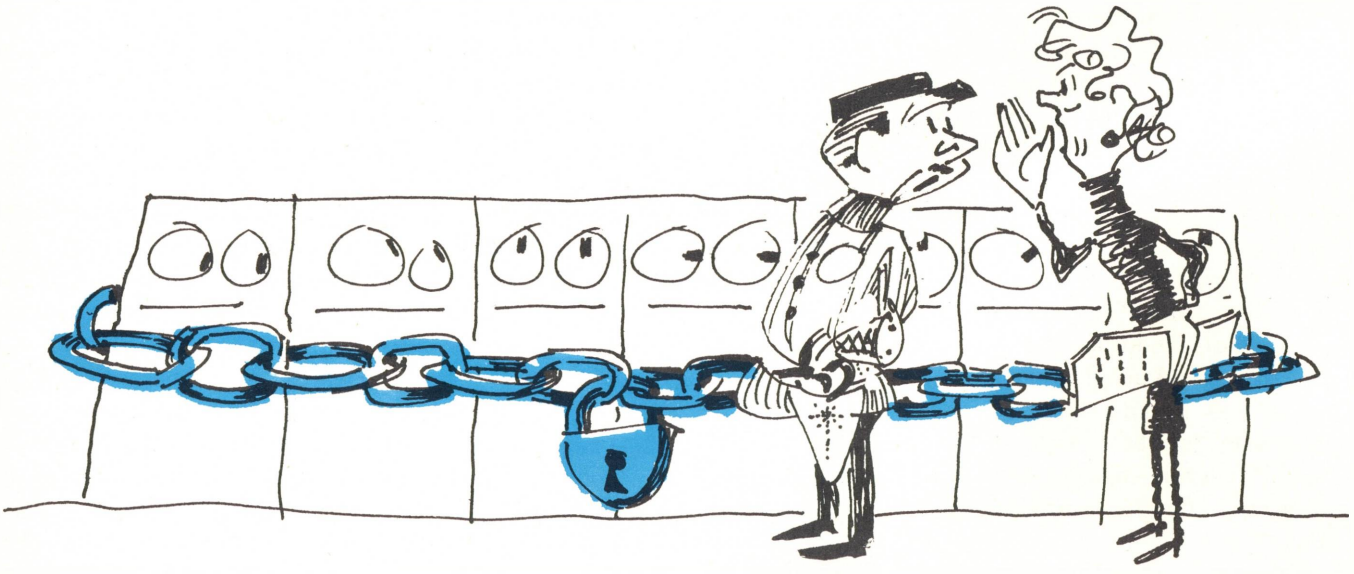
Authority lists are another form of protection. In this instance, the lockword is used to identify the person transmitting from the remote location. After the initial identification has been established, reference is made to an authority list which indicates which type of data the sender is authorized to receive. As with lockwords, the authority list may classify references to the files as read only or both read and write.

The previous discussion regarding the use of these two techniques does not exclude the use of other approaches to accomplish the same ends. For instance, "if an inquiry is received from a remote station. . . . . asking for confidential data, the computer might break the connection and then redial it, after checking to see that the station is authorized to receive the data.[2]" The extent to which these controls are used will depend on the type of system and the nature of the stored data.

When lockwords and authority lists are not used, terminals may be identified by means of dedicated communication lines. This generally implies the use of only one terminal on the line. Where terminals are attached to a party line or a similar network, answerback would be used in lieu of a dedicated communication line. With answerback a signal is sent to the terminal, and the latter responds within a prescribed amount of time with its code identification. Because this system can be compromised, it is not recommended where the security of stored data is of major importance.

The first two methods discussed should successfully exclude unauthorized personnel from the stored data files. However, even the best coding system can be broken if an individual can work on it. What procedure, then, can be incorporated in a system of this nature to prevent an unauthorized individual from transmitting data to the processor in an attempt to decode the lockword and gain access to the system? A monitoring routine could be established which would count the number of unsuccessful attempts to enter the system and after a certain number had been reached, say, three times in succession, a message might be printed out at the data station with instructions to call the downline station for an explanation. The point to be made here is this: If the data are important enough to require the

[2] Corning Publications, Inc., *EDP Analyzer*, March, 1966, Vol. 4, No. 3, p. 12.



"Lockwords" can be the key to preventing file compromise. One set of characters entered through the transmitter will permit the file to be retrieved for reading purposes only; another more restricted group of characters can be used for both reading and writing into the file.

use of lockwords and authority lists in the system, it is important to ensure that these controls are effectively accomplishing their assignments.

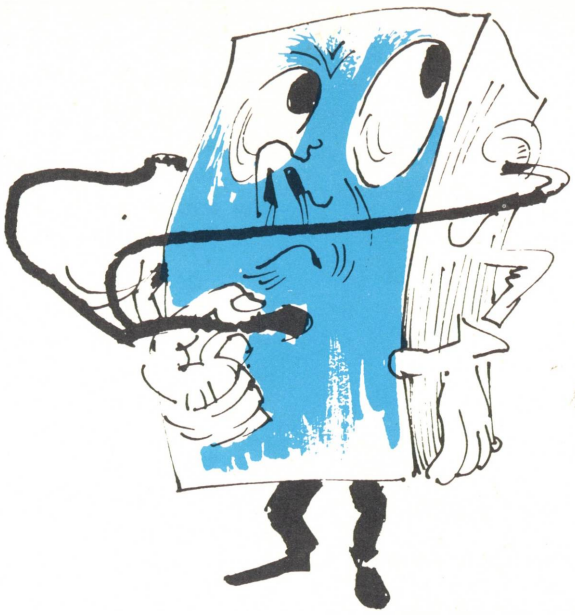
Boundary registers

Memory Protection—In a multiprogramed system, a number of different data elements will be in core storage at the same time. These will consist of the control program, a portion of which will permanently reside in core; a number of operational programs; and various queues of messages awaiting processing or in the process of being handled by the computer. Because of the possibility of a programing or a machine error, an operational program could address portions of core storage outside the limits of its own coding, work areas, or other applicable areas. The result could be the alteration or modification of another program; the destruction of data on tape, disk, or drum; or perhaps the creation of a series of endless loops. To keep this from happening the system should provide for some form of memory protection.

One technique currently employed is the use of boundary registers. This requires additional equipment in the form of an upper and lower boundary register. In the simplest form of this system the boundary registers are loaded with the upper and lower core storage addresses of the program when it is loaded into the processor. If during the course of the program the address portion of the instruction exceeds the boundaries indicated in the registers, an interrupt occurs, and control is passed to the supervisor program for appropriate action.[3]

The IBM and the Spectra 70 use storage and protection keys. Core storage in these systems is broken up into blocks. Each block has a four-bit storage key assigned to it. The program status word for each program has a four-bit protection key. Before any program references a block of core storage for the purpose of writing data, the storage key and the protection key must be matched; otherwise the operation is aborted, and control is passed to the supervisory program.

It is easy to see that there are a number of different approaches, depending upon the equipment used, to provide memory protection. Since this topic has been thoroughly discussed in various EDP publications,[4] it will not be discussed further in this article.



One of the characteristics of real time equipment is that it should keep operating without stopping if there is a malfunction somewhere in the system. This means that the machine must itself identify the trouble and either cure it or switch to another routine until the problem has been remedied.

Diagnostic controls

One of the characteristics of a real time system is that it must operate without stopping for fixed periods of time. The duration of time will depend upon the equipment configuration. A duplexed system can be designed to operate 24 hours a day, whereas a simplex system operates for only part of the day. Suppose, however, that there is a malfunction of some component part or that a programing error occurs while the system is operating. Should the processing halt, as was usually the case with second generation equipment, or should it continue processing after branching to some routine to handle the problem? The general rule is to keep the system operating if there is some way of circumventing the trouble. To accomplish this objective, it is necessary to build into the system some way of detecting and isolating error conditions so that appropriate action can be taken. This can be done through the use of diagnostic programs.

"Diagnostic programs are a tool used to test computers, isolate component malfunctions, and improve overall computer system operations."[5] We are interested only in those on line routines which detect the fact that errors are happening

[3] For a more thorough discussion of this topic refer to William H. Desmonde's "Real-Time Data Processing Systems, Introductory Concepts," Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1964, Chapter IV.

[4] See especially Corning Publications, Inc., op. cit., pp. 10-12.

[5] James Martin, *Programming Real Time Systems*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1965, p. 125.

and isolate, where possible, the cause of the error.[6] Once the error has been isolated it is up to the supervisory program to determine what action is necessary. According to Martin,[7] one of six actions can be taken:

1. Re-execute the faulty instruction and continue processing.
2. Restart the program in question.
3. Transfer to an exception routine characteristic of the program in question.
4. Initiate switchover.
5. Initiate closedown.
6. Halt.

Each of these alternatives will be discussed in the section on emergency procedures which succeeds this section.

The number and types of diagnostic programs in a particular system will depend on the design of the system and its equipment configuration.

For purposes of illustration, the following is an example of how these programs might work:

Consider a real time system communicating with a number of remote terminals. Suddenly a terminal breaks down. When this happens, a diagnostic program checks the communication network and establishes that there is a problem. Another diagnostic program checks each line until the down terminal is isolated. Once the error has been isolated, control is returned to the supervisory program, which might close down this line until repairs are made and route all interim messages to an adjoining terminal for manual handling.

It is always possible, of course, that errors may occur which will not be detected by such routines. The only protection against invalid data created by such errors is to have adequate file reconstruction procedures.

When a system is able to switch its operation from one computer an another, as is possible in a duplexed system, without changing its method of processing data, we say a "switchover" has occurred. On the other hand, if any equipment malfunction occurs in the system which requires the system to close down some part of the operation and modify its method of processing data to circumvent the error, we say it is in a "fallback" mode.

Emergency procedures

Once an error or malfunction has been isolated, it is up to the supervisory program to take appropriate action. As was stated previously, it has a number of choices. The first three of these—re-execute the faulty instruction, restart the program, or transfer control to an exception routine—do not present any unique problems. They have been satisfactorily tested in the traditional batch processing systems, and similar procedures can be incorporated into real time systems. The last three alternatives—initiate switchover, close down part of the system, or halt—are unique problems and require careful consideration if the system is to provide for all contingencies.

Failures that can cause a system to switch computers or close down a part of the system are generally due to hardware malfunctions. When a system is able to switch its operation from one computer to another, as is possible in a duplexed system, without changing its method of processing data, we say a "switchover" has occurred. On the other hand, if an equipment malfunction occurs in the system which requires the system to close down some part of the operation and modify its method of processing data to circumvent the error, we say it is functioning in a "fallback" mode. Whenever either of these conditions arises it is necessary to provide procedures to ensure that they are efficiently handled.

Switchover, as stated previously, assumes the use of duplex computers so that if the operating computer breaks down its supporting unit will take over processing. When the change from one unit to another takes place, whether it is automatic or manual, the machine operator should be informed via the console or printer what action he is required to take, if any, and

[6] Although there will be a number of off line routines peculiar to real time systems, we are not interested in them for purposes of this discussion since they do not affect the system while it is operating and are generally used only by the systems engineer.

[7] Martin, op. cit., p. 224.

the reason why the change was made. For an automatic switchover to take place, the on line computer should initiate action. However, if the malfunction is serious, this may not always be possible. To ensure that a changeover is effected when such a malfunction occurs, the standby computer should periodically check its counterpart. If it detects a malfunction, it should initiate the switchover. Whenever this transition takes place, a message notifying terminal operators of this fact should be sent downline.

During the transition it is vitally important that transactions not be lost. Messages that have not actually entered the system present no problems since these will be noted as missing when the sequence check (discussed under on line controls) is made. The problem lies with those that have entered the system and are awaiting processing on input, work, or output queues. This problem may be resolved by recording the message sequence number after a record has been updated rather than as each message enters the system, or perhaps both actions might be recorded and subsequently compared to each other. Another method is to post the message sequence number to the file as it is updated. In the event of a switchover the comparison of the transaction and file message number will prevent a file from being updated twice. It may or may not prevent messages from being lost depending on the system design.

Graceful degradation

Fallback or "graceful degradation," as it is sometimes called, occurs in a non-duplexed system when a part of the equipment configuration breaks down but the loss of the particular piece(s) is not serious enough to shut down the entire system. When this happens, the machine operator should be informed by the control program as to the current status of the system and what action he should take. In some instances, terminal operators should also be informed. Procedures should be available to advise supervisory personnel what clerical action is necessary to support the system until it recovers and, finally, what action is necessary to restore the system to the condition that existed before the fallback occurred.

The results may be catastrophic when a real time system halts. If the halt is due to a complete breakdown of a major component the only thing to do is repair it as rapidly as possible. Procedures should be available for supervisors so that they may take necessary emergency action and guide clerical personnel in work which must be done while the system is down and initially after it recovers.

It is imperative that restart procedures be incorporated in the system. The restart is based on a complete checkpoint record written on a peripheral device such as a disk file. The checkpoint record, provision for which should be incorporated in the system, is a complete record of all messages, counters, logs, and status indicators in the system at that time. When a restart is necessary, the checkpoint record is used to restore the system to its condition at the time the checkpoint record was written. Each terminal is advised of the restart and the number of the last message properly received from the terminal at the time of the checkpoint. Subsequent messages are retransmitted, and the system is again operational.

If the halt occurs because of a system overload the problem is not as serious. System overloads can occur when a number of messages are read into core and subsequently it is discovered that there are not enough available core blocks to complete all the work the computer has started. This problem can occur in a multiprogramed system using random input. There must be some emergency procedures in the system to handle this dilemma.

It is possible to prevent this from happening, except in rare instances, by anticipating when the level of core blocks available for processing

Fallback or "graceful degradation," as it is sometimes called, occurs in a non-duplexed system when a part of the equipment configuration breaks down but the loss of the particular piece(s) is not serious enough to shut down the entire system.

When the level of core blocks in the computer available for processing data is reaching a danger point, the computer should shut down to the extent of refusing any additional input.

data in the computer is reaching a danger point. When this level has been reached, the computer should shut down and refuse to accept any more input. This means the computer must be able to control the volume to input during peak periods. This control is exercised in a system utilizing "polling" techniques by not "polling" the transmitting locations until the overload is ended. Another method that may be used is for the processor to send a signal either requesting the operator to re-enter the message into the system or locking the terminal pending further notice from the computer.

If the overload does occur, however, the system should be able to handle the problem by first determining the application programs temporarily in core which are not currently being used and making their applicable blocks available for the further processing of data. If this doesn't solve the problem, the system may have to destroy messages in the system, preferably on a last in basis, and request the applicable terminals to repeat the messages.

Conclusion

Real time systems are here to stay. If systems analysts, programers, and auditors are to design and review these complex applications, it is necessary that they understand what a real time system is and, more important, the controls necessary to ensure that the desired results are produced. An understanding of the traditional controls is not sufficient when operating in a real time environment. Although these controls, such as matching and batching or validity and limit checks, are just as necessary to the effective operation of a real time system as to a batch system, the nature of the real time system has necessitated additional controls to ensure that the system operates as desired.

This article discusses many of those control considerations. It is not intended as an all-inclusive statement of control requirements in real time applications, since these will be dictated by such factors as system design specifications, the equipment used, security requirements, and many other factors. It merely summarizes some of the more common control considerations basic to a well designed real time system.

Planning and control of business procedures are all too often badly neglected in professional practice — the attorney's, architect's, or even the management consultant's office. Some corrective measures for —

BETTER MANAGEMENT CONTROL IN THE PROFESSIONAL OFFICE

by Reginald L. Jones and H. George Trentin
Arthur Andersen & Co.

THE TECHNIQUES of planning and control needed to keep a professional firm operating profitably and effectively are much simpler than those required to manage a business enterprise. Yet they are all too seldom applied. In many architectural, engineering, law, medical, and other firms engaged in selling professional services the way in which the practice is administered is a hindrance rather than a help to its progress.

Unlike a business executive, the typical professional man has not been prepared by education or experience to consider management important or interesting. His interest is in his own field; his mission is to serve his clients; and often he has difficulty meeting all the demands on his time. His normal tendency is to consider administrative systems and procedures necessary evils. Often the result is neglect of the business affairs of his firm.

This situation presents a real opportunity for the CPA who serves as the professional firm's accounting advisor to be of genuine service, to move beyond the bookkeeping and billing systems to design an effective management control system for the client. The basic principles outlined in this article have evolved from our own firm's consulting assignments for professional clients. They are applicable to all organizations providing personal services (even to consulting and accounting firms themselves).

Symptoms of trouble

Many professional firms have grown substantially in size in recent years. From the firm's point of view such growth is generally considered desirable, but it poses problems in the management of human effort. A small practitioner keeps informed of his firm's activities without conscious effort, through personal observation and involvement. Once a

This article has been adapted, with permission, from a chapter in a book being published this winter by the American Management Association (*Management Controls for Professional Firms* by Reginald L. Jones and H. George Trentin, copyright 1968 American Management Association, Inc., New York).

group of professional men reaches a certain size, however, no one man can give personal attention to everything, and the management process must be formalized.

A classic example of the communication problems that growth produces is the law firm that unaccountably finds itself representing both parties to an impending litigation. Most of the problems of growth are more subtle, although they may be equally devastating to a firm's reputation and chances for continuing prosperity. Every professional firm should be on the alert for the appearance of the following symptoms of the need for better management, often found even in firms showing good current profits:

Vague objectives—Every firm that plans to continue in profitable practice must have objectives, formulated and expressed in financial, operational, and manpower terms. Then the investment and its expected returns, the scope of operations, and personnel levels can be planned with a purpose. The absence of such objectives often becomes apparent in the absence of guidelines for directing activity toward results that are both desirable and reasonably attainable.

The absence of a uniform fee policy and a fair fee structure—Professional fees can be set in many ways. For example—just to mention two possibilities—an architect may have a contract for time-card cost plus profit, or a lawyer may charge on a statutory or court-approved fee basis. Regardless of how a particular client's fee is negotiated or arrived at, however, for management purposes a fee structure should be established as a bench mark for controlling performance and profitability.

Productivity and profits

Poor or uneven utilization of professional personnel—It is obvious that failure to control the productivity of personnel can affect profits directly. Less obvious are the effects on morale, on turnover, and on the competitiveness of fees.

Unreasonable overhead costs—Overhead cost control is particularly important in professional firms because many overhead or support costs tend to grow disproportionately with professional activity. Accordingly, management must guard against the growth and persistence of an unreasonable overhead cost level that drains away profits.

Poor control over the flow of cash—Experience has shown that the impact of management control on cash flow is most crucial in the areas of billing and of manpower utilization. With a manpower table given, expenditures for payrolls, rent, and other overhead items are relatively easy to anticipate. The timing and amount of cash revenue, however, must be well controlled, starting at the point where professional personnel actually perform client work. Every hour of such work creates a potential asset of unbilled charges; whether these charges are earned or are not earned on any given day is a function of manpower utilization. The cash realization of such unbilled earnings potential then becomes a function of billing control.

Any or all of these symptoms spell potential danger for the professional firm. What is needed is a management control system that will expose—and point up corrections for weaknesses.

Key elements of control

In a professional firm, as in a business, management should identify and control those factors in its economic activity which, either on an individual or a group basis, have the greatest impact on profit. The system should be designed to measure these key management control factors clearly and objectively.

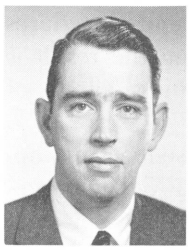
In professional work, management control centers around the value of the professional man's time and talent. In this article the use of time and talent is considered in five steps, as follows: the utilization of personnel, the worth of talent, the ability to bill for services, the investment in unbilled and billed charges, and acceptance of work.

