

SYSTEMS AND PROCEDURES

The convergence of systems and procedures to the main corporate stream is treated in a number of ways. This part of the text concisely treats the total concept of systems in management planning and controlling. It attempts to present focal aspects of the systems and procedures function. The concept of work simplification and motion study as subordinate scientific managerial aids in systems work are presented, and the reader is finally introduced to those fact-finding tools, techniques, and aids frequently used in office analysis activities.

THE SYSTEMS AND PROCEDURES FUNCTION

The modern approach to management by systems attempts to coordinate and control all the organizational objectives of the enterprise. This approach is predicated on the principle that the individual needs of workers and work units, within the enterprise, are subordinate and must be directed toward the achievement of these objectives. Therefore, all systems within the enterprise must be organized and administered so that they form an integrated information system that will assist all work units of the enterprise to achieve maximum performance in meeting total organizational objectives. The systems approach does not eliminate the functions of management; rather, it attempts to integrate the functions within a framework that is structured to point out their need of more effective and efficient systems.

As business enterprises grow in size and complexity, they create a need for more effective systems to provide timely and adequate information for management decision making. The processing of available information and the provision of information, needed for wise decision making, are vital for truly efficient management.

The changing business climate and the growing interest and emphasis in management by systems will require the manager to play a new role. He will be required to manage by total objectives and to assume greater risks than ever before. He will need to have the initiative to take more risks. Further, he will need the creative ability to decide on the best alternate risks, to anticipate the outcomes of his decisions, and finally to control further actions as the results of his decisions substantiate or refute his expectancies.

These and other factors, such as the technological explosion, the emergence of new, world-wide markets, the rising volume of productivity, and the increasing application of varied mechanized and electronic means of processing information, have caused astute managers to rely more than ever on the systems and procedures function as a critical managerial aid in efficient and effective decision making.

When we speak about business systems today, we are referring, in a sense, to a kind of teamwork. A business enterprise, or for that matter, any kind of enterprise, might be compared with a successful football team which functions at optimum efficiency. A series of team plays are needed. The fusing of the many complex and specialized operations, skills, and personalities that we find in a business enterprise is not a simple undertaking to achieve, but it is essential if total-enterprise objectives are to be met. Systems help to join organized efforts into effective team play. This is a *total-systems* approach and embraces a recognition of the interrelationships, if not total interdependence, of the various systems and subsystems in an enterprise of any size. Thoughtfully planned, organized, and administered, the systems and procedures function assists management at all levels to select and decide in a more precise and orderly manner between alternative courses of action in achieving total-enterprise objectives.

To summarize briefly, the purpose of the systems and procedures function is to devise and maintain the best means of assisting management, at all levels, to exercise its functions. By prescribing specific procedural responsibilities, effective systems should eliminate unnecessary tasks, simplify and systematize the essential work that remains to be done, add to the efficient utilization of all resources, assist in the control of operations and their costs, and assist in implementing plans for organization and improve overall team work and coordination.

DEFINITIONS OF METHOD, PROCEDURE, AND SYSTEM

A *method* may be defined as the manner in which a clerical operation or task is performed. For example, the data on a form might be filled in by writing the information with a pen in longhand (manual method), or by typing the information (mechanical method).

A *procedure* may be defined as a series or sequence of related operations, designed to standardize the performance of the various steps which make up a major operation. For example, *classifying, coding, and sorting* correspondence would be three different procedural units within the filing system of a company.

A *system* may be defined as a *complex* of related procedures designed according to an integrated scheme for the purpose of achieving a major activity of a company.

In most companies there are a number of systems. For example, a system for budgetary control, a system for wage and salary administration, a system for order processing, and many others depending on the nature and complexity of a particular enterprise. Likewise, there are also a number of subsystems, for

*Frank B. Solteralski "What Does Management Expect from Systems," *Ideas for Management*, Systems and Procedures Association, 1960, p. 78.

example, customer billing (in an order processing system), personnel testing (in a personnel administration system), and records disposal (in a records management system).

