# What People Are Writing About

James H. Bullock

L. Serafino Corsini

William C. Boynton

Steven Flory

Shane Moriarity

*See next page for additional authors*

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## Authors

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## BOOKS

### Analysis of Behavioral Systems
by JAMES R. EMSHOFF, The Macmillan Company, New York, 1971, 147 pages, $6.95.

*Efforts to build quantitative models for analysis of problems involving human behavior have not been very successful to date. This author tells why and offers an approach that he considers more likely to be productive.*

Operations research, systems analysis, and related fields of study have achieved some spectacular successes in such diverse areas as the blending of petroleum and food products, inventory control, and transportation routing. Much less progress has been made in applying these methods to problems where the solution requires models that provide an explicit understanding of the behavior of people.

In this book Dr. Emshoff, an independent consultant, explains why the current methods of the "systems sciences" are unsuitable for behavioral studies, outlines a method that he says would be suitable, and describes the results of a study conducted according to the principles he expounds. (In the "systems sciences" he includes OR, management science, and systems analysis. All, he says, are essentially the same thing; all use the concept of a model as the basis for problem solving. However, systems analysts "tend to use a model to identify a problem as well as to solve it, whereas operations research/management science tend to formulate the problem prior to developing a model.")

The systems sciences, he concedes, have dealt to some degree with problems that include behavioral factors, but these problems have tended to be ones in which human choice plays a minor role (for example, production) or in

## REVIEW EDITORS

which the numbers of people were large enough for statistical probabilities to apply (for example, waiting lines). In all these cases it has not been necessary to consider *why* men in the system make the choices they do; what has mattered is *what* they do.

## Behavior important

Now, however, systems scientists are getting interested in activities such as marketing, research and development, urban problems, and long-range strategic business planning. Problems like these require control over aspects of behavior, and that control depends on the extent to which human behavior is understood and can be explained.

Partly because of their heavy emphasis on statistical theory, operations researchers have tended to be output-oriented in their studies. (Dr. Emshoff defines output-oriented as meaning that "the analysts were primarily concerned with how to represent interaction among the input variables in the model so that the output of the model would be similar to that of the real system.")

In problems involving human choice, Dr. Emshoff points out, inputs to the model, that is, the causes of the behavior, are at least as important as the output produced by the model. Output-oriented research, he says, has been unsuccessful in solving marketing and other human-oriented problems because it results in a model that describes the choices people make, and description provides only knowledge—not understanding—of behavior.

## Research strategy proposed

Dr. Emshoff goes on to present a proposed strategy for behavioral research. Essentially, it calls for thorough study of small segments of behavior, whose results can then be integrated sequentially. This was the method applied in the Wharton School's six-year "conflict project," (a study of the general problem of

controlling the escalation of conflict situations), which is described in the latter part of this book. The use of this method, the author feels, was the principal reason for what he considers to be the success of this project.

As can be seen from this description, Dr. Emshoff's book is a highly technical one in the sense that it contains no easily adaptable bag of tricks. His prescription, rather, is for more work, and it may be work that the typical business reader is unwilling or unable to undertake.

It is not, however, a difficult book to read; it contains little mathematics, and the organization structure is very clear. And it is an important book. The type of research the author is talking about represents a major frontier for the systems scientists; once it has been conquered quantitative methods will probably become standard tools in nearly every business of any size.

## The Administrative Revolution: Notes on the Passing of Organization Man by George E. Berkley, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1971, 181 pages, $5.95 (clothbound), $2.45 (paperbound).

*Only a few decades after the publication of* The Organization Man, *this author, an assistant professor of political science at Northeastern University, attempts—with some success—to prove that the character it personified, as well as the forces that shaped him, is now obsolete.*

The growth of bureaucracy, culminating in the stereotype of the organization man as painted by William F. Whyte, Jr., has not always been viewed with the disapproval it draws today, this author reminds us in his opening chapter. As compared to the capricious despotism it replaced, bureaucracy had the practical and human ad-

vantages of rationality, impartiality, and (relative) efficiency.

Today, however, bureaucracy is losing popularity, not only among the radical young and the clients of government but also in its heartland, business. There, says Professor Berkley, the traditional pyramid is crumbling, to be replaced by something like a "squishy circle," and the organization man is giving way to "Mobicentric Man."

## Reasons why

The reasons are many: the allegedly growing influence of Theory Y and other human-relations-oriented theories; the alleged growth of participative management and profit sharing in response to union pressures; the success with which some companies are applying management by objectives; and the increase in numbers and power of staff (as distinguished from line) personnel and consultants, the need for more intercommunication among elements of a business, and the popularity of the project group type of organization—all results of increased technology.