Utilization of personnel

Adequate control over the use of personnel is fundamental to profitable professional work. This is because time is both limited and dynamic; the hour lost today is never recovered. Conversely, the hour spent on client business by a professional man creates revenue potential and is, therefore, the source of future billings.

Time spent on client work may be classified as chargeable time and time not spent on chargeable work as a burden or overhead cost to the firm. Actually, this is exactly what happens, because professional men are paid or take drawings over an interval of time that encompasses a certain number of available hours for work. If those available hours are used on client work, the time used is assumed to be productive; if not, it is nonproductive or a form of overhead cost.

Control of productivity starts with the maintenance of adequate time records. Time-record-keeping



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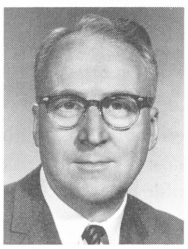

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KEYES AND KEYES
ILLUSTRATIVE TIME SHEET

Hrs.	Qtr.	Chargeable Time					
	1	Phone call	Client	X-Cell Inc., Inc.	File No.	627	
		Court time	Matter	Merger with Giant Corp.	Date	6/2/68	Initials J.D.
		Travel	Expl.		Expenses		$
2	3	Conference					
1	–	Research					
		Other (explain)					
Hrs.	Qtr.	Chargeable time	Client	Ajax Corp.	File No.		
		Phone	Matter	General Corporate	Date	6/2/68	Initials J.D.
		Court time	Expl.		Expenses		$
	2	Travel	Other - Consultation with S.E.C re - 10-K		Cab fare		1 25
	2	Conference					
		Research					
1	–	Other (explain)					
6	–	Total chg. – this pg.	DAILY TIME SUMMARY		Tot. exp. – this pgs.		1 25
		Total chg. – other pgs.			Tot. exp. – other pgs.		
6	–	Total chg. – day			Tot. exp. – chg.		1 25
1	–	Office management					
		Charity					
		Promotion					
		Director activities	Held billing - A.B. Clark Corp.				
		Professional development	1 hr. conference				
		Vacation, holiday, illness	$2 - Cab fare				
1	–	Held billings			Cab fare		2 –
		Lost time					
2	–	Total nonchargeable (day)	Group Corporate	Approval Signature	Tot. – nonchg. exp.		2 –
8	–	Total hours	Page No. 1/1	John Doe	Tot. – all exp.		3 25
1	–	Overtime hours	Date 6/2/68				

EXHIBIT 1

involves both the individual and the firm's accounting department. The individual is responsible for an accurate account of the use of his available hours, and the accounting department is responsible for summarizing such time for each client engagement in progress and by category of nonchargeable time.

Every professional man in a firm should account periodically for all of his time during normal working hours whether spent on client matters or on nonchargeable activities such as administration, promotion, and professional development. Chargeable time worked after normal hours should also be reported because the firm should have a complete record of work done on client and other projects as well as of total hours worked by employees and partners.

The original record of this time is often a personal diary, in which entries are made each day. The information should then be recapitulated on a time sheet at regular intervals; the time sheet serves as the accounting record for bookkeeping purposes.

Exhibit 1 on this page shows an individual time sheet used by a law firm. In this example, the smallest unit of time recorded is a quarter-hour. The file number identifies the client engagement. Note that the form provides for the recording of expenses as well as of time.

This time sheet was designed for use in a manual accounting system and thus is provided with perforations for separation and sorting of client charges. Note that the sheet has two basic sections: the client data and a daily time summary. The summary provides data for calculation of a chargeable time ratio and for distribution of nonchargeable time by activity. Summarization of the daily time data is facilitated by the use of a peg strip, for which holes were provided.

The purpose of the timekeeping procedure is not only to provide billing information for those engagements to be billed on the basis of time spent but also to inform the firm about its total cost of providing services on any engagement. Among other benefits, this knowledge could help the firm in its future fee negotiations.

Nonchargeable time covered

Another purpose served by this time-reporting procedure is to enable the firm to review and control the nonchargeable time of its personnel. Certain nonchargeable activities—such as promotion of new business—are appropriate at the higher levels of the firm but usually not at the lower levels. It is important to know who charges time to promotional activities and under what circumstances.

Also, instances may arise where individuals wrongly decide that time worked for a client is to be charged to a training category rather than to the client's account. It is important to be able to identify and rectify these mistakes in time reporting. In addition, where indi-

ASSOCIATED ARCHITECTS AND CO.
SUMMARY OF CHARGEABLE RATIOS
June 19__

Description	Current Month: Total Firm	Principals and Project Mgrs.	Design	Drafting	Specification Writing
Hours:					
Total reported	4,576	704	528	2,640	704
Vacation/holiday	480	160	80	200	40
Available hours	4,096	544	448	2,440	664
Chargeable hours	3,296	260	324	2,080	632
Chargeable ratio – actual	80.4%	47.7%	72.3%	85.2%	95.1%
Chargeable ratio – budget	84.9%	60.0%	80.0%	90.0%	90.0%
Better (worse) than budget					
Chargeable ratio	(4.5%)	(12.3%)	(7.7%)	(4.8%)	5.1%
Chargeable hours	(182)	(66)	(34)	(116)	34
Per diem value	($5,010)	($2,640)	($1,700)	($1,160)	$510
Overtime hours	300	10	–	270	20

EXHIBIT 2

viduals are working overtime, it is important to understand why that may be necessary and to determine its propriety in view of the nature and amount of time associated with nonclient work in the same period as the overtime. Finally, a review of time reports and information regarding nonchargeable time is an important check on the firm's personnel supervision, for it is a basic management responsibility to maintain the planned level of chargeable time and possibly to adjust the size of the staff to control the overall level of nonchargeable time.

A convenient way to measure chargeable and nonchargeable time is through a chargeable ratio—the ratio of an individual's chargeable hours to a standard measure, perhaps 40 hours a week, or to total hours worked. In addition to computing individual chargeable ratios, it is often useful to compute a combined chargeable ratio for a department or working group or for each level of responsibility in the firm, from principals through juniors.

Exhibit 2 on this page shows a summary of chargeable ratios in an architectural firm. Note that the report is structured by department, not by project. The organization of this firm includes design, drafting, and specification-writing departments, each with a man in charge. A fourth departmental category includes principals and project managers.

The key control provided in the report is based on the budgeted chargeable ratios. For example, the ratio is lower for principals and project managers—60 per cent—than for drafting work—90 per cent. The budgeted ratio becomes a standard of performance required if the firm is to achieve the expected level of profitability.

To follow through our example, let's consider the drafting department, where the budgeted performance is 90 per cent of available hours. During June actual performance was 4.8 per cent below the standard. This is equivalent to 116 hours of nonproductive time that should have been productive if standard performance had been met. In this firm the billable value of a drafting hour is $10; accordingly, the loss in potential fee revenue is $1,160 with respect to drafting. Compare this result with the fact that there were 270 overtime hours worked during June.

The utilization of draftsmen is the responsibility of the head of the drafting department. This is in contrast to control of draftsmen charges to a specific project—the responsibility of the project manager. Because chargeable time of draftsmen has not met the standard, the department head should have some explanation and plans to improve manpower utilization. The report in Exhibit 2 shows current month figures, but a similar report would also be prepared on a year-to-date basis.

Worth of talent

The earning assets of a professional firm are its professional or technical personnel. By billing the services of these people the firm creates revenue; revenue in turn must cover not only the salary costs of the professional people but also those of the firm's administra-

tive and support personnel as well as all overhead expenses. The remainder is the firm's profit.

A common way of ensuring that adequate provision for overhead and profit will be made is to establish a per diem or per hour fee structure or a standard billing rate for each professional man. This is often a standard multiple or markup of salary cost, although deviations from the standard may be made in recognition of special talents, advanced standing, or occasionally for different types of consultation or work. The markup contemplates that not all of the professional man's time will be chargeable to client work. Hence the chargeable ratio we have discussed is an important input to establishing a per hour standard. The markup also appears to contemplate that the billing for any particular client engagement will be based on professional time expended on the work. We know, of course, that this is not universal practice; to take legal work as just one example, a number of factors other than time spent can enter into fee determination—the result obtained for the client, ability to pay, possibility of continuing work, nature of services, and so on. For example, an attorney may prepare a client's will for a nominal fee, unrelated to the time actually spent in preparation, in anticipation of subsequent work.

The establishment of a per hour billing rate can be accomplished in one of two basic ways:

Use of a going rate—Under this method the firm can determine by inquiry how other firms value an hour's worth of chargeable time by partner or employee classification. A set of rates based on the findings can then be established.

Use of a pay rate multiple—A second approach is to develop a billing rate based on a multiple of the payroll rate of an employee or the equivalent drawing rate of a partner. For example, in many architect offices a factor of two and one-half times payroll cost has been used historically to compute fees specifically based on time.

ARCO CONSULTING ENGINEERING COMPANY
EVALUATION OF PER DIEM RATE STRUCTURE

Step		Partners	Associates	Total Firm
	Per Person:			
1	Total hours	2,080	2,080	
	Vacation/holiday hours	240	160	
	Available hours	1,840	1,920	
	Budgeted chargeable ratio	60%	80%	
	Chargeable hours	1,104	1,536	
2	Per hour rate	$ 40	$ 20	
	Per diem rate – 8-hour day	$ 320	$ 160	
	Billable value (rounded)	$ 44,000	$ 31,000	
	Number of personnel	3	6	
	Total billable value	$132,000	$186,000	$318,000
3	Budgeted expenses			
	Drawings	$ 45,000		$ 45,000
	Salaries		$ 66,000	66,000
	Other expenses			147,000
	Total			$258,000
4	Planned Profit Contribution			$ 60,000
	Per Partner:			
	Planned profit contribution			$ 20,000
	Partner drawings			15,000
	Total planned distributable income			$ 35,000

EXHIBIT 3

Exhibit 3 on this page shows the evaluation of a per diem rate structure based on a planned chargeable ratio and expected earnings level using the going rates for this type of firm. Regardless of how the per diem rate is established it must provide for the planned profits and expenses of the firm.

The requirements for evaluating a per diem rate structure on this basis involve several steps and assume the use of a budget or profit plan.

Step 1: The total expected chargeable hours are calculated based on budgeted chargeable ratios. In the exhibit, the *total hours* figure is based on a 40-hour week for 52 weeks. Firm policy provides for vacations of four weeks for partners and two weeks for associates and for ten holidays. The chargeable ratios are based on prior experience and on what is considered desirable performance, recognizing the need for promotion and other activities.

Step 2: The per hour rate is multiplied by the chargeable hours calculated in Step 1 to determine the total billable value per person. This value is then multiplied by the number of persons in each category to determine the total billable value for the firm.

Step 3: The total budgeted charges for partners' drawings, associates' salaries, and other expenses are summarized to determine the total costs for the firm.

Step 4: The total planned profit

contribution is determined by subtracting the budgeted costs from the total billable value. That total is then divided by the number of partners to determine the planned profit contribution per partner. If the results do not meet the partners' objectives, a new rate structure can be determined and evaluated in a similar manner.

The per diem concept has three distinct advantages for the professional firm:

1. It provides a ready means of arriving at a fee based on time spent or of assessing the gain or loss in standard profit where the fee is determined on a basis other than time.

2. It provides a bench mark for evaluating the profitability of limited fee arrangements by comparing the limited fee with the per diem equivalent of the time actually spent or expected to be spent on a budgeted or before-the-fact basis.

Although most professional men are familiar with the per diem concept, they often fail to realize its full benefits. Doctors and dentists usually think of each visit or operation in terms of its retail (per diem) value. But many other professional people, especially those involved in long-term projects, measure their ultimate profitability only in terms of billings in excess of direct payroll costs, neglecting to compare billings and the per diem value of the work. This practice is unsatisfactory because of the natural tendency to regard as profitable any engagement that covers its direct payroll costs. The measure of profitability should include an evaluation of the amount of overhead recovery and profit provided by the engagement measured against the standard, or per diem, value. Variations or sacrifices from the per diem value of work contain two elements that may be overlooked: excess payroll costs that must be paid out of the gross profit on the engagement —thus reducing the overall gross profit below the standard—and lost opportunities to put those excess payroll costs to work earning their normal per diem values elsewhere. Any writeups or writedowns of per diem value should be reported to the firm's management and to the engagement partner responsible for the variation.

Some firms compute actual overhead rates and apply overhead costs to personnel costs that are charged to engagements on a retroactive basis. This practice really serves no purpose. It does not help to control overhead because these expenditures can be controlled only at the source and at the time made. Moreover, individual engagements are not responsible for the level of activity in the firm or for the amount of overhead expenditures—the factors determining the overhead rate—and their profitability should not be viewed in light of these factors.

The per diem rate affords a better measure of profitability than the use of the overhead rate described, and its administration is easier. This is not to say that the comparison of overhead expenditures to chargeable payroll is not important; on the contrary, it should be made regularly. Significant variations from the planned overhead rates—provided they are justified and approved by management—should then be reflected in the per diem rate along with any changes in the desired profit factor.

From the standpoint of overhead cost, a critical factor affecting a professional firm's profitability is its ability to maintain a realistic balance between professional and support personnel. This balance is one of the basic factors determining the ratio of productive costs to overhead costs inasmuch as the costs of support personnel account for a major portion of all overhead costs.

The sheer number of personnel cannot tell the whole story; there are many options of substituting equipment costs or costs of outside services for personnel costs. In addition, there can never be a direct correlation between the number of professional and support personnel.

Consequently, the soundest method for controlling overhead cost is to incorporate a well constructed budget of overhead expenses into a per diem structure. The achievement of firm profits can then be reviewed by cause and effect, including maintenance of chargeable ratio, billing per diem value, and control of overhead spending within budget.

The establishment of the worth of time and talent provides a valuable key control factor, not only to assure adequacy of fee negotiations and billings but also to provide a standard for revenue control and to assist in the analysis of profit leaks.

As a simple overall example: The Arco Consulting Engineering Company, with three partners and six staff personnel, shows a profit for the fiscal year of $42,000, assumed to be shared equally by the three partners:

Billings (memo)	$218,000
Cash receipts	220,000
Expenses—	
Salaries: Professional	100,000
Office	30,000
Payroll costs	6,500
Rent	18,500
Utilities	10,000
Other	13,000
Total expense	178,000
Partner profit	42,000
Per partner	$ 14,000

The adequacy of this income for the partners is, of course, up to them; let us suppose that each partner agrees it is not adequate and that each should earn $36,000. The basis on which the achievement of this goal was planned is shown in Exhibit 4 on page 29; the notes tell why the result was not achieved—little profit leaks that totaled almost two-thirds of the expected income.

Ability to bill for services

In addition to controlling the chargeable hours worked by its personnel, the firm must control the execution of its billing policy. The maintenance of a desirable chargeable ratio and an adequate per diem structure for its personnel does not of itself assure the firm its desired profit. The firm also must be able to bill the time charged at some

acceptable rate in order to earn this profit.

Two points are important in this connection. The first is the necessity of arriving at a clear understanding with the client on the amount to be billed or on the means of calculating the amount and the timing of billings. This understanding should be reached as early in the engagement as possible. The second point, already mentioned, is that the profitability of any engagement should be measured against a standard and that any variations from the standard should be recognized as such. The standard used for this purpose should be the per diem value of the work, because this figure already contains the elements of budgeted chargeable ratios and overhead and of planned profit.

Any engagement whose billing does not equal the per diem value of the work involves the firm in a write-down or write-up. Both types of adjustments should be approved at a high level in the firm and should be clearly identified in financial reports. The advantage of this approach is the opportunity it affords for identifying all variations from the desired markup with the particular client or engagement involved, the responsible principal or manager, and the type of service or work performed.

There may be several reasons why a certain engagement is billed at other than the per diem value, but these are reducible to two from an internal management point of view:

1. The client and firm management negotiate a fee based upon billing rates different from the per diem structure.

2. The time expended to complete the engagement is different from the time billable for the work.

Because the reasons for the write-down or writeup are somewhat different under each condition, a distinction should be made in the management reporting of each. The distinction basically reflects whether the fee adjustment results from fee negotiation or from engagement performance. This distinction is important in most firms, inasmuch as the responsibilities for engagement performance and for fee negotiation do not always rest with the same individuals.

The ability to make this distinction of responsibilities depends upon the development of a budget for the engagement in terms of man-days multiplied by the appropriate per diem rates. When approved, this budget becomes, in effect, the engagement manager's contract with the firm management, and any difference between this budget and the actual fee negotiated becomes

EXHIBIT 4

ARCO CONSULTING ENGINEERING COMPANY
SIMPLE PROFIT AND LOSS STATEMENT
Year Ended March 31, 19__

Profit Gain Or (Loss) From Standard	*Notes*	*Description*	*Actual*	*Standard*	*Standard Based on __*
($ 30,000)	1	Chargeable fees	$258,000	$288,000	80% chargeable ratio and $20 per hour
		Fee reductions			
		Fixed fee negotiated	(15,000)		
		Project inefficiency	(10,000)		
($ 7,000)	2	*Total*	($ 25,000)	($ 18,000)	5% of fees budgeted
(15,000)	3	(Increase) decrease in unbilled work	($ 15,000)		
($ 52,000)		Fees billed	$218,000	$270,000	
2,000	4	(Increase) decrease in accounts receivable	2,000		
($ 50,000)		Cash receipts	$220,000	$270,000	
(16,000)	5	Expenses	178,000	162,000	162% of professional salaries
($ 66,000)		Partner profit	$ 42,000	$108,000	
($ 22,000)		Per partner	$ 14,000	$ 36,000	

	Profit (Loss) Per Partner
[1] Failed to get expected utilization on billable work.	($10,000)
[2] Poor project management.	(2,333)
[3] Inadequate attention to billing.	(5,000)
[4] Accelerated account collections.	667
[5] Failed to hold overhead spending to budgeted overhead rate of 162% of professional salaries. (Actual overhead was 178% of professional salaries of $100,000.)	(5,334)
	($22,000)

LIMA, ALPHA & HAMILTON
FEE ADJUSTMENTS REPORT
Year to Date Through Tenth Period

Attorney	Total as % of Fees Billed	Better (Worse) than Per Diems: Total	Wills, Estates, And Trusts	Litigation and Administrative Agency	Corporate	Domestic Relations	Taxes	Real Estate
H.V.J.	(6)	($ 8,200)	$ 3,000				($11,200)	
C.E.R.	(30)	(33,420)	(3,000)	($30,420)				
R.E.G.	45	62,000	(1) 80,000		($15,200)		(2,800)	
C.C.A.	(10)	(29,000)			(2,000)	($8,000)	(19,000)	
M.B.A.	(40)	(40,000)						(2)($40,000)
J.S.K.	4	20,000	20,000					
R.L.	(1)	(1,000)			(1,000)			
Total	(3)	($29,620)	$100,000	($30,420)	($18,200)	($8,000)	($33,000)	($40,000)
Percent of total fees billed		(3%)	20%	(60%)	(6%)	(10%)	(50%)	(40%)
Significant Clients								
Harris Estate			(1) $ 50,000					
Able-Baker Realty Co.								(2) ($30,000)

EXHIBIT 5

management's fee bonus or fee sacrifice. The actual billings should identify the amount of this variance as well as of any variations from the approved budget. Variations from the approved budget would be the responsibility of the man assigned to supervise or carry out the work.

In the final analysis, the ability to bill for services is controlled by monitoring fee adjustments from the planned per diem structure (writeups and writedowns). Although resolution of any individual client billing may appropriately result in a fee adjustment, the net of all writeups and writedowns for the firm as a whole must be balanced off to achieve a consistent and acceptable level of profit. The net effect of such fee adjustments for the mythical law firm of Lima, Alpha & Hamilton is shown in Exhibit 5 on this page.