TOTAL-SYSTEMS CONCEPT

Like the term *operations research*, the term *total systems* is one that has been read about, discussed, and applied without too much discrimination to a concept which is not new to management scholars, but whose application and accomplishment are today finding support among members of management concerned with the problem of information processing.

Almost any experienced person in the systems field has his own definition of the term *total systems* and, in many cases, his own name tag. Here are some examples taken from current literature:

By the total-systems concept, I mean integrated corporate intelligence systems designed to permit management by exception, based on timely information, randomly available, and guided by rigorously determined relationships and decision rules.

... complete integration of all major operating systems within a company into a single operating system through the medium of data processing. In a sense, it is an extension of integrated data processing as we think of it today.

... total systems is thought of as integrated electronic data processing which serves two purposes:

- a) The processing and/or production of operating documents, records and reports, and
- b) The preparation of management control information through data reduction and analysis.†

A number of persons have attempted to define the total systems concept in terms of objectives, for instance:

The objective of total systems is to bring to bear all possible scientific disciplines in a quantitative way to create information systems that will make it possible for management to operate an organization in the most effective manner.

Laden§ notes that there is no certainty that a complex business enterprise can be studied economically as a total system, because there is a lack of an accept-

*Roger W. Christian, "The Total Systems Concept," *Ideas for Management*, Systems and Procedures Association, 1961, p. 15.

†Norman Spray, "Total System Concept in Action at Bell Helicopter," *Paperwork Simplification*, No. 58, 1960, p. 5.

‡Richard E. Sprague, "Advances in Data-Processing Hardware and Software," *Advances in EDP and Information Systems*, American Management Association, Report No. 62, 1961, p. 75.

§H. N. Laden, "Total Systems Concept," *Ideas for Management*, Systems and Procedures Association, 1961, pp. 22-23.

able system. . . model for the business enterprise as a whole. He does not, however, rule out the possibility of the design of such a model. He, among many others, recognizes that the management science of business systems has come a long way in recent years and is now at the stage where it is possible to perceive what is significant.

GUIDELINES FOR A TOTAL-SYSTEMS APPROACH

The following guidelines for structuring a total-systems approach represent a composite thinking of management scholars and practitioners. These guidelines, however, are not universally agreed on.

- ▶ Information processing should be recognized as a vital business function worthy of top-management planning and control.
- ▶ A total-systems design should be flexible enough to keep up-to-date with the dynamic needs of the objectives of the total enterprise.
- ▶ It should be recognized that the entire business enterprise is a *system of the highest order and a fit subject for analysis and redesign* . . . *The total business fits every criterion established by the operation research scientist for a system.*
- ▶ The cost of any system should be consistent with the values anticipated from it.
- ▶ Total systems should provide management with necessary, accurate, complete, organized, clear, and meaningful information for effective decision making.
- ▶ The presentation of information should be refined to feature the relatively few exceptions that usually dominate an activity.[†]
- ▶ Operating procedures should be fully integrated into logical systems.
- ▶ The total-systems approach should recognize the need for a system that is not restricted by departmental boundaries.
- ▶ The total system should be so designed that source information is recorded once, and thereafter the data are processed in a number of summary forms geared to meet the enterprise needs without repetitive processing.
- ▶ All forms of information in an enterprise should be systems oriented rather than oriented to isolated problems.
- ▶ An effective system should refine, interpret, and focus on those problems that are most important for the total enterprise.

*R. L. Ackoff, *Progress in Operations Research*, New York: John Wiley & Sons, 1961, pp. 10-12.

†R. C. Ludlow, "Systems and Procedures," *NOMA Guides to Office Operations*, Section 5200, p. 3.

A system which processes information for decision making is a control system; therefore caution should be exercised not to restrict action or initiative by setting unduly restrictive controls.

Since new developments in most areas usually bring up problems, the reader should recognize that the area of systems is no exception. For example, most total systems are believed by many to be misoriented. As one writer puts it, "They are designed by, and meet the needs of the scorekeepers and not the players." Emphasis in most instances is on the operational level, not on the top-management level.

In the opinion of a number of observers, it is felt that the concept of total systems at the present time is not clear as a general concept, has many different meanings, and that many of the present "so-called" total systems in various enterprises are compartmentalized and misplaced in the organizational structure and are not meeting *total* enterprise objectives.