"The growth of education," says Professor Berkley, "provides the main thrust for the administrative revolution. Combined with the gowing need for innovation, specialization, and professionalization, the emergence of educational (*sic*) man is slowly but surely spelling the doom of organization man."

## Trend praised

This trend is altogether a good thing, in the author's view. In addition to becoming looser and more open, organizations (business and other) are becoming much more integrated with society's goals. And the work organization, by providing such things as medical care, marriage counseling, recreational programs, and education, shows signs of replacing what the organizational revolution destroyed: the supportive functions of such traditional institutions as the family, the neighborhood, and the church.

It would appear that in this book Professor Berkley is hoping he has another *The Organization Man*. It seems unlikely that he does. For the reader employed in a business organization Whyte's book carried the shock of recognition; he suddenly realized that the things described were all around him.

That is not the case with this book. Despite a lavish journalistic-style use of quotes and concrete examples, Professor Berkley does not succeed in proving that his administrative revolution has become universal or even reasonably common. He does establish that such a trend exists; whether it will become the dominant one remains to be seen. Meanwhile, however, this remains a lively, entertaining, and provocative book.

**Automation and Alienation: A Study of Office and Factory Workers** by Jon M. Shepard, the M. I. T. Press, Cambridge, Massachusetts, 1971, 163 pages, $7.95.

*Do the automatic factory and the computerized office turn workers into bored automatons, as many have feared? This author found quite the contrary, in the study reported in this book, but his evidence, at least where office workers are concerned, is highly debatable.*

Job specialization may be the most efficient way to organize work, but it results in a loss of meaning in work for the employee, as innumerable sociological and psychological studies have shown. Both trends—specialization and loss of pride—have continued steadily since the beginning of the Industrial Revolution, with the growth of mass production in both plant and office.

Now comes automation. Although it might at first glance seem to be a continuation of mechanization—only more so—in terms of the worker's relationship to his job it is actually quite different, many sociologists feel. By eliminating and con-solidating jobs it broadens the duties and increases the responsibilities of the workers who remain.

### Clerical work stressed

A number of factory research studies support this thesis. Less information has been gathered about the effect of automation on clerical job structure. In this book, one of a series of research studies on the impact of computers conducted by the Industrial Relations Section of the Alfred P. Sloan School of Management at Massachusetts Institute of Technology, the author, a sociologist teaching at the University of Kentucky, reports how he tested this hypothesis in studies of five clerical work situations and, by way of comparison, two industrial plant situations.

Workers whose attitudes were studied were selected to represent the three basic man-machine relationships (nonmechanized production, mechanized production, and automation) characteristic of the major stages of technological development. The factory workers were employed in an oil refinery and an automobile assembly plant; the office workers were employed in a large bank, a large insurance company, and four small insurance companies. Data on which the production workers' alienation indexes were constructed were obtained by interview; the office workers filled out questionnaire forms.

### Workers compared

Attitudes of assembly-line-machine operators (mechanized workers) in the automobile plant were compared with those of automobile maintenance craftsmen (craft or nonmechanized) and process instrument monitors in the oil refinery (automated). In the office studies secretaries and clerks whose jobs were not machine-dominated were used to represent the craft or nonmechanized phase of technological development; operators of special-purpose machines (such as keypunch operators and produc-tion typists) represented the mechanization phase; and computer operators, computer programers, and systems analysts were used to represent the automation phase.

### Feelings measured

Characteristics of alienation include feelings of powerlessness, meaninglessness, and norm-lessness in work; lack of self-evaluative involvement in work; and instrumental work orientation (viewing work as a way of merely earning a living rather than as something worthwhile in itself). These were the feelings measured in the attitude survey.

Among the factory workers, feelings of alienation were low among the skilled automobile maintenance workers, reached a peak among final assemblers in the same factory, and declined among monitors in the oil refinery to a point even lower than that of the craftsmen on all scales except that of power-lessness. This finding is more or less consistent with those of other blue-collar studies.

### Results complex

The results for the office workers were more complex. For them no overall index of alienation could be calculated, for within each work group there were differing results for each component of the alienation scale; for example, computer operators scored highest of all groups in feelings of powerlessness and lack of self-evaluative involvement; nonmechanized clerks were highest in instrumental work orientation; nonmechanized clerks and mechanized office workers tied for first (above the automated workers) on feelings of meaninglessness; and mechanized office workers had a clear-cut lead in only one category, lack of self-evaluative involvement. Furthermore, there was little relation between the feelings of the two groups in the automated category, except for involvement; in terms of the other components of alienation computer programers

and systems analysts scored far below computer operators.