Unbilled and billed charges

Another important control factor for the professional firm is the management of its unbilled and billed charges. The objective of such a control is to insure that all charges are billed and that all billings are collected. In addition, it is important for the firm to know and to control both the level of its unbilled work and the amount of cash on hand for immediate requirements.

The controls over unbilled and billed charges can be built on a few basic accounting techniques. Management's exercise of these controls is then reflected in various management reports. These reports indicate the planned level of billed and unbilled charges, cash on hand, and cash receipts and disbursements and show actual results against the plan, highlighting any significant deviations.

Ratio techniques can be employed to compare the current investment in billed and unbilled client charges to a planned level. The planned level may be established by management in terms of an acceptable level of weeks or months of charges that the firm is willing to carry as an investment in its work-in-process inventories. For example, if the firm establishes a policy that all clients should be billed every eight weeks on an average, its current client inventory level should not exceed the last eight weeks of fees charged to in-

ventory. The weekly average of this total may be calculated and divided into the current inventory balance accumulated at per diem rates. The number of weeks calculated in this way can then be compared with the pre-established performance standard. The ratios in this type of comparison will emphasize the importance to the firm as a whole of predetermined levels of cash, unbilled inventory, and accounts receivable. In addition, the use of the number-of-weeks targets enables each engagement manager to bill and to collect individual jobs within those targets, thus keeping the firm as a whole within the prescribed levels.

The example of one law firm illustrates this technique. By converting current charges to inventory to a weekly equivalent and dividing it into the overall unbilled charges, the firm found that its level of such charges represented almost 48 weeks of fees. The partners agreed that 13 weeks was a reasonable target, and a concerted effort to bill out charges was undertaken. Every engagement unbilled within the prior 13 weeks was scrutinized, and billing activity stepped up noticeably. As expected, a significant increase in cash flow resulted, and the investment in unbilled charges was reduced.

Exhibit 6 on this page shows a monthly report of balances used by an engineering firm to exercise these controls.

Acceptance of work

Fundamental to any discussion of control of time or billings is the question of client arrangements. One of the best services a professional firm can render to itself and its clients is the early development of a clear agreement as to the services to be performed and the basis for billings. In many cases this agreement may take the form of a written contract; in others it may be only a letter of understanding. Regardless of the degree of formality, the terms of the understanding should be specific.

In addition, all client arrangements should be documented within the firm in a standardized format. Regardless of whether it is called an engagement notice, new case memorandum, or by another title, the form will serve to activate accounting and business controls and pinpoint engagement management responsibility. It is essential to specify the technical requirements and objectives of the engagement as well as the administrative details, including client responsibilities for liaison and project participation.

As important as the preceding details is a specific understanding with regard to the amount and method of computation of the fee and the timing of billing. It may not be possible or even desirable to agree on the amount of the fee at the beginning of the engagement. What should be settled, however, is the basis of calculating the fee and the details of billing arrangements.

Several methods of fee calculations are commonly used today. However, professional work is done either under open-ended or limited fee arrangements. The open-ended arrangements, which include recovery of useful time charged at normal per diem rates, are normally preferable from the viewpoint of the professional firm. However, the fact is that more and more work each year is being offered on the basis of a limited fee, not only by governmental agencies but by many clients who control this type of cost by a program budget of limited amount. It then becomes necessary for the professional firm to determine if it can expect to earn the desired profit under a particular limited fee proposal and if its expectations are being realized, both during and after the completion of the engagement.

The question of billing arrangements is important because it affects the cash flow of the professional firm. As a general proposition, it is to the firm's advantage to bill services as soon after rendering them as possible since the

EXHIBIT 6

ENGINEERING ASSOCIATES

SUMMARY OF INVENTORY AND ACCOUNTS RECEIVABLE

Month: September 19__

	Inventory	Accounts Receivable	Year to Date Actual	Year to Date Plan
Beginning balance	$142,000	$101,000		
Time charged to clients — at per diems	40,100		$352,520	$380,000
Bills rendered	(60,000)	60,000	480,640	500,000
Fee adjustments (net)	(2,100)		(28,000)	(19,000)
Cash receipts		(63,000)		
Bad debts		—	3,000	—
Ending balance	$120,000	$ 98,000		

Number of Weeks of Fees:

	Total	Inventory	Accounts Receivable
Standard	21.0	13.0	8.0
Current month	21.8	12.0	9.8
Last month	24.3	14.2	10.1
Year ago	51.1	35.3	15.8

One of the best services a professional firm can render . . .

January 30, 19--

Mr. T. B. Smith
Partner
Beta Associates
95 Lee Street
Chicago, Illinois 12101

Dear Mr. Smith:

In accordance with our recent conversation we are pleased to submit this proposal for professional services:

Scope

We understand that you now occupy about 50,000 square feet at the above address, that you anticipate substantial expansion in the next few years, and want to plan now for acquiring the additional space which will be needed. You wish professional assistance to help you determine what your space requirements will be; to find the best solution to these requirements, either in 95 Lee Street or elsewhere; and to plan and implement a move into the new space.

We propose to assist you in this project as outlined below in three phases of work:

Phase I--Determination of Requirements

This would be a study of your present requirements and how they will probably change and grow during the period for which we will be planning. It would include a description of the amount, type and distribution of space required as well as other physical and environmental factors.

Phase II--Site Analysis and Lease Negotiation

Having established your requirements in Phase I, we will analyze the plans and lease terms of the two or three most likely sites as recommended by your real estate consultant and compare them with the space available at 95 Lee Street.

Phase III--Planning and Construction

Once the new site has been decided upon, we will do the following work to implement the move:

A. Planning

1. Block Layouts
We will revise and refine
Phase II for your final a

2. Detailed Layouts
After your approval of t
detailed layouts of each
walls, the position of f

B. Design Standards
We will prepare design and de
the space standards establish
clude:

- Design concept
- Color palette
- Partitions
- Flooring
- Ceiling
- Finishing items--wall
  accessories
- Furniture

C. Letting of Contracts
For any construction and cab
drawings which is not a part
suggest contractors, send the
in the analysis of bids and a

D. Coordination and Construction
Coordination as required wit
construction remains on sched
are made known and are covered
supervision of all phases of
work to insure that methods a
ings and specifications.

Fees

A. Our fees for the above work
(2 3/4) times the payroll of
for your account.

B. 1. In the event that you dec
total fee for all three phas
to 10 per cent of the total
and decorating the space to
include the price paid for a
electrical, and plumbing work
ing, cabinet work, furniture

EXH

. . . is a clear, written agreement as to services to be performed and fees.

...lock layouts prepared in

...k layouts, we will prepare
...ent showing all interior
...e, equipment, and personnel.

...g standards to complete
...hase I. These areas in-

...erings, drapery, carpet, and

...rk called for on the above
...the landlord's work, we will
...gs out for bid, and assist
...g of contracts.

...pection
... contractors to insure that
... and that any changes required
...riting. Inspection and
...ction, including landlord's
...erials conform to the draw-

... two and three-quarters
...ersonnel actually working

...o move to a new location, the
...l not exceed an amount equal
...s of constructing, finishing,
...upied by you. Such costs to
...erior construction, mechanical,
... your space and all finish-
...rpets, drapery, and accessories.

Should the landlord undertake, as a part of his lease responsibility, to assume part of the above costs, we would have no way of determining the actual cost of his share of the work. In that case we would negotiate a formula for arriving at an equivalent to 10 per cent of costs.

2. In the event that you should decide to rent additional space at 95 Lee Street and renovate parts of your existing space, our total fee would not exceed 12 per cent of the costs outlined above.

C. In addition, we are to be reimbursed at cost for any out-of-pocket expenses for such items as blueprints, telephone, carfare, filing fees, and so on, including any extraordinary expenses that we may incur at your request and with your approval.

D. The above fees do not include the cost of any engineering or other consulting services which may be required. These fees would be billed directly to you at cost.

Billing

Invoices will be submitted monthly in accordance with actual payroll costs against an estimated total fee.

General Terms

A. Notwithstanding the foregoing, you shall have the right to terminate the scope of the work outlined above at any time upon five (5) days written notice to us. In this case, we shall be compensated for work already done at a rate of two and three-quarters (2 3/4) times payroll.

B. Any changes made by you after approval of the detailed layout, which shall require additional work, shall be paid for by you as an extra charge, above estimate, at a rate of two and three-quarters (2 3/4) times payroll.

C. The scope of the work may be modified or expanded, in which case a new letter of agreement would be executed so that we have a mutually clear understanding of our responsibilities.

Your signature of acceptance below will make this proposal the agreement between us and authorize us to proceed with this project.

Sincerely,
ABC Associates, Inc.

Accepted for Beta Associates

By: _____

Title: _____

Date: _____

Martin A. Johnson
President

firm's biggest cost—its payroll—must be met on a current basis. Some firms, especially in limited fee engagements, are inclined to defer billings on the theory that this "saves some of the gross profit for later" and avoids making a contract look too profitable—until the profitability has been well established by performance.

The question of profit recognition and timing is really separate from the question of cash control, and one should not influence the other. Proper accounting techniques can be employed to reflect profit realistically; it should not be necessary to delay billings merely to accomplish this purpose. Whether interim billings are made on the basis of costs incurred for the period or on some measure of physical completion, the question of profit accounting and cash control can and should be considered separately.

The classic tradition, still followed in many firms, is that any expenses incurred by the firm in behalf of a client should be reimbursed by the client. Where certain out-of-pocket expenses are not billed separately, it seems reasonable to assume that excessive costs incurred for these specific items as a result of specific client requests should be billable to the client.

Out-of-pocket expenses

The classic tradition, still followed in many firms, is that any expenses incurred by the firm or its personnel in behalf of a client should be reimbursed by the client. In some cases, however, certain out-of-pocket expenses are considered firm overhead and are recovered through the per diem rates billed. Where these expenses are not normally billed separately, it seems reasonable to assume that excessive costs incurred for these specific items as a result of specific client requests should be billable to the client. An example of the latter situation might be the cost of preparing more than a normal number of copies of reports, documents, drawings, or other, similar items.

Other types of out-of-pocket expenses associated with the client engagement—such as supper money, overtime premium, and travel and communication expenses—may or may not be reimbursable under any particular arrangement. Because nonreimbursable expenses must be subsidized out of the firm's gross profit, it is advantageous to provide for the reimbursement of expenses wherever possible. Regardless of what arrangements are finally negotiated with the client, it is important to specify the types and amounts of expenses to be reimbursed. In many cases, expenses which could be reimbursable are not recovered merely because no provision for them was made in the initial agreement.

A corollary but important benefit of having a specific understanding with the client on the terms of an engagement is the opportunity it affords of identifying work which is not a part of the original agreement. It may not be possible to determine in advance if the additional work will be billable, but it is important to collect this time separately to avoid distorting the profit on the initial agreement. In addition, knowing the amount of time accumulated on each extra project can be an important factor in determining whether it is to be billed and at what amount.

An illustrative arrangement letter of an architectural firm might look something like the one shown in Exhibit 7 on the preceding pages, 32 and 33.

Conclusion

The management of a professional firm can improve its control over the economic results of operations by looking at the key factors of management control. These can be summarized for professional work as follows:

1. The utilization of professional personnel as reflected in chargeable times ratios
2. The worth of talent predetermined in accordance with an acceptable per diem structure, with controlled overhead
3. The ability to bill adequately, based on control of fee adjustments from the per diem structure
4. The investment in time charges, billed and unbilled, kept within pre-established targets based on a planned level of operations
5. The acquisition of work based on acceptable engagement arrangements

Direct costing as an accounting method has many valid uses but is dangerous when used as the main basis for product pricing decisions, the authors maintain. They argue, instead, for the use of an alternative good for the long run — full costing.

DIRECT COSTING IN PRICING: A CRITICAL REAPPRAISAL

by Richard J. L. Herson and Ronald S. Hertz
Hertz, Herson & Company

KNOWLEDGE of how costs behave when there is expansion or contraction of sales or production is essential to understanding a business. The separation of costs into their fixed and variable components is the cost accounting technique normally used to provide this kind of information. Applications of such analysis to flexible budgeting and costing, breakeven analysis, and general cost control appropriately follow. Moreover, consideration of the variability or fixity of costs may even be an important element in certain aspects of sound pricing decisions.

The concern here, however, is with the broadening of this approach, especially since World War II, to a general costing-pricing philosophy commonly referred to as direct costing and its application to major business decisions, particularly pricing. In general, it is the thesis of this article that a policy of using "direct" or variable costs as a basis for pricing and related decisions may at times lead to radically wrong decisions. The reason is that direct costing fails to establish directly a basis for management to set standards of profitability that incorporate limitations of production capacity and appropriate allowance for risk.

Definitions

The looseness of terminology that has developed in recent years makes it necessary to define our terms precisely. Direct costing is a method of cost accounting which charges against production only those costs that vary directly with the level of production; all remain-

The frantic balancing of "direct" costs against "fixed" costs as a means of establishing a final price can result in a product that loses money.

ing costs are charged to operations as they are incurred.[1]

Variable costs are those costs of materials, direct labor, and variable manufacturing, distribution, administrative, and financial overheads that fluctuate as production and/or sales change within existing capacity and within a specified operating period. Fixed costs are those which remain independent of fluctuations in volume of sales or production within the operating period unless there are changes in production, sales, administrative, or financial capacity.

Direct costs are costs incurred in particular cost centers or specifically applicable to a particular product; indirect costs are costs applicable to cost centers or products only by allocation.[2]

Full absorption costing (as advocated in this article) means the inclusion in cost of all elements of manufacturing, distribution, and administrative cost and also a provision, computed either directly or indirectly, for a minimum net profit. Total cost, as thus defined, becomes the minimum acceptable selling price, and the formulas used for the absorption of all overheads, including the net profit element, are the "pricing discipline," a term we believe to be our own but generally applicable.[3]

Over a period of years we have seen the interchange of such terms as "marginal analysis," "breakeven analysis," "contribution analysis," and "direct costing." The various expressions have an underlying similarity of derivation in that they attempt to synthesize concepts and expressions found in cost accounting on the one hand and in economic theory (especially "marginal costs") on the other. Even if this synthesization were justified, it would not in itself be a valid reason for adopting a direct costing approach for the determination of profitability criteria. This "synthesization," however, is an oversimplification, the result, in our judgment, of an incomplete understanding of economic marginal analysis and the assumptions upon which it is based.[4]

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Value, selling price, and costs

While space is not available to examine in detail the theoretical bases of sound pricing policies, some general clarifying comments are necessary.

Regardless of the cost of a product to its manufacturer or seller, the price realized normally will not exceed its economic value. Once the product is brought to market, its economic value is the highest price the market will bear. In the case of goods that do not lend themselves to product differentiation, there frequently is a widely known price which, although it may fluctuate, is generally uniform throughout the market. In the case of products that lend themselves to product differentiation through such techniques as brand identification, styling, packaging, secret processes, and patent protection, the price is not established until the product is marketed.

Projections of market value

It is a major function of management, crucial to business success, to anticipate the market value of products. Projections of market value are the result of management's skill; its understanding of the markets for its and competitive products; its knowledge of past and

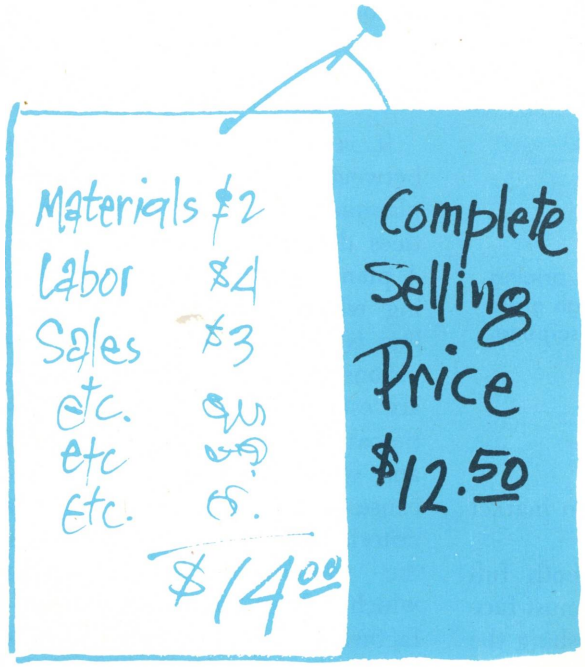
current prices of comparable products already on the market; consultations with potential users of the product; and a general understanding, perhaps intuition, regarding value.

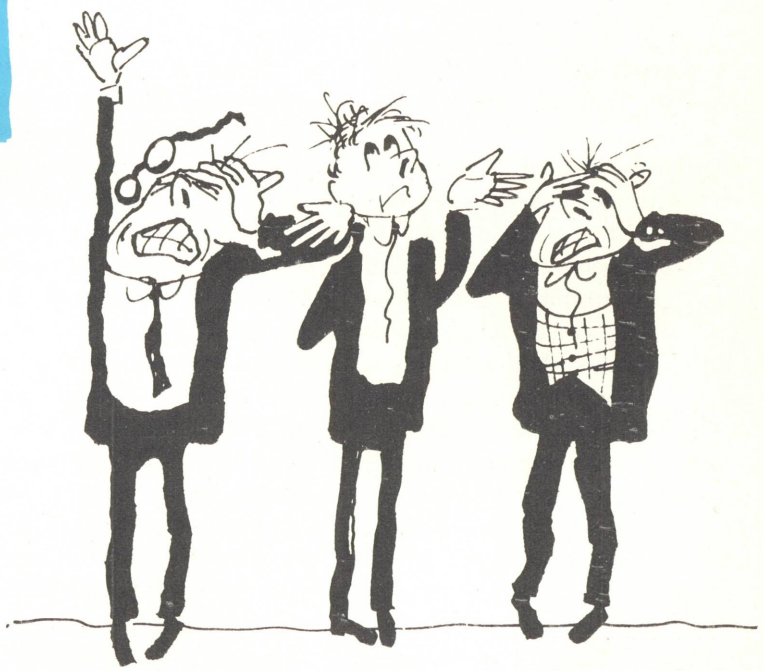
Cost does not determine selling price. However, in a well planned and well managed enterprise knowledge of cost is vital to sound pricing policy. Items that are not profitable on the basis of application of sound cost-selling-price criteria and cannot be "re-engineered" to fall within allowable cost levels may not be marketed. Thus, costing a product before it is offered for sale leads to the decision as to whether to offer it at the anticipated market price (as modified by such considerations as discount and/or freight terms, credit terms, advertising allowances, etc.) or discard it.

How does management determine pricing policies that will optimize the company's net profits? How does it systematically establish effective profitability criteria for selecting among alternative products and sales prices? How does it integrate profitability criteria with criteria for minimization of risk and maximization of use of production and distribution facilities? Effective refutation of the applicability of the direct costing concept requires a systematic analysis comparing it with an alternative, full costing.

Pricing discipline and full cost

Profit planning is essential to business success, and pricing discipline is essential for proper profit planning. Even direct costers must realize—at least intuitively—that a minute contribution margin is unsatisfactory. Without a minimum standard for profitability, management may be tempted to feel that since some profit is better than none at all any selling price that exceeds





Costing a product before it is offered leads to the decision as to whether to offer it at an anticipated market price or discard it entirely.

To establish standards of minimum profitability, a group of pricing formulas must be evolved that work back from net profit through gross profit to the selling price. This has been termed the pricing discipline.

"direct cost" is acceptable, or it may gamble on averages, assuming that less profitable sales will be offset by those that are highly profitable.