There is also a general feeling that many of the systems in existence are antiquated, and that the scope of systems in most enterprises is much too narrow and should be extended beyond the mere collection and processing of information. It is also felt that the quantity of information processed is not adequate. The information processed should be accurate, logical, and timely. Equally important and frequently overlooked is the recognition that the quality of the information processed also depends on the quality of input data.

Another frequent criticism is that too much emphasis is centered on the use of the computer, which is only a means to an end and not an end in itself. According to A. Richard De Luca, "By far the toughest assignment facing any systems man is the job of helping managers define, in detail, their personal information needs for planning and control. The task of defining a problem requires brain-power—not computer-power."

These are some of the controversies, issues, and problems concerning the total-systems concept that need to be clarified, refined, and resolved by study and research. A critical review and evaluation of the literature in the field of management pertaining to various concepts of management by systems should prove to be very thought provoking to the discerning student of management. It appears prudent, at this time, to state that the management of a business enterprise can find a workable solution to many problems by a study of business systems. The systems concept has broadened over the years, and a variety of workable and profitable solutions and ideas are coming into clearer perspective. A growing number of management scholars and practitioners have the feeling that the most significant developments in the practice of management during the next few years may center around the systems concept.

*Christian, *op. cit.*, p. 15.

†A. Richard De Luca, "Understanding Total Systems," *Total Systems*, American Data Processing, Inc., Detroit, Michigan, 1962, p. 31.

ACTIVITIES OF THE SYSTEMS AND PROCEDURES DEPARTMENT

A former national president of the Systems and Procedures Association stated that, "Systems work is a professional type of work concerned with research, analysis, development, problem-solving, and assistance to management." More specifically, the systems and procedures department usually concentrates its efforts in the performance of the following types of activities:

- ▶ Development of the procedures necessary to implement the primary plans and policies of top management.
- ▶ Development and use of work measurement techniques as a basis for budgeting and controlling all areas of expense.
- ▶ Work simplification.
- ▶ Time study.
- ▶ Motion study.
- ▶ Forms analysis, design, and control.
- ▶ Records management.
- ▶ Organizational analysis and planning.
- ▶ Space and facilities planning.
- ▶ Report analysis and control for management.
- ▶ Equipment evaluation, selection, standardization, and preparation of specifications.
- ▶ Research and training activities.
- ▶ The utilization of computers and various types of mechanized information-processing media.
- ▶ Preparation and up-dating of procedure manuals.
- ▶ Management audits.
- ▶ Operations research.
- ▶ Creative thinking and problem solving.
- ▶ Systems design.

Some or all of these activities are "common" to systems work, especially where the systems function is formally organized and carried out on a continuing basis. However, it is quite unlikely that any organization could possibly engage in all of these activities because of limiting factors such as lack of adequate manpower, lack of specialized skills, budget limitations, top-management support and approval, and line-staff relationships, to name a few. No two organizations are alike, but this should not deter systems personnel from trying to serve management in the best possible way within the limits prescribed by such factors.

TABLE 13-1
Organizational Position of the Systems Department

Reports to	Manufacturing, %	Insurance, Banking, %	Utilities, %	Retail, W'sale, %	Govt., %	Total, %
President	20	51	24	34	17	25
Comptroller or assistant	50	20	34	28	20	41
Operations de- partment head	9	8	11	6	20	10
Treasurer or secretary	5	4	5	13	X	5
Other	16	17	26	19	43	19

ORGANIZATIONAL POSITION AND RESPONSIBILITY OF SYSTEMS DEPARTMENT

As a result of the increasing interest that is being given to the systems function in management, one might very likely think that some general pattern of organization and administration would be evident, but this is not the case. This factor can be attributed, however, to understandable reasons such as the size and nature of an organization, the interest by management in the systems function, the organizational structure, and the scope of the systems function and its relationship to other organizational functions.

The systems department has traditionally been tagged as a staff department with no direct authority; its administrator reports to the top or near to the top echelon of the management organization. We have no quarrel with this, because the systems function operates best when it services the needs of the entire enterprise in achieving objectives and is able to cut across all departmental lines.