The author seems to believe that these findings for the clerical workers nevertheless reinforce his main thesis, and he offers some elaborate interpretations to justify this conclusion.

To the reader a more obvious reason for the discrepancies leaps out: a poor choice of job categories for comparison. The selection of general clerical workers as the equivalent of skilled mechanical craftsmen seems far-fetched; so does the lumping of computer operators, programers, and systems analysts under a single classification of automated employees. Studying programers and systems analysts as the equivalents of instrument monitors in a power plant shows little understanding of the structure and requirements of EDP jobs.

It may be true that increasing automation will decrease alienation in the office as well as in the plant, but it cannot be proved by studying the attitudes of programers and analysts, who hardly qualify as upgraded clerical workers. The issue awaits further study by someone with a clearer understanding of the nature of the various types of work.

### Briefly listed

**How to Be a Boss** by AINSLIE MEARES, M.D., Coward-McCann, Inc., New York, 1971, 249 pages, $6.

The author of this book is an Australian psychiatrist, and the subtitle of the American edition is "A Practicing Psychiatrist on the Managing of Men." The author classifies as major personality characteristics extrovert, introvert, obsessive, and hysteric and describes them. He also tells how to cope with anxiety, hostility, and depression in one's self and in others, how to communicate with individuals and groups, how to obtain information from others who are reluctant to give it, how to persuade, how to maintain morale in one's self and in a business, and how to cope

with retirement. A chapter entitled "Women on the Way Up" discusses the executive's wife and what she can do to help as well as the problems of the woman executive. The final chapter deals with the question, "What is success?"

**Listen, Management!** by WILLIAM F. KEEFE, McGraw-Hill Book Company, New York, 1971, 200 pages, $8.95.

This guide by an industrial communications consultant carries the subtitle, "Creative Listening for Better Managing." It treats listening as a communications specialty deserving the same attention as speaking, reading, and writing. Among the subjects: the danger of failing to listen effectively, how to develop the mental attitude required for effective listening, how to eliminate common barriers to good listening, how to separate facts from feelings, how to establish rapport with others, and how to listen through emotion and conflict.

**Survey of Patent Development and Marketing Organizations,** TTA Information Services Company, 4 West Fourth Avenue, San Mateo, California 94402, 1971, 30 pages, $15.

This is a directory of organizations that engage in refining patents and products for commercial markets and assist manufacturers, research departments, management and technical consultants, universities, and inventors in locating companies willing to market their products. Ninety organizations are listed; 56 are profiled.

**The Impact of Information Technology on Management Operations** by WILLIAM HOUSE, Auerbach Publishers Inc., Princeton, New Jersey, 436 pages, $15.

Twenty-six articles by 29 contributors (some of them CPA consultants) survey recent developments in data processing and their im-

pact on organizational structure, decision making, planning, and control. Technological trends reviewed include hardware, software, systems engineering, data communications, and time sharing. Other topics include mathematical models, on line processing, and management information systems.

**Effective Management Selection: The Analysis of Behavior by Simulation Techniques** by CABOT L. JAFFEE, Addison-Wesley Publishing Company, Inc., Reading, Massachusetts 01867, 1971, 150 pages, $12.50.

This book explains how to use simulation (game playing, role playing, in-basket exercises, etc.) in testing candidates for supervisory positions. There is little actual discussion of the subject; most of the book consists of sample exercises, score sheets, validation studies, and the like. There also is an order blank for a complete "assessment center program for supervisory selection" designed by the author and marketed by the publisher.

**The Engineer in the Industrial Corporation** by R. RICHARD RITTI, Columbia University Press, New York, 1971, 266 pages, $10.

Dr. Ritti, a professor at Pennsylvania State University, finds widespread dissatisfaction among engineers in industry and government, particularly in systems development organizations. He traces it to low influence over technical programs and to problems of skill utilization, especially under-utilization. He offers some suggestions for a management system that matches the requirements of the work and the use of engineers in roles more consistent with their expectations.