In order to establish standards of minimum profitability, pricing formulas must be evolved that, in effect, work back from net profit through gross profit or gross margin to selling price. A group of pricing formulas that establish a minimum standard of gross profit or gross margin when applied to the pricing of particular products has been termed the pricing discipline. In the establishment of a pricing discipline adequate allowance must be made, of course, for all costs and expenses, including the potential losses from off-price sales resulting from quality deficiencies and obsolescence. The pricing discipline is used only to set minimum selling prices: actual selling prices are based on market value.

It would seem that both full costers and direct costers must face the same problem, establishing the minimum gross profit or gross margin. The full coster includes in his formula an adequate allowance for fixed as well as for indirect variable costs, which are costed into the product at a pre-set level of production and sales. And the direct costers? Among the criteria suggested by the more sophisticated are the relationship of the contribution margin to the capital employed by a particular product line and the relative proportions of material and conversion cost, including relative machine hours.[5] (Shades of "orthodox" full cost allocation?)

Thus, full costers solve directly what direct costers must solve indirectly, that is, the problem of establishing minimum profit margins compatible with limitations in capacities. Direct costers may appear to solve this problem during the planning period by determining combinations of products, prices, and distribution methods whose sales and contribution margins relative to total fixed costs appear to be maximized. However, there is a considerable risk in assuming that the planned mix of products, prices, distribution, production methods, etc. will be maintained during the operating period and that fixed and variable costs computed on "static" assumptions will behave as defined during the subsequent dynamic operating period.

Projection of planned mixes

It is important to differentiate between pricing policy during the planning period and pricing practices during the operating period. A planning period is the time during which a product or product line is readied for sale—when revisions are made and offering prices are established on the basis of anticipated market values and costs and when items are rejected because of their failure to meet profit criteria. The operating period is the subsequent period during which selling, purchasing, manufacturing, and distributing operations take place. In practice, the time periods can overlap. Functionally, in the decision making process, there is a separation.

During the planning period under a system of direct costing, alternative combinations of products, prices, volumes, and costs are projected to determine the product-distribution mix that maximizes total contribution. The accuracy of the final projection depends, of course, on the accuracy of the projected demand schedule of each product (the quantity demanded at a price which in turn depends on the assumed price elasticity); the compatibility of the demand schedule with capacity; and the projected behavior of wage rates,

material prices, overhead costs and other costs. The projection will be modified by such practical operating considerations as the extent to which interchangeability of materials, labor, equipment, etc., can be used to reduce risk; the size of the product line; the number of stockkeeping units; machine set-up time and flexibility in use from product to product; production lot size; company market objectives; and general company policies and history.

Such assumptions as the planned product-distribution mix and the extrapolation into the future of past functional relationships must be followed to their effects before the projection may be considered ready for application. A change in almost any projected factor can adversely affect the total planned contribution—if minimum markups and capacity factors are considered in total rather than on a product by product basis. The uncertainty of all forecasts is the essence of the problem in determining a pricing discipline.

Based upon his projections, the direct coster may compute mathematically a policy that appears to maximize profits. The use of computers and techniques of linear programing can make "dynamic" projections of price-product-customer-distribution mixes within the appropriate limitations of productive capacity, available financing, etc. But what happens if there is a shift in demand, an error in the projection, a change in the mix? And with what omniscience must the planner project so that changes in the assumptions underlying the very separation of fixed and variable expenses (as elaborated in the section to follow) will have no material effect? The non-quantifiable elements of business appear; the future is uncertain. This is the gamble. The question becomes one of contribution costing's potentially higher projected profit versus full costing's reasonable realizable profit. Conceptually, computer runs can simulate many of the assumptions of direct costing, but it is management that must evaluate the risk as well as all the intangibles of customer relationships, market conditions from the demand and supply side, and organizational and historical factors. The use of full allocation costing with a price discipline is the logical alternative, reducing the dependency upon the accuracy of projections.

Of course, the full coster runs some of the same risks in the use of projections and in the setting of levels for the absorption of costs. It must not be inferred that budgets, planning, and projections—

A misdirected emphasis on volume instead of profitability can be destructive to a business since it leads to preoccupation with uneconomical products.

assumptions about the future—are not essential in full costing. However, the allocation of all costs to the product minimizes the speculative factor resulting from changes in the basic assumptions in the projection. The same criteria have been applied in all pricing decisions for all sales so that the sales dollar, if not homogeneous throughout, is at least a common denominator. This is true, regardless of the product.

The full coster must take a stand on the allocation of overhead that the direct coster is not required to do during the planning period. Accordingly, contribution costing may permit the introduction of products into a company's product line that would not qualify for production under a full costing policy. In this way, contribution costing may in some circumstances provide an opportunity for larger volume and greater plant utilization. This very approach, however, with its misdirected emphasis on volume instead of profitability, can be destructive to a business as the plant and management capacity become occupied with uneconomical products and as overhead, both factory and distribution, is expanded to meet each of the new capacity requirements.

A cost is fixed only in the short run; over the long run all costs are variable. Thus fixed and variable cost separation is essentially a static technique . . . the informed decision maker will recognize the real variability of all costs . . .

Cost separation

The risk of changes in product mix and other factors during the operating period is not the only danger threatening the user of direct costing for pricing decisions. There is also risk of changes in the nature of fixed and variable costs. A cost is fixed only in the short run; over the long run all costs are variable. Thus fixed and variable cost separation, like the breakeven analysis of which it is a basic tool, is essentially a static technique. Variable data must be available, but the informed decision maker will recognize the real variability of all costs when he allocates to products depreciation by machine hours, office costs by paper work, production overhead by size of lot and set-up time, and warehousing by handling costs and method of shipment. In an economy of large investments in equipment, shortages of labor, and uncertainty, direct costing loses much of its pragmatic justification.

Breakeven analysis—of which direct costing is historically an extension rather than vice versa—portrays the short-run relationship of costs, revenue, and profits as a function of activity. It is based on a projection of a myriad of assumptions about product mix, distribution mix, selling prices, direct costs of manufacture (wage rates, material prices, efficiency, etc.), distribution and selling expenses, overheads, and the like. In effect, quantities, prices, costs, markets, salesmen, overheads, etc., are all projected.

Assumptions about product mix, prices, inventory level, lot size of production, markets and methods of distribution, uses of equipment, etc., are all basic to the analysis of fixed and variable costs. If the assumptions hold, fixed and variable expenses will behave as they are supposed to—but even then only over a limited range of output, certainly not over the entire potential range. With theoretically constant mixes for prices, products, and distribution, the standard graph of one horizontal line for fixed costs and one linear curve for variable costs does not apply to the entire range of output from zero to existing capacity and certainly not to future time periods and capacity changes. Thus, assumptions about time, expectations, the particular range of output, and the variations of expected change can be applied only within relatively narrow limits. For example, certain indirect labor may be treated as fixed at a 60 per cent capacity level of output but can become largely variable at 80 per cent. Equipment needed on an hourly rental at 60 per cent may become by purchase a fixed cost at 80 per cent. In general, fixed costs tend to become variable as output and sales increase, while variable costs may tend to become fixed as output and sales contract. Salesmen on salary plus incentive

on sales increments can be fixed at 60 per cent and partially variable above 80 per cent when the incentive level is reached; and salesmen on drawing against commission are relatively fixed for the immediate period until their commissions exceed their drawing accounts.

The segregation of costs into their fixed and variable components depends on the planned level of operations and estimated capacity (adjusted for normal seasonal fluctuations where necessary). The costs that are fixed at the planned level would not be the same if the planned level were significantly reduced or increased (even where significant idle capacity exists). Variable costs for increments in output from a zero base are not the same as from a 40, 60, or 80 per cent base.

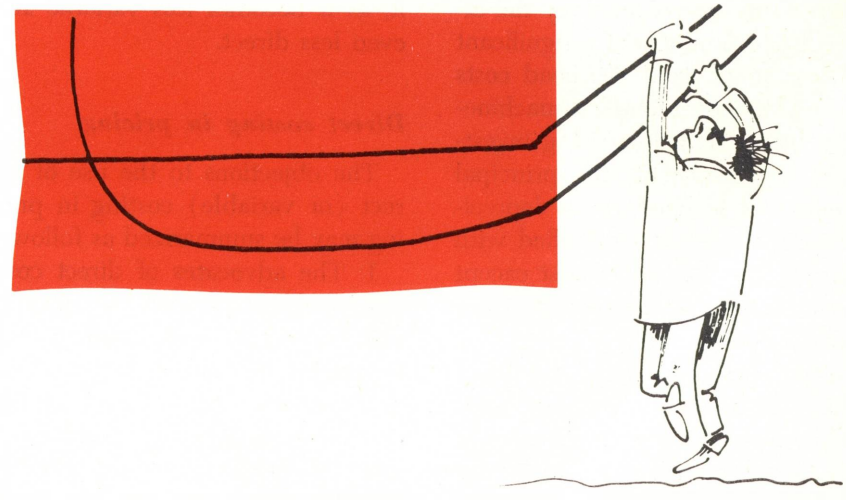
Extrapolations into new ranges of operating levels or new time periods must take into account equipment needs, overtime requirements, risk in off-season inventory accumulation, available outside production facilities, production lot size, etc. Apparent excess capacity ceases to be excess when longer manufacturing hours are required. Changes in sales mix lead to inefficiencies in the use of existing facilities; new products create a need to expand supervision and administration as well as variable production costs. The fixed costs of equipment and general administrative expense become variable—particularly with "underpriced" products. The pat assumption that only a few expenses, such as power and supplies in the factory and freight and salesmen for distribution, are variable is shattered by reality. The opportunity cost as well as the allocable cost of management that is not priced into the product becomes significant, especially if disproportionate amounts of time are diverted to products and customers where cost has been computed without regard to "fixed" costs. Even the fixity of depreciation cost beyond the immediate planning period is a mirage with ever increasing mechanization and with operations currently running at full capacity.[6]

Allocations

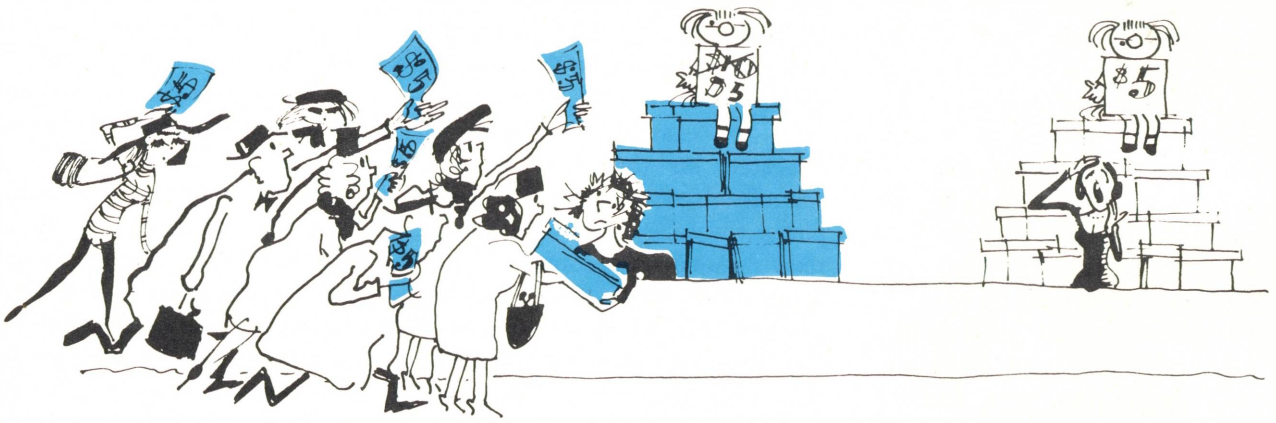
Allocations of indirect costs to products under full absorption costing may be subjective and unreliable, the direct costers argue. Yet the assignment of variable costs to products under direct costing may be equally arbitrary, where such costs are indirect and therefore not readily identifiable with specific products. Variable distribution expense components that are not directly assignable to specific products, for example, are generally allocated on the same basis as their fixed components. The example of the sales force with guaranteed drawing accounts applies again here. Only after drawings are exceeded by commission earnings does part of such sales compensation become variable. For which salesman and group of salesmen it becomes variable depends first on the assumed operating levels and then on the mix of salesmen. These, in turn, depend in part on customer, product, and style mixes. To which product or item sold do the recurring unearned commissions apply? Or are they not a cost until sales levels are reached where all are variable?

The same applies to administrative and financial overheads, whose variable components are usually allocated on the same basis as their fixed components after deduction of the assignable and/or identifiable expenses of the product group or division. The allocation of general and administrative costs, when attempted on a "logical" basis rather than by arbitrary proration, is a problem primarily of determining functional relationships, not of separating fixed and variable costs. Thus, for allocation of clerical costs to a product grouping, the determination of the average size of the invoice, the frequency of back ordering, the number and size of customers, and the number of lines per invoice is more significant than the fixed and variable separation of clerical labor costs.

What about such variable plant overhead expenses as parts, power, supplies, etc.? How do product costs reflect such expenses? Are



Even with theoretically constant mixes for prices, products, and distribution, the standard graph of one horizontal line for fixed costs and one linear curve for variable costs does not apply to the entire range of output.



Direct costing may lead to the underpricing of some products and relative overpricing of others, by omitting fixed or capacity costs.

they not first allocated to a cost center, direct and/or service, and then prorated to the product on a machine-hour, labor-hour, or labor-dollar base? Is this identification of variable expenses any more direct than most fixed overhead? Under today's machine technology the allocation to products of a significant proportion of fixed overhead costs is on a directly identified machine-hour basis. With increasing investment in equipment, the principal component of fixed costs, depreciation, is as directly identified with a product as any other cost except direct materials—and perhaps more readily determinable.

Even the allocation of direct labor (theoretically, a "pure" variable) to the product is often indirect, as a function of machine-hour cost. What is direct labor when rates of output are machine-determined? Is there any difference between direct labor and indirect labor when a crew is employed, e.g., supervisor, engineer, and materials handlers as well as machine operators? With the obvious trend away from hand work to predominantly machine work, direct labor more and more takes on characteristics traditionally not ascribed to it, as it becomes less variable and even less direct.

Direct costing in pricing

The objections to the use of direct (or variable) costing in pricing may be summarized as follows:

1. The advocates of direct costing have taken a useful accounting and analytical tool, namely, the separation of costs into their fixed and variable components within existing capacity, and extended it into a point of view which in effect assumes that many costs are fixed in the long run, failing to recognize the myriad of short-run assumptions in the original separation.

2. A pricing policy based on direct costing is unrealistic because it does not directly establish a minimum profit margin which can be used by management for comparison of the relative profitability of products and which provides for the cost of capacity expansion.

3. By omitting fixed or capacity costs, direct costing may lead to the underpricing of some products and relative overpricing of others, creating shifts in demand in favor of the less profitable product mix.

4. The theoretical model of direct costing must assume the accuracy of projected demand schedules; product, customer, and distribution mixes; and accordingly of consequent cost behavior, assumptions that are unduly speculative.

5. If fixed costs are not allocated, a pricing policy that seems logical in the short run may become ruinous in the longer run as fixed costs become variable. And fixed costs may become variable

when plant capacity that is fixed in the planning period becomes variable in the subsequent operating period precisely because of its use for production of "underpriced" product lines. When shifts in mixes require changes in production, distribution, and/or administration, overheads must become variable because of significant expansion of output.

6. There is a notion that variable costing is simple and accurate while allocation costing is complicated and distorted. This has been demonstrated to be erroneous. Furthermore, while effective costing for a pricing discipline depends in part on the validity of functional allocations on the one hand, it deemphasizes the accuracy of the fixed and variable segregation of expenses on the other.

Appropriate applications

Direct or variable costing provides important information for management. Among its uses are the following:

1. Control of operations by means of flexible budgeting and/or standard costs and analysis of budget variances and variances from standard during the operating period

2. Breakeven analysis during a planning period as an overall guide to management in forecasting

3. Feasibility analysis where it is necessary to forecast the effects of alternative management decisions such as price, cost, or volume changes upon profits

4. Assistance in determining the advisability of special pricing, inventory holding or replenishment, and other ad hoc decisions during the operating period: However, use of variable costing in such circumstances is limited, as has been implied previously in this article; it is essential that, for example, basic pre-operating-period planning not be superseded by ad hoc contribution thinking.

5. As supplementary information for management in its judgment of the propriety of fixed cost allocations made under the full absorption costing approach: The recognition by the decision maker of large fixed cost allocations against products, decisions, etc., with high contribution margins may well lead to corrections in the assumptions made by cost accountants where market factors, availability of similar services from outside sources, etc., may not have been given consideration.

In these cases and for other specific analytical projects designed to yield special information for management, fixed costs may be temporarily held in abeyance. But in the operations of the business, regardless of method or time, ultimately they must be paid for and accordingly reimbursed, in effect, by the customer through inclusion in the price of the product.

Furthermore, full costing, by definition includes opportunity costs, the alternative uses of men and facilities—those involved in production as well as those involved in administrative and in overall management. Perhaps the inclusion of opportunity costs is the primary function of full allocation costing and disciplined pricing. Conversely, it is probably fair to say that if there were no opportunity costs, no alternative uses of men and facilities, full costing might be irrelevant. But then so would the study of economics itself!

The theoretical model of direct costing must assume the accuracy of projected demand schedules; product customer and distribution mixes; and accordingly, of consequent cost behavior, assumptions that are unduly speculative.

FOOTNOTES

[1] "Analytical Methods of Measuring Marketing Profitability: A Matrix Approach" by Frank H. Mossman and Malcolm L. Worrell, Jr., *Business Topics*, August, 1966, p. 36.

[2] From the literature of "direct costing" it would seem that its proponents actually mean "variable costing," i.e., costing into the product those costs or components of costs that tend to be sensitive in the

short run to rises and falls in production—for which the term "variable" has traditionally been used in cost accounting.

The term "direct costs," on the other hand, has traditionally been used to define costs specifically attributable to a particular cost center, department, or product line with no implication that such costs are necessarily variable. Raw materials are, of course, both direct and variable costs; frequently, perhaps usually, direct labor is the same. But some direct labor and direct manufacturing overhead applicable to the production cost centers, for example, may well be fixed in the accounting sense. For example, the foreman of a cost center or even a highly skilled machine operator with a skill that is difficult to replace may be employed on virtually a fixed salary basis even though his work is a direct cost.

The term "indirect costs" is meaningful only in context; for example, costs that are direct from the point of view of a service center are indirect from the point of view of a cost center or product to which the aggregate of such service center costs is applied. From this point of view, both direct and indirect costs may be either fixed or variable, depending on their behavior relative to production or sales. While the term "variable costing" may be more appropriate, for this article the currently used term "direct costing" is used.

[3] The computation of full cost consists of measuring the direct variable product costs, absorbing variable and fixed manufacturing overhead by formula, then marking up the total product cost by one or several formulas to arrive at a minimum required realizable net selling price, and, finally, adjusting this price by formula for potential losses from off-price sales resulting from quality deficiencies, obsolescence, etc.

A full description of the techniques for the development of the several formulas is beyond the scope of this article. Briefly, however, the main elements in addition to the measurement of direct variable costs (materials and variable direct labor), include, where applicable, the following:

1. Selection of the appropriate independent variable of which manufacturing overhead may be considered a function—direct labor dollars or hours, machine hours, direct unit output, etc.,—and computing a flexible tabulation of this independent variable as a function of levels of output

2. Preparation of flexible manufacturing and distribution-administration overhead tabulations with variables in the former case expressed as a function of the independent variable described above and in the latter as a function of production and/or sales

3. Additions to both overhead categories of an element of profit, if this approach is to be taken

4. Selection of absorption levels relative to both categories of overhead (a decision that will be partially influenced by whether a net profit factor has been included as indicated in 3 above).

This selection is the crucial point in absorption costing. If net profit has not been included directly, then a wider safety margin between capacity and absorption levels must be considered, indirectly providing for profit through planned overabsorption. This has been dubbed "comfort margin," again our own term but one with broad usefulness. The measurement of capacity must also consider seasonal fluctuations, availability and flexibility of all the relevant factors of production, and the position of the company in comparison with its industry relative to its technological development, flexibility in employment, and the ability to eliminate the factors of production, competition, etc.

[4] When accountants jump upon the interdisciplinary bandwagon, however, they should understand the fundamental concepts of what they are borrowing. To the late Nineteenth and early Twentieth Century economist, marginal cost and marginal revenue were terms used to describe the rational relationships among the firm, the factors of production, and the market. These traditional economic models were derived from *a priori* logically founded definitions of behavior. The cost and demand functions were presupposed for the determination of price and level of output by a rational entrepreneur whose very rationality was defined by maximization of profit. This model, is, in effect, an analytic proposition, and for an analytic proposition the basic realities in the computations of the curves—the motives of profit maximization, the objectivity of calculations, the reliability of estimates—are all irrelevant. To be pertinent to management decision making, however, marginal analysis must take into account such "irrelevancies" as the applicability of statistically derived demand and supply curves in the light of knowledge of cost curves; the reliability of estimates of demand and price elasticity; the extrapolation of data and expectations; the interrelationship of selling costs, changes in quantities demanded, and overhead costs; the basic immediate goal of profit maximization versus such longer-run business considerations as liquidity and risk minimization; and effects on relationships with customers, suppliers, competitors, the public, unions, etc.—in general, the position of the multi-product firm in a multi-process technology.

[5] NAA Research Report 37, "Current Applications of Direct Costing," National Association of Accountants, New York, 1961, pp. 44-53.

[6] Direct costing emerged during the 1930's. It is ironic that it is more popular now, in a period of prosperity, capacity utilization, and expansion even outwardly ill suited to many of its underlying assumptions. Depression period ad hoc business thinking logically was influenced by the existence of idle capacity of plant, equipment, and labor. At least 15 per cent of the work force was usually unemployed; furthermore, labor unions had not yet reached their present strength, and employers had greater flexibility in hiring, layoffs, setting standards, cost control, etc. Fewer capital assets were committed to each worker, and, from the point of view of the individual enterprise, insolvencies and quick changes in ownership of capital assets at distress prices had decreased dollar costs of investment per worker below the years immediately preceding. Brand identifications, markets, and selling prices were less differentiated, on the whole, and in many more markets than today intense price competition prevailed.

Compare our current economic situation: little idle capacity in manpower or machines, a high and increasing ratio of machinery to labor cost, powerful trade unions, more restrictive labor laws and relatively inflexible labor costs, and rising costs of fixed asset replacement and management and administrative personnel.

The special characteristics of the depression economy made it possible for management to emphasize variable costs and frequently neglect fixed costs in pricing decisions without apparent adverse consequences. In an economy of idle capacity, incremental costs tend to be small, and certain costs may not increase at all until capacity is absorbed. Graphically, the fixed cost plateaus were much longer relative to the existing operating levels of many businesses. However, as plant and equipment were replaced and as capacity was fully utilized on regular product lines, costs that appeared to be constant eventually became variable. Continuing an ostensibly "logical" short-run policy into the long run would have been highly destructive.

The peculiar problems of the depression gave direct costing a pragmatic justification that obscured its theoretical fallacies. The continuation—and even expansion—of the concept to a changed economic and technical environment is an excellent example of a cultural lag.

A simple system already in operation can simplify — and, above all — speed financial dealings between major shippers and the carriers that move their freight. Here are the details —

FREIGHT PAYMENT: CHEAPER BY THE BANK

by Sidney W. Hall
The General Tire & Rubber Company

WOULD YOU be interested in a system that:

1) Reduces out-of-pocket costs
2) Requires no additional capital investment
3) Is easy to learn and operate
4) Has very little exception processing
5) Is equally applicable to a small or large organization
6) Operates effectively in either a centralized or decentralized environment
7) Lends itself to EDP batch processing?

You have just read a description of a system popularly called "The Bank Freight Payment Plan." The plan is presently offered by more than 35 "Freight Plan Associate Banks" servicing most of the United States. Almost all major carriers including railroads are members.

Shippers and carriers join the plan and enter into a contract with an appropriate bank in the area. The member shippers establish a freight payment account or use their regular account, and the member carriers establish a depository account. Once the plan is in operation, the member carriers submit their freight bills to the bank for payment. The bank treats the freight bills like checks drawn on the shipper's account. Dollars sufficient to cover the freight charges are simply transferred from the shipper's account to the carrier's account. The bills are cancelled and sent on to the shipper as evidence of payment.

When the shipper's and carrier's accounts are maintained at the same bank, the bank charges the

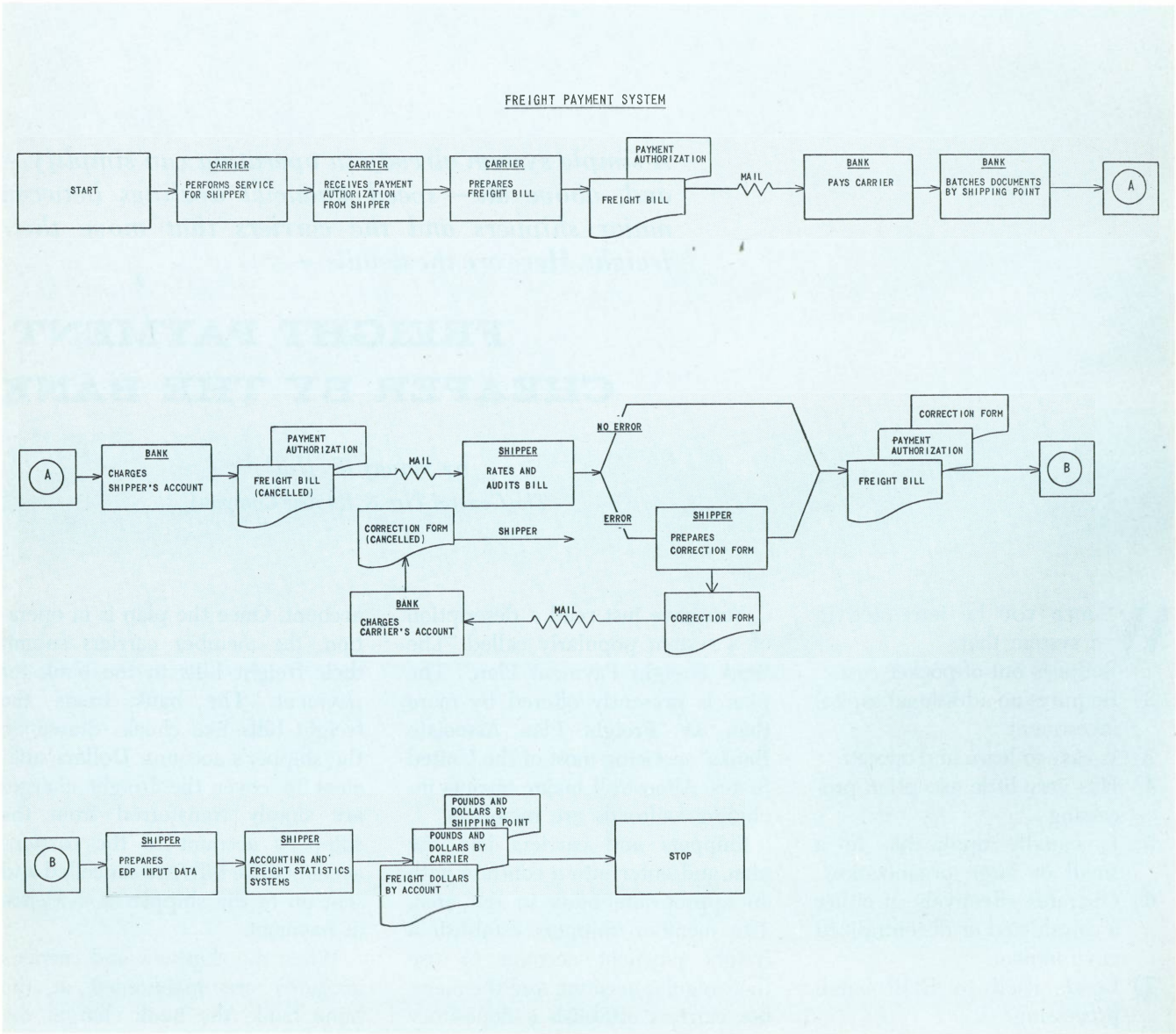
carrier a processing fee for this total service. However, the "Freight Plan Associate Banks" work together so that a shipper may maintain an account in one area of the country while the carrier maintains an account in another area. When the accounts are held in different banks, the freight bills are processed through an interbank system and both the carrier and shipper are charged a fee by their respective banks. The bills flow from the carrier to the carrier's bank, to the shipper's bank, and finally to the shipper. In this manner, a shipper may pay freight bills from a wide geographical area through one bank account. The general system flow

As part of the service, the bank provides each carrier with a shipper membership list. The list details the name of the shipper, the address or company locations covered by the plan, and any special shipper instructions. Likewise, each shipper receives a carrier membership list. The bank keeps both membership lists current.

So much for the background; what are the details? For outbound prepaid shipments, the carrier receives a bill of lading packet containing one copy that is stamped showing the shipping point and account coding appropriate to the shipment. For inbound collect shipments, the carrier is required to present the original freight bill at the time of delivery. The freight bill is stamped, coded, and returned to the carrier. The stamped documents serve a dual purpose—one, to authorize payment by the bank, and two, to provide shipping description and accounting distribution for internal use by the shipper.

Freight bills from all carriers, member or nonmember, can be paid by the bank. The member carrier submits the stamped freight bill or the freight bill with the bill of lading attached directly to the bank for payment. In the event the carrier loses the supporting documents, the bills are submitted ini-

EXHIBIT I



tially to the shipper. After verification that the bill has not been paid previously, a freight approval is attached to the freight bill and returned to the carrier for submission to the bank.

Nonmember carriers submit statements with the attached bills and supporting documents directly to the shipper. After auditing and rating the bills (corrections are made right on the statement), the shipper attaches a payment approval and forwards it to the bank for payment. Since the nonmember carriers do not participate in the plan with the bank, the bank prepares a check for the audited amount shown on the carrier's statement. The check along with the statement is forwarded to the carrier. The bank charges the shipper 25¢ for each check regardless of the number of freight bills covered by the payment.

On receipt, the bank ensures that all freight bills are properly supported before payment is made. Bills that are not properly supported are returned unpaid to the carrier. The bank separates the bills into batches by member or nonmember carrier and by shipping point code shown on the freight bill or bill of lading. A detail adding machine tape of the amounts charged to the shipper's account is prepared and submitted with each batch of cancelled bills to the shipper.

The shipper rates and audits the member carrier's paid freight bills by batch. (The non-member carrier's bills are audited and rated before payment.) Errors in the amount charged are noted on a four-part correction form supplied by the bank. The shipper places one copy of the correction form in an "open" file and forwards the remaining copies to the bank. The bank then makes the required transfer of funds from the carrier's account to the shipper's account or vice versa. A cancelled correction form copy returned to the shipper serves as notification that the bank has entered the correction.

The bills are now ready for freight statistics systems. A gum-backed coding tag is attached to each bill. On the tag is entered the information describing the shipment, including the weight and dollar amounts. The accounting distribution coding is copied from the freight bill or the bill of lading. A correction related to the bill is also shown on the tag. Using the batch tapes provided by the bank as a dollar control, the documents are entered into an EDP batch processing system.

In addition to the accounting and freight reporting, the batched bills provide the source for reimbursing the bank. Normally a check is prepared daily to the freight payment account covering charges less any corrections. Some banks will make transfers from a "balance" account to offset the freight bill payments. This eliminates the daily reimbursement by check.

Unfortunately the services offered by the banks under the bank freight payment plan vary. Only a few offer all the services mentioned previously. To date, the banks have not made a unified effort to standardize the shipper's requirements (bill of lading, stamped freight bill, etc.). Therefore, some carriers are not happy about the exception processing that the various requirements dictate.

The carriers have their own organizations like transport clearings that compete with the bank's services. These organizations usually purchase freight bills at a discount from member carriers. The clearings then handle the collection for their own account. In many instances, the transport clearings organization is a member of the bank plan and submits bills directly to the bank for payment. Generally the cost to an individual carrier is less as a member of a bank plan than as a member of transport clearings.

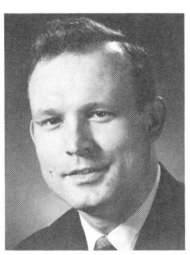
The future is bright. The plan has grown from approximately 13 participating banks in 1959 to more than 35 today. The number of national accounts (shippers using the interbank system) is also increasing. With more growth and interest, some degree of standardization usually follows. Though this article makes no case for the point, the plan itself, and to a lesser degree the banks, may be the catalyst that brings together the shippers and carriers, since each can participate in and receive benefits from the plan.

The banks are expanding their capabilities and services, especially in the EDP area. What effect EDP will have on the bank freight payment plan in the future is open to discussion. Experiments are going on right now with eliminating the paperwork by entering the bill of lading directly into the computer, calculating the freight charges, and finally debiting and crediting the appropriate bank accounts.

Summary

Expanding on the seven points made previously, the bank freight payment plan:

1) Reduces out-of-pocket costs by
   a) Eliminating check preparation for each freight bill or statement
   b) Eliminating postage and stationery
   c) Leveling work load in the traffic rate and audit function by satisfying ICC payment time limit on freight bills
   d) Eliminating costs associated with invoicing operations required to recover overcharges on post-audited freight bills

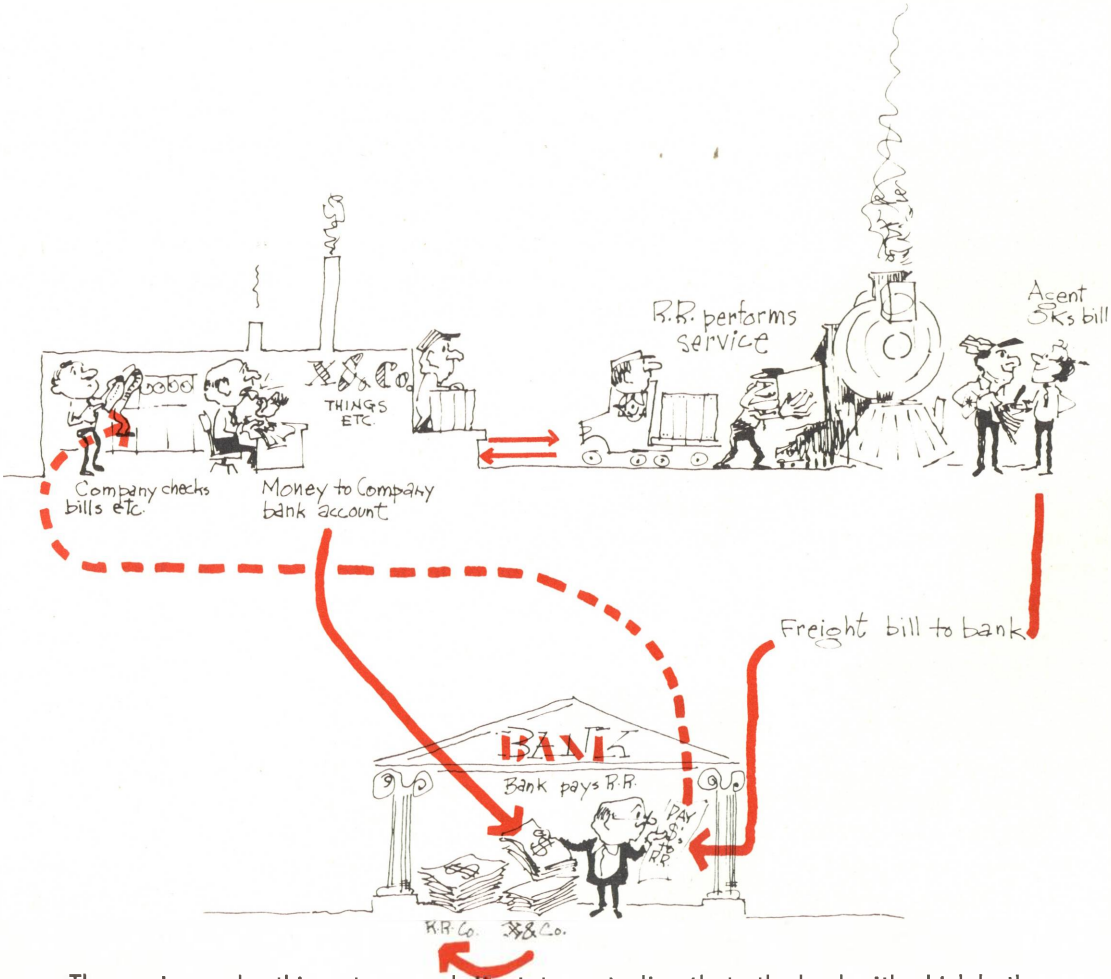


SIDNEY W. HALL is corporate systems group leader at General Tire & Rubber Company in Akron. Before joining General Tire, he was on the administrative services staff of Arthur Andersen & Company. Mr. Hall received his B.S. degree from Ohio State University and his M.S. degree from Akron University. He is vice president of the Cleveland chapter of the American Records Management Association.

e) Eliminating work involved in tracing "past due notices" from the carrier.

2) Requires no additional capital investment since it
   a) At most requires cash necessary to cover freight charges incurred during the paper processing cycle.
   b) Actually reduces cash requirements for working funds maintained in branches by use of one freight payment account and the interbank system.
3) Is easy to learn and operate—basically all operations required in the freight payment plan are performed in a normal check system.
4) Has very little exception processing.
   a) All bills follow a similar processing pattern. After one year of operation, less than 1 per cent of the bills processed come from nonmember carriers.
   b) All bills are paid by the bank.
5) Is equally at home in a small or large organization.
   a) In a small organization, it frees the employee who handles several functions to process the bills when convenient without complaint from the carriers.
   b) In a large organization, it eliminates crisis processing due to peaks in paperwork volume, holidays, and vacations.
6) Operates effectively in either a centralized or decentralized environment.
   a) It allows outlying branches to have their own system in most parts of the country because of the widespread involvement by the banks.
   b) It provides for one central freight payment account through the interbank system.
7) Lends itself to EDP batch processing.
   a) Items are already received in batched form from the bank.
   b) Dollar controls are provided by the bank.

The future is promising and exciting. All we need is the initiative to make it materialize.



The carrier, under this system, sends its statements directly to the bank with which both carrier and shipper have a contract. The bank treats the freight bills like checks drawn on the shipper's account, and simply transfers funds from shipper's account to carrier's.

Corporate treasury stock can serve many purposes: to fulfill employee stock option plans, to retire equity, as a substitute for cash in acquisitions. But which is best: issuing new stock or buying back old for these purposes? Here are some —

DECISION MODELS FOR THE ACQUISITION OF TREASURY STOCK

by Edward J. Mock, George Washington University and Donald Hart Shuckett, Whittaker Corporation

THE RISING TREND of interest rates over the last few years has made it costly to hold idle cash.[1] As a result, corporate financial managers have come under increasing pressure to manage their funds more effectively.[2]

Corporate treasurers can invest their cash either externally or internally. Generally, external investment involves the purchase of marketable securities or investment in other companies offering opportunities for growth. Internal investment takes many forms. In the past, the primary emphasis in allocating funds has been on accounts receivable, inventories, and fixed assets. This article will examine another use for these funds, investment in treasury stock.