**Managing People at Work** by DALE S. BEACH, The Macmillan Company, New York, 1971, 515 pages, $6.95 (paperbound).

This anthology, subtitled "Readings in Personnel," contains 45

articles on various aspects of personnel by personnel administrators, professors, journalists, and others. General areas covered include the nature of the personnel function, organization, employment (with two articles on employment of the "culturally deprived"), performance appraisal, training and development, motivation, styles of management, leadership and supervision, morale and attitude studies, participation programs, communication, discipline and grievance handling, compensation, health and safety, collective bargaining, and ethics and social responsibility.

# MAGAZINES

**Overhead Allocation Via Mathematical Programming Models** by ROBERT S. KAPLAN and GERALD L. THOMPSON, *The Accounting Review*, April, 1971.

*The authors present a procedure for allocating overhead which combines the desirable features of both absorption and direct costing.*

In this article Professors Kaplan and Thompson introduce a novel approach to overhead allocation. Their method utilizes linear programing formulations as a primary tool, with suggested integer programing extensions.

A brief review of the advantages and disadvantages of both full and direct costing provides the launching platform for development of the basic model.

## *Allocating common overhead*

Initially all overhead costs are treated as joint costs. As such they are allocated to products in a manner that maintains the relative profitability of the products in the optimal solution.

Under certain restrictive assumptions, some of which are subsequently relaxed, the initial primal and the corresponding dual linear optimization problems are formulated. A numerical example is presented and utilized throughout the article to demonstrate the procedures. Rule 1 is formulated for the allocation of common overhead. In effect, this rule states that common overhead is to be allocated in proportion to the gross profit of each product. The optimal values of the dual variables under this formulation are relevant for decisions on acquiring additional amounts of scarce resources.

## *Allocating traceable overhead*

Since it is probable that some overhead can be identified as associated with the provision of specific resources, the authors develop Rule 2 for allocating such traceable overhead. $B'_i$ is introduced as the per unit charge for use of Resource i so that products using this resource are not charged for more than either the marginal value or the average unit cost when using that resource. The authors then modify the initial primal and dual problems to include the unit charges attributable to the use of the scarce resources. Under Rule 2 a traceable overhead charge of $B'_i$ is assigned for each unit of Resource i used in producing a good. Common overhead remaining after allocation of traceable overhead by Rule 2 is then allocated via Rule 1.

## *Interdependencies*

The authors show how the model can be modified for other types of constraints that recognize interrelationships among products in addition to scarce resource usage.

The numerical example is extended to illustrate a situation in which one product receives a negative overhead charge, or overhead subsidy, because its production and sale are needed for the production and sale of another product. The claimed advantages of this method of overhead allocation are these: "The existence of sales interdependencies is explicitly recognized and a better measure of the true profitability of products is obtained; i.e., those products whose sales depend upon the production and sale of other goods are made to bear an increased share of overhead while those products whose sale leads to increased sales of other products receive a subsidy to reflect this value."

A similar result (i.e., a partial overhead subsidy) is obtained when the numerical example is modified to include a managerial constraint on production. The authors show that the proposed method prevents a product from being adjudged unprofitable as a result of top managerial dictates. Such a result may be important for companies using profit center reporting. The authors state that their procedure ". . . gives a rationale for deciding on the size of a subsidy payment to such a division to recognize its contribution in achieving the company's goals."

## *Avoidable costs*

Escapable or avoidable overhead refers to those overhead charges which would be eliminated if a product were not produced or if a facility were shut down. In the last section the authors show how such costs can be handled in much the same way as the previous kinds of overhead charges.

They point out that an integer programing formulation rather than a simple linear programing model is required for problems of this sort. The authors describe the model mathematically and then assume that the solution is available in order to proceed with the overhead allocation problem per se. A linearized problem (and numerical example) are presented showing allocation of avoidable overhead. Rule 3 sets forth the procedure for (1) allocating fixed costs associated with positive production of a given product and (2) assigning avoidable costs associated with the use of a given facility. This manner of assigning avoidable overhead does not distort the optimal solution to the linearized problem. Avoidable costs not allocable under Rule 3 must be treated as common over-

head and allocated under Rule 1.

The accountant or management consultant with interest in mathematical models can benefit from study of the overhead allocation procedures presented by Professors Kaplan and Thompson in this introductory paper. Their method does not introduce distortions in the relative profitability of products, and it recognizes scarce resource utilization and production and sale interdependencies. Verifiability is increased by the use of linear programing models which specify shadow prices for scarce resources without reliance on intuition or unspecified assumptions.

JAMES H. BULLOCK, CPA
*Oklahoma State University*

## Accomplishment / Cost: Better Project Control by ELLERY R. BLOCK, *Harvard Business Review*, May-June, 1971.

*How to measure progress on a project in terms of both technical accomplishment and cost continues to be a problem for major contractors. This author outlines a solution.*

If expenditures on a project are running ahead of budget, does that mean that project accomplishment is correspondingly ahead of schedule? This is the crucial question for management, but, says Mr. Block, current progress-reporting techniques do not provide the data needed to answer it.

PERT/Cost, Line of Balance/Cost, and other tools of project control have three major drawbacks, in his view: They do not correlate cost with overall schedule accomplishment. They foster inaccuracy by trying to report and predict cost for each conceivable task; the resulting paperwork burden on the busy project manager encourages him to cut corners on his own estimates. Report displays are awkward; by presenting too many variables all at once, they make it difficult for management to evaluate what is going on.

In this article Mr. Block presents a new method of project control, the Accomplishment/Cost Procedure (ACP), which, he says, eliminates all these drawbacks. Essentially, it consists of graphing actual and budgeted cumulative accomplishment against actual and budgeted cumulative cost, with accomplishment sharing the time axis. The gap between the actual and budget lines then measures the degree to which the project is running ahead of or behind the plan.

### Value assigned

Each task is assigned an accomplishment value. In the example given by the author, each $10,000 of the budget for that task was given the value of one unit of accomplishment; the degree of value added and the degree of difficulty to attain are suggested as possible alternatives. Accomplishment values, the author warns, should correspond with the relative contribution of each milestone rather than the length of the time period during which the milestone is to be accomplished. When progress is being measured, accomplishment values should be accumulated only for completed tasks.

### Progress reported

Progress is reported through one or two indexes. The principal one, average cumulative accomplishments, is calculated by determining which tasks have been completed, summing the appropriate preassigned unit values, and noting the progress gained for each function. A curve of actual performance is then drawn through the points plotted from a number of reporting periods. If there seems to be risk that tasks ahead of schedule will mask lagging tasks sufficiently to make the average accomplishments misleading, a second index, slippage units, may be used. Slippage units are calculated by summing up negative (lack of progress) units between planned and actual progress.

This technique, Mr. Block reports, worked well in monitoring performance on a project aimed at development and production of a radar altimeter. The same company has also used it successfully in design engineering, drafting, industrial engineering, quality control, metal working, manufacturing assembly, inspection services, manufacturing testing, and boxing and shipping. Other possible applications suggested by the author are in the building and construction industry, shipbuilding, and computer programing.

## Sensitivity Analysis and Share Valuation by D. MAUND and J. TYDEMAN, *The Australian Accountant*, December, 1970.

*Sensitivity analysis can be a useful tool in the process of share valuation. The twofold procedure involves: (1) a stochastic determination by the information processor (accountant) of after-tax earnings per share as a result of changes in operating variables and (2) assessment of share prices by the decision maker (investor) through the use of the internal rate of return method as compared with the net present value method.*

The primary task of management is to determine and evaluate alternative courses of action under conditions of uncertainty. In such a setting parameters can and will assume an infinite number of values. Thus, sensitivity analysis, which is used to illustrate how changes in variables will affect model outputs, can be a valuable aid to the decision maker.

To illustrate this fact, the authors develop a "sensitivity model," using a nickel mining company. The model, which contains nine discrete variables, is used to calculate after-tax earnings of concentrating operations. The upper and lower limits of the values which the variables may assume and the sizes of the incremental changes are given.

The after-tax earnings per share are then calculated for all possible combinations of values allowed within the limits prescribed. A class frequency distribution of the earnings is then compiled and the mean and variance for the distribution are calculated. Assuming a normal distribution, even though there is evidence of skewness, confidence intervals are established at the 95 per cent level, and the assertion is made that the true value of the after-tax earnings per share lies within the interval. The analysis is then extended to consider the effects on earning outcomes should a decision be made to construct a smelter. Additional variable data are furnished, and the problem is reworked as above. The results reflect the after-tax earnings per share considering both the concentrating and the smelting operations.

## Procedures used

The discussion of share valuation centers on two discounted cash flow procedures, the internal rate of return method (IRR) and the net present value method (NPV). To illustrate IRR, a dividend model is used to equate the future dividend inflows with the present price an investor would be prepared to pay for one share. If the current market price of the share is less than the price he would be prepared to pay, the investor should buy. The authors maintain that the formula is useful because it focuses attention on the fact that the investor knows subjectively his desired minimum rate of return.