Treasury stock is used primarily to acquire stock to fulfill stock option plans within a company, to retire equity to increase the rate of return, and, externally, as a scrip for corporate acquisitions. We have formulated decision models for each of these situations. The last section of this article deals with the ethical problems involved in a reacquisition.

Stock options

Stock options are given to employees as additional tax-favored compensation or incentive. An option allows an employee to purchase a specified number of shares from the company at a specific price within a specified period of time. Any increase in the market price of the optioned stock results in greater after tax take-home pay, if the gain on the option qualifies as a capital gain, than if the equivalent were given to the employee as a pay increase taxable as ordinary income.[3]

The company may obtain stock to meet option requirements either by issuing authorized but unissued shares or by reacquiring stock. When the options are to be exercised, the option price will be below the market price of the stock, and the funds received by the company will be considerably less than if these shares were sold on the open market. Issuing new shares may thus dilute their value. However, if treasury stock is used, funds must be provided to obtain this stock.

The decision rule is formulated thus: Is it more profitable to issue authorized but unissued shares or to buy treasury stock? We must examine the effect on the stockholder, where:

- EAT = earnings after tax and before option
- ROI = return on investment after tax
- k = cost of capital after tax
- Po = stock option price
- Pm = market price of option shares
- T = marginal tax rate of the average stockholder
- N = number of shares outstanding prior to the option
- n = number of shares in the option

The effect on earnings per share if new stock is issued is:

$$\frac{EAT + (ROI)\,(Po)\,(n)}{N + n}$$

Earnings of the corporation will be increased by (ROI) (Po) (n) as the proceeds from the option stock sale are invested within the company. These increased earnings will be distributed over the original number of shares plus the newly issued option shares (N + n).

The effect on earnings per share if treasury stock is purchased is:

$$\frac{EAT-(k)\,(Pm-Po)\,(n)}{N}$$

Earnings of the corporation will be decreased by (k) (Pm-Po) (n) as funds earning the return open to the corporation are given up to acquire treasury stock. Only part of these funds (Po) will be recovered.

The alternative which yields the best return to the stockholder should be undertaken. Treasury stock should be used if:

$$\frac{EAT + (ROI)\,(Po)\,(n)}{N + n} \qquad \frac{EAT - (k)\,(Pm-Po)\,(n)}{N}$$

Since return on investment is inversely proportionate to the cut-off price of the option, the higher the term (ROI) the lower will be the price (Po). This assumes that proceeds from the optioned stock would be invested at a high rate of return. With a growth stock, this emphasizes the fact that most alternative investments would be more profitable than stock repurchases.

Example—Assume that options for 200,000 shares are coming due at a price of $16 per share. Stock currently sells at $20 per share and 2 million shares are outstanding. Also assume that the cost of cash is lost opportunity cost, or cost of capital.

EAT = $4,400,000
ROI = 7%
k = 6%
Po = $16
Pm = $20
T = 30%
N = 2,000,000
n = 200,000

The decision is to purchase treasury stock if:

$$\frac{EAT + (ROI)\,(Po)\,(n)}{N + n} \qquad \frac{EAT - (k)\,(Pm-Po)\,(n)}{N}$$

$$\frac{\$4,400,000 + (.07)\,(\$16)\,(200,000)}{2,000,000 + 200,000}$$

is less than

$$\frac{\$4,400,000-(.06)\,(\$20-\$16)\,(200,000)}{2,000,000}$$

$2.10 $2.18

Since $2.10 is less than $2.18, treasury stock should be purchased to meet the stock option requirements.

If retained earnings are available to reacquire the treasury stock, some cost must be assigned to these funds. This will be the shareholders' lost opportunity cost, since retained earnings are owned by the stockholder. The cost is:

Earnings after Tax x (1 - marginal tax rate of the average shareholder)

– Market value of shares outstanding

or $\frac{EAT\ (1\text{-}T)}{Pm\ (N)}$

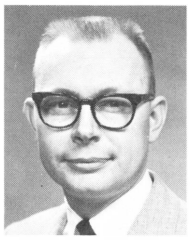
If the treasury stock is purchased with funds supplied through retained earnings, the effect on earnings per share will be:

$$\frac{EAT - \frac{EAT\ (1\text{-}T)}{Pm\ (N)}\ (Pm\text{-}Po)\ (n)}{N}$$

The decision is to purchase treasury stock if:

$$\frac{EAT + (ROI)\,(Po)\,(n)}{N + n}$$

$$EAT - \frac{EAT\ (1\text{-}T)}{Pm\ (N)}\ (Pm\text{-}Po)\ (n)$$



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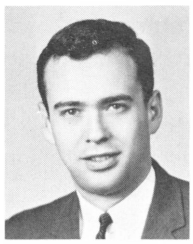


Example—Using the same data as that of the first example, the decision is to purchase treasury stock if:

$$\frac{EAT + ROI\,(Po)\,(n)}{N + n} < \frac{EAT - \left[\frac{EAT\ (1\text{-}T)}{Pm\ (N)}\right]\left[(Pm\text{-}Po)\ (n)\right]}{N}$$

$$\frac{\$4{,}400{,}000 + (.07)(\$16)(200{,}000)}{2{,}000{,}000 + 200{,}000}$$

is less than

$$\frac{\$4{,}400{,}000 - \frac{\$4{,}400{,}000(1\text{-}.3)}{\$20(2{,}000{,}000)}}{[(\$20\text{-}\$16)\ (200{,}000)]}$$

divided by

$$\frac{2{,}000{,}000}{\$2.10} < \$2.17$$

Since $2.10 is less than $2.17, treasury stock should be purchased to meet the stock option requirements.

Corporate acquisitions

Once the decision has been made to acquire a corporation, it must be determined whether it is better to acquire it with cash or stock. A tax advantage can be given to the seller of a company, through deferment of the capital gains tax, if stock is used to acquire either stock or assets under Section 368(a) 1 of the Internal Revenue Code, 1954. This may work to the advantage of the acquiring company if it reduces the amount of funds which would otherwise be required to make the offer attractive to the seller. The first decision, then, is to decide between cash and stock.

Company A wishes to acquire Company B. Assume the owners of B wish to net $1,000,000 from the sale of their company. They must receive $1,333,333 cash in order to net $1,000,000.

Let:

C_s = cost if stock were used in the acquisition

C_c = cost if cash were used in the acquisition

X = cash payment in excess of tax cost base

Thus:

$$X - .25X = \$1{,}000{,}000$$

$$X = \$1{,}333{,}333$$

If the company is acquired with cash, an additional 33⅓ per cent will have to be paid to cover the seller's capital gains tax. If stock were used, there would be a deferment of the capital gains tax. The $1,000,000 of stock would be equivalent to $1,333,333 cash, to the seller.

The decision is to acquire with stock if:

$$(C_c)\ (.25) > C_s$$

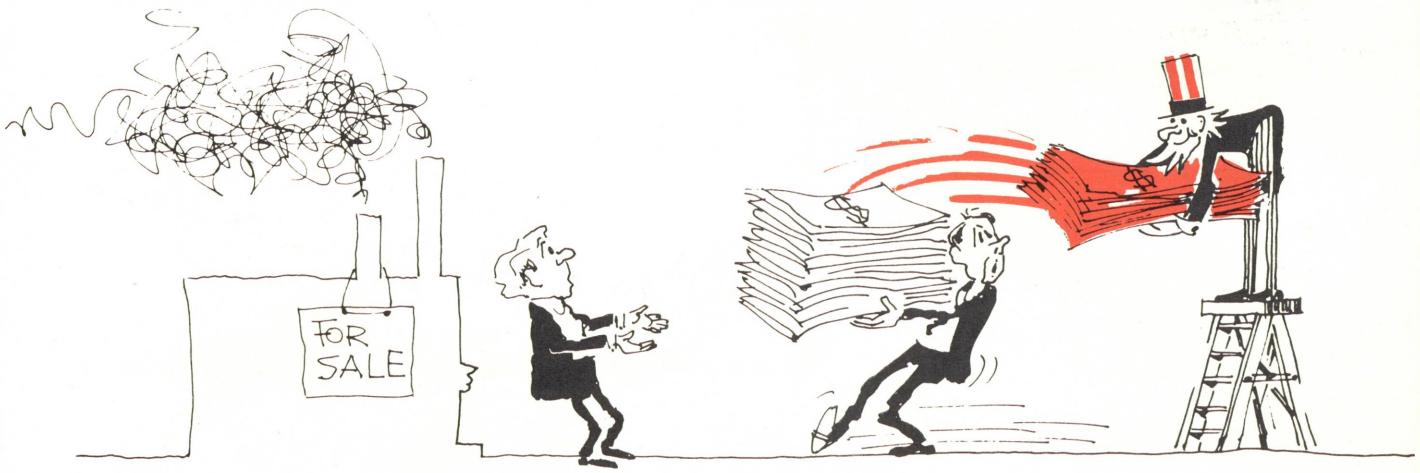
It will be more profitable for the acquiring company to purchase with stock if the capital gains tax to the seller is more than the costs incurred to acquire this stock. This emphasizes that stock may be used as a form of scrip, whose value differs because of tax considerations.

If it is decided that it is better to issue stock rather than use cash, a second decision must be made. What type of shares should be used, treasury or unissued shares?

EAT = earnings after tax before acquisition

ROI = return on acquired company after tax

k = cost of capital after tax



Certain tax advantages go to the seller of a company if the acquisition is made with stock rather than cash. This in turn may make the purchase price which the acquiring company must pay lower, since the I.R.S. doesn't take so large a share.

Pm = market price of acquiring company's shares
N = number of shares outstanding prior to any transaction
n = number of shares to be issued in the acquisition

If new stock is issued, the effect on earnings per share is:

$$\frac{EAT + (ROI)(Pm)(n)}{N + n}$$

Earnings of the corporation will be increased by (ROI) (Pm) (n) when shares which could be sold on the market for (Pm) are used to acquire a company earning a return on investment of (ROI).

If treasury stock is purchased, the effect on earnings per share is:

$$\frac{EAT - (k)(Pm)(n)}{N}$$

Earnings of the corporation will be decreased by (k) (Pm) (n) as funds earning the return open to the corporation are given up to acquire treasury stock.

The alternative which yields the best return to the stockholders should be undertaken. Treasury stock should be used if:

$$\frac{EAT + (ROI)(Pm)(n)}{N + n} < \frac{EAT - (k)(Pm)(n)}{N}$$

Example—Using the same data as that of the first sample, the decision is to purchase treasury stock if:

$$\frac{EAT + (ROI)(Pm)(n)}{N + n} < \frac{EAT - (k)(Pm)(n)}{N}$$

$$\frac{\$4{,}400{,}000 + (.07)(\$20)(200{,}000)}{2{,}000{,}000 + 200{,}000}$$

is less than

$$\frac{\$4{,}400{,}000 - (.06)(\$20)(200{,}000)}{2{,}000{,}000}$$

$\$2.13 > \$2.08$

Since $2.13 is greater than $2.08, new treasury stock should be issued to make the acquisition.

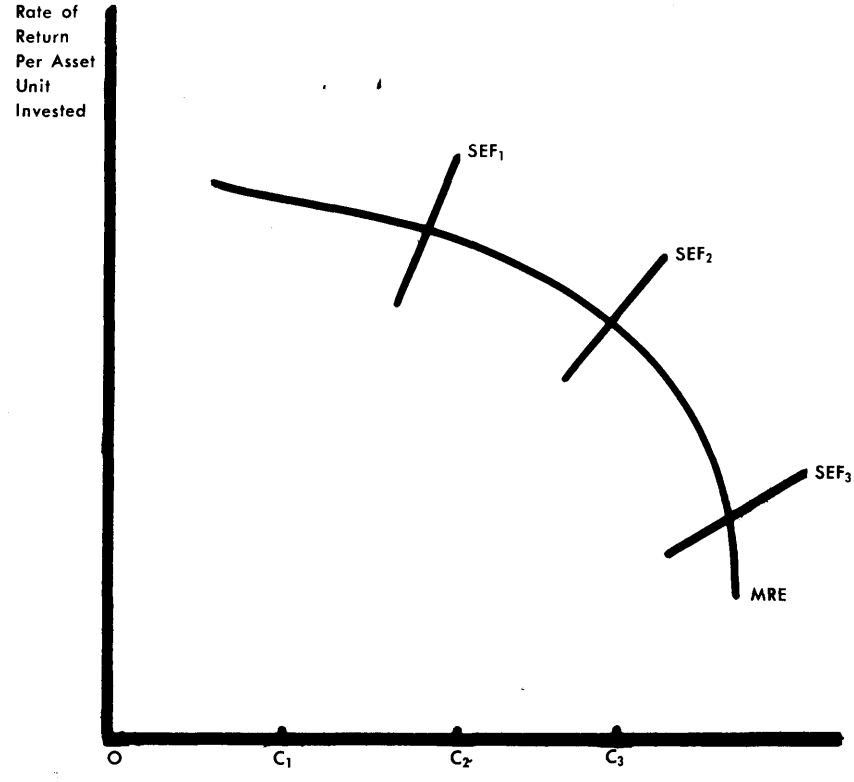
Retire Equity. The effect of a reduction in equity capital can be shown in the chart shown in Exhibit 1 on this page.

Various amounts of ownership capital (OC) are represented along the horizontal axis by the distances OC_1, OC_2, OC_3. For each specific capital structure there is a supply curve of external funds (SEF). These curves are SEF_1, SEF_2, and SEF_3. If a company reduces its equity base by contracting from OC_2 down to OC_1, the supply of external funds also shifts to SEF_1. The supply of external funds also becomes more inelastic because of the increasing proportion of debt, and thus of risk, in the capital structure.

The downward-sloping marginal rate of earnings curve (MRE) assumes physical or competitive difficulties which makes it difficult for additional assets to continually earn the same rate of return. The purchase of treasury stock will move a company farther up the MRE curve. This is partially because of increased leverage (since debt is constant but equity is reduced) and partially because of the elimination of assets earning a rate of return lower than that earned by investing in one's own stock.

A growth company should not acquire treasury stock because its earnings are low in relation to their market price and it is able to earn more from other investments. However, companies no longer experiencing growth are faced with the choice among investing in low-yield negotiable securities, purchasing

EXHIBIT 1



Source: Eli Schwartz, "Theory of the Capital Structure of the Firm," from Edward J. Mock, *Readings in Financial Management*, International Textbook Company, Scranton, Pa., 1964, p. 244. Reproduced, with permission, from *Readings in Financial Management*, copyright 1964, International Textbook Company.

treasury stock, paying out large dividends, or just accumulating vast amounts of funds. Their decision should be based upon the effect on the common stockholder.

EAT = earnings after tax
ROI = return on investment after tax
k = cost of capital after tax
Pm = market price paid for stock
N = number of shares outstanding
nt = number of shares purchased by treasury

Treasury stock should be purchased if:

$$EAT + (ROI)(nt)(Pm) - (k)(Pm)(nt) - N < \frac{EAT - (k)(Pm)(nt)}{N\text{-}nt}$$

This equation indicates that to make the treasury stock purchases attractive, earnings per share on reinvested funds must be less than the earnings per share on the reduced equity base.

Example—Assume that the company has a choice of buying 200,000 shares at the market price of $20 per share or earning a return on other investments of 7 per cent. Also assume that the cost of cash is lost opportunity cost, or cost of capital.

EAT = $4,400,000
ROI = 7%
k = 6%
Pm = $20
N = $2,000,000
nt = $200,000

The decision is to purchase treasury stock if:

$$EAT + (ROI)(Pm)(nt) - (k)(Pm)(nt) \div N < \frac{EAT - (k)(Pm)(nt)}{N\text{-}nt}$$

$$\$4{,}400{,}000 + (.07)(\$20)(200{,}000) - (.06)(\$20)(200{,}000) \div 2{,}000{,}000 < \$4{,}400{,}000 - (.06)(\$20)(200{,}000) \div 2{,}000{,}000\text{-}200{,}000$$

$$\$2.22 < \$2.31$$

Since $2.22 is less than $2.31, treasury stock is the preferable investment.

The practice of buying treasury stock to reduce capitalization and increase book value, earnings per share, and return on investment is gaining favor among corporations. In the recent stock market decline, the dividend yield on some company's shares was significantly greater than the yields in the bond market. In many cases companies intentionally reduced their outstanding shares as a means of using excess funds and/or marketable securities to enhance the earnings and market price of their stock. In effect these monies were passed on to the shareholders as capital gains. If the total dollar amount of dividend payment is reduced more than the interest income received from marketable securities, any excess cash or marketable securities a company may use to purchase its own shares may save a great amount of money, since interest received on marketable (U. S. Government) securities is taxable while a company pays no tax on the dividends saved by buying its own stock.

After Brown Shoe sold its G. R. Kinney Corporation subsidiary for $45 million in 1963, it found that it had more cash than could normally be invested. In October, 1963, Brown made a tender offer to buy 300,000 of its own shares. Shareholders actually tendered 157,000 shares, and Brown Shoe bought another 110,000 in 1964 on the open market and in private transactions. Brown's profit in the fiscal year ended October 31, 1964 increased .5 per cent from fiscal 1963, but per share earnings increased 12 per cent.[4]

Somewhat spectacular in this respect is the action in 1950 of Colt Manufacturing Company. The effect of reducing its stock and surplus by almost 50 per cent may be seen in the analysis of the company's capital structure[5] presented in Exhibit 2 on page 54.

The decision whether to invest available funds in treasury stock or whether to pay them out as dividends depends on the effect on the stockholder. Where:

EAT = earnings after taxes
E = earnings per share *before* treasury stock acquisition
ΔE = change in earnings per share due to treasury stock purchase
F = funds available
T = marginal tax rate of the average stockholder
T/2 = capital gains tax rate[6]
Pm = market price per share
N = number of shares outstanding
P/E = price earnings ratio

Treasury stock should be purchased if:

$$\left(\frac{F}{N}\right)(1\text{-}T) < (\Delta E)(P/E)\left(1\text{-}\frac{T}{2}\right)$$

In order to make treasury stock purchases attractive, the return of the dividend must be less than the gain on increased stock price, after taxes.

Example

Assume the following:
EAT = $4,000,000
E = $2.00
F = $4,800,000, with which to buy 200,000 shares
Pm = $24
T = 30 per cent
N = $2,000,000
P/E = 12

Earnings per share after treasury stock acquisition =

$$\frac{\$4{,}000{,}000}{1{,}800{,}000} = \$2.22.$$

Change in earnings per share: $(\Delta E) = \$2.22 - \$2.00 = \$.22$.

Therefore:

$$\left(\frac{F}{N}\right)(1\text{-}T) < (\Delta E)(P/E)\left(\frac{1\text{-}T}{2}\right)$$

$$\left(\frac{\$4{,}800{,}000}{2{,}000{,}000}\right)(1\text{-}.3) <$$

$$(\$.22)\,(12)\left(\frac{1\text{-}.3}{2}\right)$$

$$\$1.68 < \$2.24$$

In this case the acquisition of treasury stock is more attractive to the common shareholders than the payment of a dividend.