## Earnings model

The NPV method is illustrated with an earnings model. The discount rate used is the consensus rate used in the market to discount future earnings. The authors postulate that security analysts cannot know the "market discount rate"; therefore, a "market discount rate" specified by a security analyst is no less subjective than that used by

an individual investor. It would therefore seem preferable to use a share valuation method wherein values for the price an investor would be prepared to pay are calculated on the basis of varying interest rates related to estimated earnings. The investor is then in a position to compare the price he would be prepared to pay, based on his subjective rate of interest, with the present price and thereby exercise the decision making function which is rightfully his.

## Formula calculated

The authors then assume a constant earnings stream, which they regard as a perpetuity, modified to take into account a four-year time lag necessary to install plant and develop mine workings. Thus the price one would be prepared to pay is determined by the formula:

$$P_s = \frac{E}{i} (1 + i)^{-4} - - - - -$$

$P_s$ is the present price he would be prepared to pay for the share;

E is after-tax earnings per share;

i is the rate of interest which equates a future flow of earnings with $P_s$.

## Price tables developed

With the aid of this formula and the class cumulative frequency distributions of after-tax earnings per share developed earlier, two tables are developed. The first table sets forth $P_s$ values for concentrating operations, and the second table sets forth $P_s$ values for concentrating and smelting operations. Each of these tables discloses the following: rate of interest, worst possible value of earnings, lower value of 95 per cent confidence interval, average value of earnings, upper value of 95 per cent confidence interval, and best possible value of earnings. With these tables, a variety of investors with different expectations as to future earnings and different subjective interest

rates can arrive at a price which they would be prepared to pay for a share.

There can be no doubt that sensitivity analysis is useful in this type of problem. In fact, the technique has widespread applications in manufacturing and commercial industry. However, the assumption of a unit normal distribution of the after-tax earnings to determine confidence intervals would be strengthened if a Chi-square test, for goodness of fit, were applied. Both the IRR and NPV methods should yield the same results if the investor uses his required rate of return in the NPV method rather than a "market discount rate" in discounting the future streams. The question is not one of methods but of discount rates to be used in the initial investment and in the intermediate flows. Nevertheless, the notion of shifting the investing decisions to the investor and casting the security analyst in the role of information provider is a useful one.

L. SERAFINO CORSINI
*Louisiana State University
at Baton Rouge*

Management Planning in Higher Education—Concepts, Terminology and Techniques by CHARLES A. NELSON, *Management Controls,* January, 1971.

*Colleges and universities are finding themselves the targets of mounting criticism and pressure for change from all quarters of society. Questions are being raised about virtually all aspects of their operation. At the same time, their administrators are increasingly aware of the scarcity of available resources. As a result, a growing number of colleges and universities are examining their management and planning processes in the search for solutions to their complex problems.*

In this article, Mr. Nelson discusses some major management approaches and techniques, success-

ful in the business sector, that are now gaining acceptance as essential elements of the planning process in higher education. In particular, he discusses operating systems; planning, programing, and budgeting systems; management information systems; and long-range plans and planning models. In each case he considers the current state of the art and presents several observations. There are some exhibits, which are based on actual applications.

### Operating systems

An operating system in an educational institution is a combination of methods, procedures, equipment, and personnel organized to accomplish a specific repetitive function such as enrollment, billing, or scheduling. Since the operating systems designed to handle these separate functions are not necessarily interdependent, various levels of sophistication and efficiency may characterize the systems in use by a single university. Such systems often lend themselves readily to computerization. While significant accomplishments have been made in the efficient performance of routine functions through the development of operating systems, systems that will simultaneously provide information for use in management control, evaluation, and planning have not reached as high a state of development. Thus, the integration of operating systems with other management systems, particularly the management information system, offers considerable potential for increased management effectiveness.

### PPBS

With a program budget as its major component, a PPBS (planning, programing, and budgeting system) is a comprehensive and sophisticated planning process. The components of a PPBS include identifying general institutional goals, defining specific objectives in quantitative terms for specified time periods, grouping interrelated activities into programs organized to accomplish specific objectives, calculating the cost of carrying out these programs, establishing program budgets, and projecting the requirements and returns of specific programs over an extended time frame. In addition, a PPBS should involve explicitly considering alternatives so as to justify the selected programs, periodically evaluating current programs, and replanning or modifying programs consistent with the evaluation process.

### Implementation problems

The primary problems in implementing a PPBS in an educational institution include defining programs with elusive objectives, constructing budgets for programs rather than for organizational units, and agreeing on standards for evaluating the quality of performance. Many state-supported institutions use this approach because they are required to do so by the state governments. Nevertheless, conformance with this requirement is often more a matter of form than of substance.

### MIS

The management information system performs the function of collecting, storing, processing, and transmitting information needed for the operation, control, evaluation, and planning functions of management. The questions of what information is appropriate, in what form, for whom, and with what frequency are the critical elements in the MIS design. To answer these questions, a review of the organizational structure of senior management is usually necessary.

The MIS aids management in its control function by monitoring the operating systems. Accordingly, the need for efficient and integrated operating systems is apparent. Additionally, the MIS must identify standard sources of specified external and demographic data which can be fed into the system periodically. These data, together with internally generated data obtained from the operating systems, are required for the planning and evaluation functions.

Finally, the MIS should generate intermittent responses to specific inquiries as well as routine reports. The routine reports would cover, among other things, the academic program, students, faculty, support services, facilities, and finances. Additional reports providing updated projections for several years in advance can be generated for use in long-range planning. A major contribution of the MIS should be the periodic presentation of data in such a way as to raise internally the questions now being brought to the attention of educators by society at large.

### Progress slow

An investigation into present practice reveals that many alleged management information systems are at best partial systems or merely modernized operating systems. The absence of guidelines for systems development and the cost of systems design are among the factors that have hindered further advances. Weaknesses in operating systems have also been a hinderance. But it is not always necessary to perfect the operating systems befor embarking on development of the MIS. Considerable flexibility can be allowed to best meet the exigencies of specific situations. Several complete systems will become operational shortly.

### Long-range plans

Long-range planning is concerned with projections of demands and requirements over a longer period of time and at a more general level than the extended time frame feature of the PPBS. The long-range plan may be incorporated as part of the planning function of the MIS.

Planning models have received considerable application in enroll-

ment projections and other isolated segments of university operations. General simulation models covering the entire planning process for academic institutions are now feasible. Computerized simulation models revolutionize the planning process by making possible the consideration of a far greater number of alternative courses of action when a complex decision is involved.

WILLIAM C. BOYNTON
*Michigan State University*

## Making Marketing Information Systems Work Better by STEPHENS DIETZ, *Business Management,* December, 1970.

*Data banks in a computerized marketing information system can be an effective management tool, or they can be an added source of confusion if improperly utilized. The author describes the characteristics of an effective marketing information system.*

The first step in making any information system work is to use the data bases properly. These raw data are processed into reports which contain mixtures of data and information. Mr. Dietz points out, "The confusion between data and information has been one of the principal reasons many executives have been burdened rather than helped by computers, because the emphasis has been on the vast quantities of data that computers can spew out."

The various data bases must be carefully analyzed for invalid, overlapping, or missing data according to the information the user wishes to receive. This information can be classified under the essentials of a news story—how, where, when, why, and who—with an added "how am I doing?"

Emphasizing this last characteristic leads into the area of exception reporting—comparing performance to plan. The author says exception reporting can be an important means of increasing the information content of reports by relieving managers of the overwhelming burden of scanning meaningless numbers. Exception reporting also improves the reporting system by providing a measure of the usefulness of these reports. The ultimate test of the data base's usefulness is management's ability to correlate the data, to apply statistical manipulations for planning and establishing operating goals. "The computer can help you do this only if the data bases are set up properly to begin with," he says.

Today's marketing management information systems primarily consist of a haphazard accumulation of data. One layer has been piled upon another with little effort being exerted to dispose of useless and obsolete data and reports. By cleansing the system and correlating the data bases, the user can improve the efficiency of the marketing operation by having all groups draw from the same basic information.

STEVEN FLORY
*Louisiana State University at Baton Rouge*

## Earnings Retention, New Capital and the Growth of the Firm by WILLIAM J. BAUMOL, PEGGY HEIM, BURTON G. MALKIEL, and RICHARD E. QUANDT, *The Review of Economics and Statistics,* November, 1970.

*This empirical study raises a basic question regarding management dividend policy. Specifically, it examines the reputed benefits to investors of earnings retention.*

It has been commonly accepted that the retention of earnings by a company (ploughback) works to the advantage of the stockholders, particularly those in high tax brackets, since ordinary earnings will then be transformed into capital gains. However, if stock prices are related to earnings and if ploughback does not significantly increase earnings, then management should either improve its investment decisions or distribute current earnings as dividends.