Somewhat spectacular in this respect is the example of Paramount Pictures, which used a 15-year reacquisition program to maintain its $2 annual dividend rate. This seemed unlikely in 1949, when the old Paramount Pictures, Inc. left the new company with 33 million shares outstanding but only the movie-producing half of its former business. The company decided to reacquire stock to maintain the $2 dividend. Through several tender offers and an open market purchase program, Paramount reduced its outstanding shares by 1964, to about 1,560,000, and maintained the dividend.[7]

There are many alternative methods for acquiring stock: block purchases of stock from individual shareholders, purchase in the open market, or tender offers.[8] The opportunities available to buy large blocks are rare, and even rarer is the coincidence of availability at the specific time the purchase is to be made. For the purchase of large blocks of shares, tender offers are less costly, more flexible, and less risky than purchase on the open market. Open market purchases may tend to bid up the price of the stock, especially if large numbers of shares are to be acquired. The tender offer hedges the purchase because its exercise is contingent on the corporation's receiving the number of shares sought. It is also faster, since purchases do not have to be arranged in a time pattern so as not to disturb the market.

Ethical considerations

Whenever a corporation becomes involved in a program of treasury stock reacquisitions, ethical and legal problems arise. With the separation of management and ownership, conflicts may arise between their respective goals. In a reacquisition, management will attempt to buy the stock at the lowest price, while stockholders seek to sell at the highest. The problems which may arise revolve around insider information and its effect on the investing public.

The Securities and Exchange Commission has established legal restrictions which apply to treasury stock transactions. These laws say little about stock promotions. The main thrust of what they do say is against stock promotion that either might affect the sales of securities in a public offering or is blatantly dishonest.

The SEC restrictions emphasize the effects of treasury stock reacquisitions on the public's investment decisions, viz., whether to acquire, dispose of, or retain stock. Any question of impropriety is usually based on the dissemination of less than complete truths to induce unsuspecting investors to buy, or stockholders to sell, too soon.

Disclosure requirement

The Cady, Roberts and Company decision in 1961 emphasized both the materiality of the information and the effect of disclosure, or lack of it, on a reasonable man's investment decision. In a reacquisition, the following type of data should be presented: information which a prudent investor ought to have before purchasing the security, information which would materially affect the decisions of the other party, and information which might be expected to have an effect on the market.[9] These guidelines transcend the basic goals of the corporation—maximization of stockholder wealth. It is the effect of a treasury stock acquisition on the public at large and on present stockholders that must be considered, The Cady, Roberts and Company verdict also held that the non-disclosure of material information, when insiders or their privies took advantage of it, unwittingly or otherwise, was a violation, and subject to prosecution.[10]

Problems of this sort can be avoided by proper disclosure. The

EXHIBIT 2

Change in Capital Structure of Colt Manufacturing Company, 1949—1950:

Item	1949	1950
Capital stock (par $25)	$ 5,000,000	$ 5,000,000
Surplus before earnings for year	7,762,726	7,874,833
Earnings for year after tax	519,497	944,117
Total net worth	13,282,223	13,818,950
Less reacquired stock at cost	109,174	6,653,174
Net stock and surplus	$13,173,049	$ 7,165,776
Number of shares outstanding	195,900	71,073
Book value per share	$ 67.24	$ 100.82
Earnings per share	$ 2.65	$ 13.28
Market price high	$ 44.50	$ 66.75
low	$ 33.75	$ 39.75
Moody's 125 Industrial Common Stock Average:		
high	$ 52.28	$ 64.46
average	$ 46.88	$ 57.83
low	$ 43.46	$ 52.58

stockholder who sells, and the individual who buys, must still have done so at that price even if they had known that the corporation were the purchaser, and if they had been in possession of all material information. It is quite difficult for the corporation to know whether it is in possession of material information not generally known to its shareholders, since a corporation will inevitably be better informed of its affairs and future prospects than its public shareholders. On the other hand, it may be unwise to make this information public for competitive reasons. However, it is advisable that if significant developments are pending that could affect the price of the stock, purchases of the stock should be held in abeyance until after a public announcement is made.

Conclusion

The substantial fund flows of the past decade have led many corporations to alter their capital structure by eliminating debt and preferred stock. More recently we have witnessed large acquisitions of treasury stock by major corporations. If maximization of shareholder wealth is one of the major goals of management, the acquisition of treasury stock, although often overlooked, can be a flexible and powerful way to help accomplish this goal.

Treasury stock acquisition can require substantial commitments of corporate funds and should be studied and analyzed as is any other large capital investment. Retiring common stock is not as simple a routine as retiring debt or preferred. The acquiring company is dealing with its owners rather than creditors, and equitable treatment must replace the philosophy of "caveat emptor." However, the problems are usually not nearly so great if the action is properly planned.

[1] For further information on the trend between 1954 and 1963, see Leo Guthart, "More Companies Are Buying Back Their Stock," *Harvard Business Review*, March-April, 1965.

[2] For a further discussion, see Mock and Shuckett, "Increasing the Velocity of Corporate Funds." *Management Services*, July-August, 1966.

[3] Assuming the market price was the same as the option price at the time of issunace.

[4] "Investing in Yourself," *Wall Street Journal*, June 30, 1965, Page 8.

[5] *Moody's Industrial Manual*, 1951, Page 701.

[6] For individuals filing a separate return of income, up to $26,000; for those filing a joint return, income up to $52,000; and for heads of households, incomes up to $38,000.

[7] "Investing in Yourself," *Wall Street Journal*, June 30, 1965, Page 8.

[8] For a further discussion on tender offers, see Samuel L. Hayes, III, and Russell A. Taussig, "Tactics of Cash Takeover Bids," *Harvard Business Review*, March-April, 1967.

[9] Richard L. Baker, "Non Dilutive Stock Benefits," *Business Lawyer*, January, 1967, Page 441.

[10] *Ibid.* Page 440.

A growth company should not acquire its own stock; earnings will be low in comparison with the market price the stock commands; the company can earn more from other investments.

what people are writing about

BOOKS

Accounting Information in Managerial Decision-Making for Small and Medium Manufacturers (Research Monograph 2) by GARY A. LUOMA, National Association of Accountants, New York 10022, 1967, 88 pages, $2 (paperback).

Smaller companies, this study finds, could improve their decision making simply by making better use of the information that is already known or readily available to them.

This little monograph compares the "proper and sophisticated" use of accounting in decision making and the extent to which it is practiced by managements of small and medium-size firms. Not surprisingly, the research indicates "a wide gulf" between them.

The author picked six specific decision areas in which to analyze management use of cost data and information: capital equipment analysis, cost-volume-profit analysis, financial budgeting, inventory control, make or buy analysis for products or components, and product pricing. He conducted in-depth studies of six companies, all Southern or Midwestern manufacturers with annual sales volumes of $12 million or less. This research was supplemented by a mail survey from which 62 usable replies were received.

In general, the author concludes, managerial decision making in small and medium-size manufacturing firms is not highly structured, and accounting data are not being used in a sophisticated manner. Some major operating decisions are made without the use of proper accounting information, even though that information is known or is readily available to management.

The sophistication with which accounting data are used in deci-

sion making varies, of course, among companies and among the specific decision areas studied. Orderly procedures are more common in the areas of capital equipment analysis, financial budgeting, and product pricing than in the areas of cost-volume-profit analysis, inventory control, and make or buy analysis.

Among the major deficiencies: There is a general lack of precise definition and separation of fixed and variable costs with a consequent lack of incremental or differential analysis. Full manufacturing costs are used in many situations where other cost structures would be more meaningful.

Decisions are based on oversimplified analyses. Many of them are made in response to developments in operating environment without adequate attention to the effect on costs and profits. Generally, executives are aware that accounting information can be useful in decision making but do not understand exactly how to go about using it. The author's recommendation: more accounting education for management, particularly top management.

Although the conclusions of this study are far from unexpected, they do point up specific opportunities for accountants to be of service to smaller companies. For the small company executive, the description of model accounting-based decision making that the author presents for contrast with his research findings might serve as a simple introduction.

A Manager's Guide to Computer Processing and The Management of Data Processing by ROGER L. SISSON and RICHARD G. CANNING, John Wiley & Sons, Inc., New York, 1967, each 124 pages, each $6.95.

These companion volumes are basic guides to the use of computers for the executive and the data processing administrator, respectively.

The first of these books, the manager's guide, is another introduction to the computer for the businessman. Its purposes, according to the authors, are to show the manager how to view the management information system analytically, to teach him enough of the language of the systems designers to facilitate communication with them, and to teach him enough about computers for him to be able to determine whether his information system needs modernizing.

It defines the characteristics of management control systems, relates these characteristics to the various functions of the business, and discusses how information can be categorized for management purposes, how systems functions should be organized, and what costs are involved. There are, of course, a myriad of such books; this one is shorter and less technical than most.

The book for data processing managers has less competition. Its emphasis is on the future. The authors identify the major trends in computer applications, equipment, organization, and staffing, differentiating the advances they think will be made almost immediately—such as the adoption of visual display units and fast response systems—from those that are more remote—such as the corporate data file and the information utility. Then they suggest how the EDP manager should prepare for these changes.

The language is simple, but the approach is sophisticated. These authors know a lot about data processing problems; any manager of an EDP system should be interested in what they have to say.

Management Systems: A Book of Readings by PETER P. SCHODERBEK (editor), John Wiley & Sons, Inc., New York, 1967, $10.95.

Although this volume was compiled primarily for use as a supplementary college textbook, it would also be valuable background reading for anyone involved in systems work.

This carefully chosen collection of articles on various aspects of management systems combines a number of subjects not often taken up in a single volume. The principal topics are the systems concept, information technology and its effect on the organization structure, design of management systems, total systems, human problems of systems, management control systems, cybernetics, computers, simulation, measurement, PERT and PERT/Cost, real time systems, and information retrieval.

All the articles are readable (clarity was one of the editor's principal criteria for inclusion in the volume); most are valuable; and some are genuinely outstanding. The material is reprinted from books, seminar proceedings, and nineteen periodicals; five of the articles originally appeared in MANAGEMENT SERVICES.

An Evaluation of Finance Leasing by JAMES F. JACKSON, JR., Bureau of Business Research, Graduate School of Business, The University of Texas, Austin, 1967, 139 pages, $2.50 (paperback).

This summary of the basic considerations in deciding between leasing and purchase would be helpful background material for anyone who must make such an analysis.

The objective of this study was to determine what conditions favor the use of finance leases over alternative methods of financing an asset.

The author examines various methods of determining the relative cost of the alternatives, including relative total cost and annual cost of assets; analyzes the effect of cash-flow differences; reviews the basic tax considerations; and summarizes the significant qualitative factors to be considered.

Assuming that the finance lease qualifies for a tax deduction, it generally has an economic advantage over purchase of the asset if the nondepreciable portion of the asset is high, if the useful life is long, and if the cost of capital is high, he concludes. However, nonquantifiable considerations such as flexibility also may be important, and in the end each decision must be made on its individual merits.

The Structure of Human Decisions by DAVID W. MILLER and MARTIN K. STARR, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1967, 179 pages, $2.95 (paperback).

Two Columbia University professors offer a remarkably clear and nonmathematical explanation of modern decision theory.

Both the advocates of traditional scientific management and the human relations theorists have been looking for a unified theory of management for a long time—without much success. More recently the mathematically minded management scientists have come up with their own candidate—decision theory.

Decision making, these authors claim, is a universal process whose basic elements apply to any problem, whatever its detail. This book seeks to explain what decision theory is and how the manager can apply it to any sort of problem. The application rests on the proper classification of a problem; once the problem has been classified, problem solving techniques appropriate to that classification can be used. The techniques themselves, which are the tools of operations research, are not elaborated upon in this book, whose stress is on basic concepts.

The authors start by explaining model building and by defining the organization as a communications network, characterized by input, output, and feedback. They explain utility and maximization as decision criteria, and discuss the problems of suboptimization.

Then they outline decision theory, stressing probability theory and payoff matrixes. They divide decision problems into five classifications: decision making under conditions of certainty, uncertainty, risk, partial information, and conflict, and suggest decision criteria for each classification. Finally, they indicate briefly how applied decision theory (operations research) can be used in problem solving.

All this is done in the simplest possible language and with minimal use of mathematics. Anyone who wants to know what management science is all about without actually becoming an operations research man himself will find this little book genuinely helpful.

Critical Path Networks by R. L. MARTINO, MDI Publications, Management Development Institute, Inc., 130 West Lancaster Avenue, Wayne, Pennsylvania 19087, 1967, 158 pages, $17.50.

A pioneer in the field of critical path networking has produced a primer for the complete beginner.

The various networking techniques (PERT—Program Evaluation and Review Technique; CPM—Critical Path Method; and MAP—Multiple-resource Allocation Procedure) are probably the most widely used tools of operations research. They have, indeed, become so common that Dr. Martino sees—probably accurately—a need for a primer that can be understood even at the high school level.

This is what he has attempted to supply in this volume. It is designed to explain the nature, scope, and application of critical path networks to all who might need to apply this approach to project work or to direct others in its application.

Topics covered include project planning, scheduling, and controlling; modeling a project; preparation of master networks; ranges of starting times, job boundaries and float; the critical path; event-oriented networks; and implementation.

The book treats networking as a universal technique independent of any particular profession, discipline, or computer configuration. The presentation requires no specialized knowledge of any field, of computers, or even of mathematics. (The reader needs only a minimum of high school algebra, and even that can be omitted.)

The style is simple, and the presentation is graphic, with more than 200 diagrams in a handsomely produced volume. Although the high price may limit its use in training programs, there is no question that this manual fills a real need.

Briefly Listed

Financial Information for Executive Management by N. THORNTON, Gee & Co. Ltd., 151 Strand, London WC2, England, 1967, 180 pages, 42 shillings ($5.04).

This little summary of the essentials of management accounting examines management information as a tool of business control, identifies the assumptions and limitations that govern the providing of financial information, outlines pertinent accounting terminology and classifications, and specifies some of the detailed information that should appear on financial reports. More than half the book consists of appendixes, containing sample accounting reports and information on report preparation, reproduction, the use of charts, and the committee system.

The Financial Executive and the New Accounting by MAURICE E. PELOUBET, CPA, The Ronald Press Company, New York, 1967, 227 pages, $6.

This review, for the corporate executive, of the services accounting firms offer their clients in-

cludes a chapter outlining current approaches to management advisory services. It lists the six basic steps in a consulting engagement and tells 18 brief case histories illustrating typical assignments.

Teach Yourself Operational Research by M. S. MAKOVER and E. WILLIAMSON, The English Universities Press Limited, St. Paul's House, Warwick Lane, London EC4, England, 1967, 264 pages, 10 shillings sixpence ($1.26).

Operational (operations) research is not really what the reader of this self-instructional text will learn from it. Rather, the subject is some of the basic mathematical techniques that are the standard tools of operations research: probability, replacement, forecasting, stock control, queues, linear programing, theory of games, network analysis, and dynamic programing. The treatment is simple, clear, and concise, but it demands some grounding in mathematics.

MAGAZINES

HP—A New Tool for Uncovering Decision Processes by CHARLES G. MOORE, *Pittsburgh Business Review*, September, 1967.

This article summarizes some recent research on human decision making processes that shows promise of developing a means of automating some middle management decisions.

The predicted automation of decision making at the middle management level has not yet occurred. Yet, this author indicates, recent progress in the use of a new tool known as heuristic programing suggests that the day may be drawing nearer.

Heuristic programing (HP) is the development of a computer decision program by rule of thumb experimentation. Academic researchers have been using this technique to teach computers to simulate human decision processes. The purpose was to learn something about how human beings actually make decisions. But the success of these experiments indicates that it may soon be possible to automate some management decision making—and perhaps even to forecast the decision making of customers and competitors.

The decision processes that have been simulated include the determination of prices (regular, promotional, and markdown) in a retail store; the investment decisions of a bank trust officer; the purchasing patterns of a department store appliance buyer; and a motorist's choice of gasoline service stations. In some cases the computer has been programed to duplicate almost exactly the decisions actually made by the human being.

From all this the researchers have reached some conclusions about the way people's minds work in decision making; for example, that the mind considers relevant factors in sequential fashion rather than simultaneously (just like a computer) and that the rules of thumb used in reaching the decisions are relatively simple. They also have succeeded in identifying the functions actually performed in decision making: choice, categorization, and computation.

The decision rules developed in these studies for the most part represent the thinking of single individuals and hence are not necessarily valid as generalizations. But larger samples can be studied. Then it would be possible to capture the decision criteria and data bases in the form of flow diagrams and put them into computers.

The decisions that would thus be automated, although relatively important and typically made at a managerial level of the organization, differ only in degree, not in kind, from those already being made by computers (payroll calculations, inventory control systems, etc.). These higher-level decisions differ from the others in that the rules of thumb used have been learned by the individuals who use them largely through experience, often without formalization, and that they may require the use of subjective, unquantifiable information. But, to be suitable for automation, they still must be routine (i.e., fitting a more or less consistent pattern) and repetitive (to justify the cost of programing).

Even more exciting is the more distant prospect of programing the behavior of persons outside the organization—a development that would give the manager much more control over his environment. The day of electronic decision making may not be so remote after all.

Systems and Government by JAME D. GRANT, *Budgeting*, September-October, 1967.

In this article the administrative vice-president of the National Institute of Public Affairs stresses the importance of the systems approach for allocation of government resources. He discusses the new integrated planning-programing-budgeting system in the Executive Branch and the applicability of the systems approach to government non-defense projects.

This article discusses two areas where the systems approach is being newly applied to government: the planning-programing-budgeting system and industrial-type systems studies for public programs. The integrated planning-programing-budgeting system was initiated by the Bureau of the Budget in October, 1965, and the systems studies were conducted by aerospace companies for the State of California.

The integrated planning-programing-budgeting system (PPBS) is intended to alter the federal planning and budgeting process to effect more systematic analysis and, thus, to provide a better allocation of federally controlled resources. The author describes the three con-

cepts on which the new PPBS system is based: 1. the delineation of agency objectives and alternative programs which can attain the objectives, 2. the existence of long-term planning, and 3. a budgeting process that can translate a broad program decision into a budgetary framework for executive action.

The author states that the new "objective-oriented" federal system has many desirable characteristics for a federal budget structure such as cost benefit analysis and the comparison of various management units administering the same program. Objectives in our society, he says, are influenced by differing social responsibilities, and the formulation of objectives should be multi-disciplinary to attain the "optimal set of concurrent objectives." Thus, social justice, not simply economic rationality, may be the limit on executive action. Mr. Grant also believes that in certain cases the handling of uncertainty can be as effectively managed in the political area as in the analytical area.

The second area discussed is the applicability of the systems approach, so successful in defense areas, to government non-defense projects. This area is currently of particular interest because of the probability of a defense cutback at the conclusion of the war. He breaks down the systems approach to its three phases: analysis, engineering, and management. Systems analysis supports decisions of design, selection, or operation. Systems engineering, more detailed than analysis, deals with design and development. Systems management represents the ability of an organization to design, develop, and operate an intricate system. The State of California sponsored a study a few years ago on the feasibility of adapting industrial systems capabilities to non-defense problems such as transportation, pollution, and crime. The results indicate that the systems approach can be adapted to public programs and the "pattern of action" necessary to attain the social objectives of these programs. The use of contracts between government and business offers a means of utilizing industrial capacity for public programs.

The National Institute of Public Affairs evaluated the California studies and concluded that they substantiated the feasibility of the application of the systems approach to public affairs fields. The institute also called for more exploration, stressed the need for cooperation among "Balkanized" jurisdictions, pointed to more specialized personnel requirements, and, finally, mentioned that government and business must work toward each other's goals if the partnership is to be successful.

The article is valuable reading for those interested in the adaptability of the systems approach to non-defense problems at all levels of government and the related activities in the federal program planning and budgeting system.

RICHARD J. VARGO
University of Washington

Canons for Line of Business Reporting by OSWALD NIELSEN, *Management Accounting*, August, 1967.

This author suggests that reports resembling analyses and reporting for internal management use might better serve the public than the line of business reporting of current controversy.