To determine the relative impact of ploughback on companies' earnings, the authors sought to estimate the average rate of return earned on funds obtained from three separate sources: 1) new equity, 2) new debt, and 3) ploughback. They hypothesized that management makes investment decisions on the basis of the cost of obtaining additional funds. That is, if the cost of obtaining funds is relatively high, then only relatively more profitable investments will be made, since the investments will have to cover the cost of obtaining funds. The authors assert that the cost of obtaining equity funds is greater than the cost of obtaining new debt and that the cost of ploughback funds is lowest. Therefore, they predicted that they would find that the rate of return on new equity funds is greater than the rate of return on new debt, which, in turn, is greater than the rate of return on ploughback funds.

### Regression analysis used

Estimates of the rate of return on investment funds were derived from regression equations where the dependent variable, change in earnings, was related to ploughback, new debt, new equity, and a risk term. Four functional forms were used for the regressions: 1) a linear additive function without a constant term, 2) a linear additive function with a constant term, 3) an additive function with a constant term and an interaction term for ploughback and new equity, and 4) an additive function with a constant term and an interaction term for ploughback and new debt. Regressions were calculated for four definitions of earnings, two definitions of ploughback, two definitions of new equity, two definitions of new debt, and two definitions of the risk measure. The regressions were each calculated with the independent variables lagged behind

earnings for the alternatives two, three, four, five, and seven years. The data for the regressions were taken from Standard and Poor's Compustat industrial tape.

The results of 32 of these regressions are reported. The authors note that the rate of return on equity capital ranged from 14 to 20 per cent, on debt from 4 to 14 per cent, and on ploughback funds from 3 to 5 per cent. These findings are in accord with the authors' original hypothesis.

The observed relatively small return earned on ploughback funds raises some interesting questions. Specifically, is earnings retention always in the best interest of investors? Is management sometimes unaggressive in its reinvestment of internally generated funds? Does management invariably strive to maximize investment return, or is this behavior a function of the source of the funds used to finance investments? The authors suggest that further research is needed to answer these questions.

SHANE MORIARITY
*University of Illinois*

**Application of Linear Programming Analysis: To Determine the Profitability of Products Involving Joint Cost—The Plywood Manufacturing Case** by LEE MENG HYE, *The Australian Accountant,* December, 1970.

*Many cost allocations for inventory valuation purposes are made on the basis of relative sales value. This method is not well suited for managerial decision making. This article discusses the application of linear programing as a solution to such problems.*

Mr. Hye points out early in this article that many costs are simply not known because suitable procedures have not been available for their determination. This has not been an insurmountable problem for inventory valuation since the relative sales value method can be

used. He does not suggest that this is an accurate method but only that it is not too damaging when used for this purpose.

Use of the relative sales value method for decision making purposes, however, is not acceptable; it is like writing a definition in terms of the item defined. In short, Mr. Hye says, the plywood industry ". . . appears to have guessed the required product cost in arriving at the market price."

### Firm vs. industry

As the author makes clear, there is a definite difference between the way a firm can view the market and the way an industry should view it. The individual firm can take the price structure as "given" whereas the industry as a whole falls more into the position of setting prices. However, even in this context the individual firm is not insulated from the need for establishing joint costs, for if it can make no such objective distinctions it will have difficulty in deciding which of several products it should make.

To illustrate the advantages and disadvantages of linear programing in solving allocation problems, Mr. Hye presents a case study from the plywood industry. He describes how the data were gathered, telling how the problem that these data were not contained in the normal accounting records was solved. As he mentions, marginal costs are usually not available from conventional records.

### Application stressed

The reader does not need an intimate knowledge of linear programing to gain insight into its usefulness, for the author stresses its application rather than the manipulations involved. There is, however, an appendix with accompanying legend to guide one through the "set-up" of the problem. The problem is set up with the usual objective function and constraints. The actual manipulation of the

matrix was carried out on an IBM 7040 computer using the LP III canned program.

There were three major sets of questions this linear programing analysis was designed to answer:

1. Which grades and quantities of logs to use
2. Which construction structures to use
3. Which types of panels should be produced.

In addition to supplying specific answers to these questions, the author presents a discussion of "shadow" prices and their relationship to sensitivity analysis.

This seems to be a well written and timely article. Businessmen have come to accept the fact that something other than intuition is needed in decision making, and this work adds reinforcement to that position. A knowledge of linear programing would make its message even more vivid, however. This is not a criticism of the article but rather a recognition of the responsibility each of us has to attain an acceptable level of mathematical proficiency.

E. A. DEVINE
*Louisiana State University
at Baton Rouge*

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## HELP WANTED