Current interest among accountants in line of business reporting (reporting sales and profits by division or product lines) was, the author points out, spurred by the Senate Anti-Trust Hearings in 1965 and the statement made by Manuel Cohen, Chairman of the Securities and Exchange Commission in Denver in July, 1966, and re-emphasized at the annual meeting of the American Institute of Certified Public Accountants in October, 1966. Furthermore, some financial analysts support more extensive reporting because they feel segmented information will help them to give better service to the investors who depend on them.

The author discusses some of the practical difficulties in presenting a meaningful expression of net income by individual lines of business—the risk of disclosing classified information, the shifting significance of lines of business, the diversity of accounting practice among divisions, and the integration of a business activity which is not always clearly identified as entirely horizontal or vertical.

He also discusses the conceptual problems. First, sales figures may not be good indicators of the revenue capabilities of various business segments. This is true in the case of vertically integrated lines and in any situation where intra-company transfer pricing is involved. Secondly, there are problems related to general overhead and its allocation. No basis for joint cost allocation has been developed up to now.

In spite of these institutional and conceptual problems, management finds segmented information useful for internal purposes, and the author feels it can be of value to outsiders. Professor Nielsen has applied the accounting techniques for making analyses for internal planning and control to external reporting to provide more adequate information for general readers and outside users. This information may be important to a sound analysis of the company's worth and future prospects. The author uses as examples analyses of such data as sales figures, joint and by-product cost, general overhead financing charges, and loss allocations.

Examples

One illustration used by the author concerns sales. If the integration is vertical, sales that occur internally between divisions might arise from a make-or-buy analysis. This may be used to determine the value of internally used production. This analysis "will be in terms of cost savings, arrived at

by comparing contemplated purchase price with those costs incurred incrementally to achieve internal production."

Another illustration deals with the difficult problems of "concurrent absorption." In this case managerial analyses should be conducted on the basis of both long-run and short-run considerations. In the long run all overhead can be traced to a particular product line on an incremental cost basis, thus reporting on a full cost basis. In the short run reporting would be of sales and contribution margins by lines of business.

The author raises the question of stability of segmentation. He recommends the disclosure of the important shifts in lines of business; to achieve this the various lines must be identified clearly enough to permit the study of such changes.

Finally, the author concludes that certain business segments, especially those that do not lend themselves readily to quantitative analyses, may be more adequately reported by combined than by segregated reporting.

What is now needed is further study by management, accountants, and regulatory agencies to assess the relative advantages of these analytical considerations and to decide what disclosures should be required in financial reporting.

FAWZY DEMIAN
University of Washington

Financial Implications of Lot-size Inventory Models by WILLIAM BERANEK, *Management Science*, April, 1967.

Many inventory models, including the lot-size or classical model, imply financial conditions that should be considered by the user. If the assumptions of the model do not correspond to those in a firm's environment, the result will be financial infeasibility or a non-optimal inventory or both. Most users of the lot-size model would not recognize financial infeasibility because they are modeling for a sub-unit within the firm, which thus would be, in effect, subsidized by other sub-units in this situation. The nonoptimal inventory is also likely to go unnoticed; it is probably an unnecessary cost when an improved model is available.

In illustrating the restrictive conditions of the lot-size model, the author examines its assumptions concerning inventory carrying costs. These carrying costs, c, are defined to include the interest cost per unit of inventory over the planning horizon, T. If demand for inventory is uniform over the horizon and if q denotes beginning inventory, the average inventory becomes q/2, and it is conventional to define total carrying costs over T as cq/2. The implied assumption in this definition is that both interest cost and the average amount of the loan outstanding are proportional to q/2. In addition, each of the several loan repayment schedules that would agree with this proportionality are associated with a cash inflow assumption. Consideration of this necessary cash inflow is complicated by the fact that dollar resources tied up in inventory must flow through accounts receivable before resulting in a cash flow.

As a remedy, the author proposes incorporation of the actual financial conditions of each subject firm or sub-unit of a firm in the model utilized. His suggested method involves the computation of actual financial carrying costs, quantities which then may be inserted into expressions of total inventory costs in the model. The procedure for computing the financial carrying costs consists of first assessing the loan repayment arrangement in order to determine the average amount of the loan outstanding. Then the interest cost per cycle is computed by multiplying the interest rate by the average amount borrowed. This amount plus any fixed borrowing fees is added to the non-financial carrying costs to obtain total carrying costs for a cycle which is used in the model. In four examples, it is shown that some ordinary financial situations result in considerable differences between the usual assumptions and the model using the firm's actual financial conditions.

Most users of this type of inventory model should consider the implications of this article on their model. It does not seem likely that the assumptions of the classical model will exist in very many firms, and the resulting errors may be costly.

WILLIAM L. FELIX
The Ohio State University

The Lawyer, the Statistician and the Internal Auditor by L. B. SAWYER, *The Internal Auditor*, Summer, 1967.

Statistical sampling has gained wide acceptance in business, but variable sampling has been held inadmissible in court cases. In this article the problem is discussed from the viewpoint of rules of evidence, and some possible approaches to gaining admissibility for variable sampling are suggested.

The author, an attorney, utilizes the case of *Sears, Roebuck and Co. v. The City of Inglewood* to illustrate and highlight his discussion of the relationship of statistical sampling (especially for variables) and rules of evidence. The case involved overpayments of city sales taxes. Sears had paid taxes on sales to out-of-city customers and sought a refund. A professor of statistics conducted a sample examination of the sales tickets for the period and found the overpayment to be $28,250 plus or minus $4,200 at the 95 per cent confidence level.

Inadmissible evidence

The case was thrown out of court when the defense attorney asked

the professor one question: "On the basis of your sample, can you state that sales to people outside the Inglewood area were exactly . . . ?" and the professor replied, "Of course not." His testimony was ruled inadmissible, and the reasons why constitute the gist of the article.

Rules of evidence are rules of exclusion, since any relevant evidence should be brought into testimony. The relevant rules in this case are these: the hearsay rule, the opinion rule, and the best evidence rule. The hearsay rule prevents admission of testimony by persons who did not witness the occurrence about which they are testifying. Business records are technically hearsay but have evolved into admissible testimony as an exception to the rule. Witnesses are not permitted to give opinions unless they are experts in some field, profession, or science and then only if the experts' opinions are the only way in which the facts could be presented in an intelligible manner to the average court and jury. The best evidence rule would require all documents pertaining to the issue to be presented. An exception to the rule has developed as a practical necessity. If the documents are so numerous that it would be virtually impossible to present them all, a summary prepared by a competent witness may be admitted.

Problems of variable sampling

Thus, business records are admissible, expert witnesses may offer opinions, and summaries of documents may be presented. Still, the court forced Sears to examine all 950,000 sales tickets for the period before its claim was allowed. The author feels that since attribute sampling has been held admissible, the problem lies in variable sampling for three reasons: Variable sampling is incomprehensible to the average court and jury; it is conjecture, not good solid fact; and its results are not precise but must be expressed as ranges, making the court hesitate to set a numerical value.

These objections he finds to be invalid. Internal auditors should carry their expertise in "translating" technical problems to nontechnical managers into the area of interpreting sample results for lay juries and courts. Similarly, variable sampling is not conjecture but is mathematically sound and widely accepted in many business situations such as determinations of the shares of airline fares when several lines carry the same passenger who pays one airline for the entire trip. Finally, the range of estimate may be narrowed through adjustments in sample size, and the saving in examination costs may offset the possible loss in accepting the low point of the range estimate ($24,050 in the Sears case).

The author concludes with some prescriptions for the internal auditor to adopt for the purpose of gaining acceptance by courts of variable sampling results—chiefly becoming proficient in the area and informing management of his ability. Certified public accountants as well as internal auditors should find the article interesting and informative, particularly since the legal aspects of the question are dealt with clearly and fairly completely.

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Marketing and the Controversy over Conglomerate Mergers by JOHN C. NARVER, *Journal of Marketing*, July, 1967.

The controversy between antitrust agencies of the federal government and business management about conglomerate mergers would be clarified if everyone could agree on a definition of a "conglomerate."

Many businessmen have concluded that the Federal Trade Commission opposes marketing efficiency, because of the Commission's opinion in the Procter & Gamble-Clorox merger case. The central issue in the proposed Procter & Gamble-Clorox merger is the antitrust implications of the alleged marketing efficiencies claimed by the principals in the merger. The Commission questions whether free competition will not be hampered by such mergers; management, on the other hand, feels that competition will be enhanced by heightened competitive opportunities, absorption of idle capacity, and marketing efficiencies in the allocation of resources.

Some seventy per cent of all mergers are conglomerate mergers. This alone is sufficient to justify the increased intensity of interest in this type of merger. Another factor is the lack of a fully developed theoretical foundation for understanding firms with interests and activities in several markets simultaneously. Economic theory is inadequate since its constructions deal largely with the single-product firm operating in one market.

The philosophical differences may have their bases in what have become diverse interpretations of the House report's description (in the bill to amend Section 7 of the Clayton Act) of a conglomerate merger. It was there stated to be an acquisition in which there is "... no discernible relationship in the nature of business between the acquiring and acquired firms." Just what constitutes "no discernible relationship"? Two possible relationships have been suggested: an *activity* relationship and a *product* relationship. In Dr. Narver's judgment, a proper definition is that a conglomerate merger is one in which the acquired and acquiring firms have no discernible *product* relationship, that is, a merger in which the products of the two companies are noncompetitive and are not related vertically. A merger of the conglomerate type, as opposed to the familiar vertical and horizontal types, is one in which the acquiring firm gains a new external market, either a new product market or a new geographical market. A new market is one where

customers do not consider the product as a substitute for the firm's present product line. Thus, despite product identity, a regional firm acquiring a firm in another region, neither of whose products cross the regional market lines, is said to have a new geographical market. Moreover, a new product market emerges and substitution is impossible when the acquired and acquiring firms' products lack the mutual ability to satisfy the same consumer want.

In conglomerate mergers "bigness" as such, is irrelevant, and an activity relationship is relevant only incidentally. A solution to the controversy over the social desirability of conglomerate mergers may be found if conglomerate is accepted as meaning any and all market diversifications. Market diversification does not necessarily restrict competition but even may enhance it.

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Motivation and Coordination in Management Control Systems by CHARLES T. HORNGREN, *Management Accounting*, May, 1967.

Most attempts to judge the effectiveness of management control systems focus on the physical and technical aspects of the systems, not on the "total" control systems employed. The purpose of a control system should be to aid management in attaining "harmony of goals (effectiveness) and the optimum acquisition and utilization of resources (efficiency)." This demands coordination, which in its turn involves the motivation of management.

The author focuses on three areas of management, using illustrative examples to show the relationship of the concepts to the business environment:

1. *Goal setting*—Is there a global perspective in the control system incorporating and interrelating the goals of the major segments of the firm? Are people motivated to achieve these goals?

2. *Structure of organization*—Is the control system complementary with the organizational structure to help improve the level of motivation?

3. *Acquiring and using resources*—Is the information generated by the control system accurate and relevant enough to be useful in the management's utilization of resources?

Goal setting

In goal setting, the firm must balance its set of interdependent goals, guarding against placing too much emphasis on any particular goal. The establishing and pursuing of goals should not be on a day-to-day basis but requires coordination over longer periods of time. For example, an incentive system should be based upon the performance of the entire firm, not some individual segment. It is possible that efforts by a division to maximize its profits will largely result in efforts to shift costs to other divisions.

The structure of organization and the management control system are inseparable. A change in one is not a panacea for problems in the other. The division and subdivision of the activities of the business enterprise are an attempt to maximize "effectiveness and efficiency," and they require some responsible hierarchy of management. This process is reflected in control systems based upon responsibility costing.

Control systems

Control systems must facilitate the striking of a reasonable balance between cooperation and competition among responsibility centers, keeping in mind the problems of motivation in each center. The accounting system is a direct part of a control system, recording and reporting the performance of each responsibility center. Problems of motivation require the firm to exercise care when establishing these responsibility centers, allowing sufficient freedom of choice to prevent the centers from becoming mere cost accumulation points. It is therefore necessary to consider the motivational aspects involved in the accounting control system

Information systems

Acquiring and using resources must be based on information that is timely, accurate, and relevant. The information from the accounting system should aid management in choosing the correct alternative from among competing courses of action. For example, the goals of the organization and its structure can influence the manner in which foremen allocate the time of their crews to the types of work performed. In the author's example, time spent on maintenance and repair was closely controlled while time spent on construction was loosely controlled. The result was that foremen were encouraging workers to understate the time spent on maintenance and repair work.

Every system possesses problem areas, such as conflicting goals and faulty information. The aim of a control system is to "reduce the lack of coordination and to increase the proper motivation." Because motivation should be a prime consideration in the design of a management control system, specific measures should be undertaken to facilitate an appraisal of the motivational influences of that system. Many times the weaknesses are not technical system problems but lie in the companion area of administration. A successful system requires strength in both.

Limited objective

The author's primary, and limited, objective is to "underscore and make explicit the probable impact of a system on managers' behavior" without analyzing any cause and effect relationships

among the various factors jointly affecting behavior. Within this framework the article illustrates through the specific examples that the control system *does* influence management behavior. It should be noted, however, that accounting has had very little experience with the problem of evaluating levels of motivation.

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Toward a Theory of Group-Decision Behavior by GEOFFREY CLARKSON and FRANCIS TUGGLE, *Behavioral Science*, January, 1966.

In explaining group decision behavior by developing a theory based on the individual's decision processes, an experiment is reported that had some success, according to its authors, in predicting the behavior of several two-person groups in bidding market prices based upon individual decision rules.

The theory outlined in this article is based on the assumption that certain structural invariances (fixed patterns) exist in the decision processes of individuals, that is, individuals have some prior knowledge, some information processes, and some decision rules. The authors extend this notion to groups and suggest that the behavior of groups is determined by individual decision processes plus some means of resolving conflict.

The experiment consists of an experimental task, a program for establishing decision rules, and a program for predicting group decision behavior.

Experimental task

The experimental task is administered first to each subject and later to two-person groups of subjects. Subjects bid prices on two objects in different markets; then an alternative set of prices is selected randomly. If the subject's bid is less than the corresponding price in the alternative set, the subject wins. In all other cases, he loses. Following this choice situation, the subject is allowed to revise one of his bids, by increasing it or decreasing it before the next alternative set of prices is announced.

Following this initial bidding the authors establish decision rules for each subject by utilizing a computer program to approximate the subject's behavior after he has experienced two wins, a win and a loss, or two losses.

Prediction

From the individual decision rules two-person group decision behavior is predicted. This prediction is made on the following bases:

1. If in a specific situation the decision rules of both subjects in a two-person group agree, then the group decision is the same as each of the individual's decisions.

2. If in a specific situation the decision rules do not agree, then conflict-resolving rules are employed: (a) If both of the group prices on the previous trial were winning prices, then each of the prices is predicted to be raised in the next trial. (b) If one of the group prices in the previous trial was a losing price, then that price is predicted to be lowered in the next trial. (c) If both of the group prices in the preceding trial were losing prices, then the prices are predicted to be lowered on the next two trials.

Comparison with behavior

Following the development of these predictions, the subjects are combined into two-person groups which are given the task, and the actual behavior of the groups is compared with the predicted behavior.

In this experiment the authors report success in correctly guessing the response of the groups at the .01 level of significance. A correct response was defined as one which determined which market price would be changed and in which direction that change would occur (increase or decrease).

Conclusion

The authors conclude that although the experiment was limited to the two-person groups, they have isolated an aspect of group decision behavior. They say that they are in the process of developing a three-person group experiment and that in the future they intend to determine what effect group decision behavior will have on individual decisions.

The authors' approach may become relevant to the study of decision processes in specific business areas. For instance, in the accounting field, researchers have been concerned primarily with the impact of accounting data on individual decision makers. Possibly this theory of decision behavior will be extended to consider the relationship between accounting data and group decision theory.

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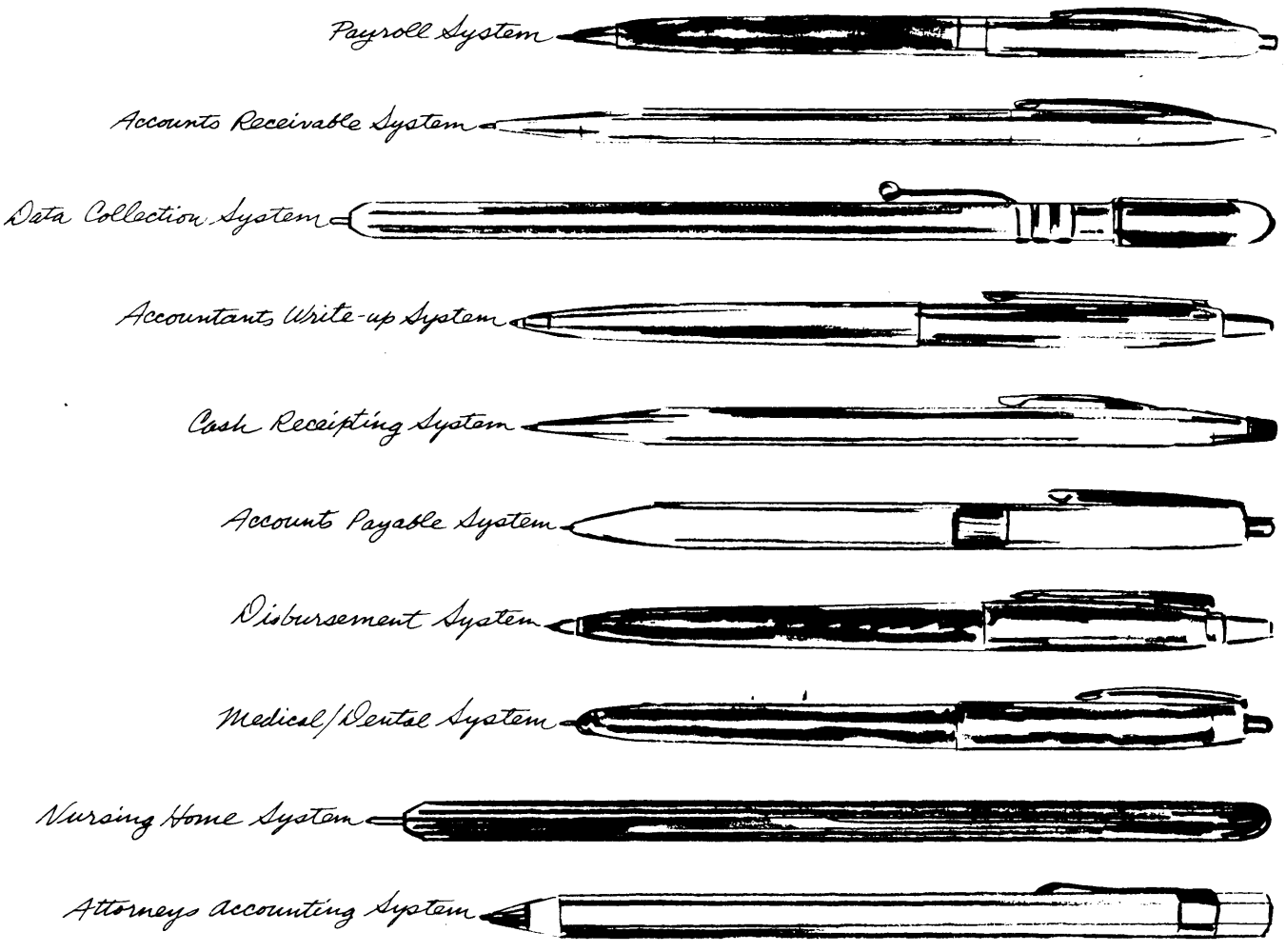

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