One survey revealed the data listed in Table 13-1, from 670 companies, concerning the organizational position of the systems department in the management structure.

Since the systems function operates most efficiently when it services all the functions in an organization, it is usually felt that its administrator should be directly under someone who has overall authority.

Walter F. Wolfe, "Organizational Position of a Systems Department and Its Relationship to Other Departments," *Ideas for Management*, Systems and Procedures Association, 1960, p. 55.

Ibid., p. 56. Wolfe also notes that while this may be ideal in terms of organizational relationships, the practical point of view indicates that such an administrator in most cases would not have the necessary time to give to the function, and as a result would not be able to devote the necessary daily support required for its efficient operation. He further notes that currently most successful systems groups are reporting to executives in the finance area of their company, who in turn are able to get the necessary support and action of the other members of top-level management.

STAFFING THE SYSTEMS DEPARTMENT

Every member of the management team is an "informal" systems man in the sense that each one should be interested, even though he is not directly involved, in improving systems and procedures in his area of command and in recommending, through the proper channel of command, suggestions for improvements in total-enterprise systems. However, as a general rule, only the "formal" systems function can work effectively with those systems affecting many or all organizational segments.

It is important to point out that the formal systems staff, in its relations with line units in an organization, should recognize that the success of its work depends on gaining the respect and acceptance of line units. The formal systems function cannot operate at optimum efficiency alone by top-level management direction. However, it is the responsibility of all administrative managers to identify for the systems staff the objectives to be achieved, and it is the responsibility of the systems team to devise ways that will help promote and achieve the objectives of the organization in the most efficient ways.

The placement of a systems department in any organization is dependent on various factors in addition to functions to be assigned for action. A report of three case histories will be used to illustrate, explore, and identify some of these factors, especially those related to planning, placement in the organizational scheme, internal organization, and authority and responsibility relationships.

TRAINING THE SYSTEMS STAFF

Currently there is an acute need for professionally trained and experienced systems personnel, but until our colleges, universities, and technical schools begin to add more courses to their curricula that are directly related to systems work, it will be necessary to fill the present need by resorting to other means of training. It is encouraging to note, however, that our various schools at the present time are making great strides in the systems area to fill the present needs and demands.

Professional groups such as the Systems and Procedures Association, the American Management Association, the Administrative Management Society (formerly the National Office Management Association), to name a few, offer many workshops, seminars, and conferences geared to the specific interests and training of systems personnel. Numerous publications are also appearing on the market as study aids

and guides. A bibliography of literature in the area of systems and procedures is available from any of the organizations mentioned as well as visual training aids and "packaged" programs. Business equipment manufacturers and their representatives also offer training courses and publish educational materials pertaining to the work of systems and procedures.

There is a general feeling that there is probably no better substitute for training systems personnel than on-the-job training. One expert practitioner expressed this as follows:

On-the-job training is most likely the best kind of training for systems personnel even though it requires much direction on the part of the manager. He must guide, but not do; and he must follow closely but inconspicuously what each trainee is doing. He must make the necessary time allowance for this training and adjust his deadlines accordingly. While the trainee is learning he will make some mistakes. Therefore, the manager must be close enough to the training situation and the work problems to prevent serious mistakes. The manager must make sure that the trainee not only recognizes his mistakes, but also what the correct way should have been. If a trainee has been carefully screened and selected, the number of mistakes he makes will not be as great as one might be misled to imagine. If the trainee is properly guided, he will in most instances make few mistakes of the same kind again. If at all possible, the manager should vary the assignments during the training period to expose the trainee to a variety of job problems of a practical nature. On-the-job training cannot be expected to accomplish wonders in a short period of time, but a man trained in this manner will most likely be better trained, since the foundation of his training is experience, not just theory.

Training Approach

Training involves a minimum of two persons: the instructor and the trainee. A skilled instructor must have job knowledge of a practical nature, interest in the learner, patience and understanding, enthusiasm, the ability to communicate clearly, the ability to plan instruction and to establish rapport, and an understanding of the psychological principles of learning and teaching methodology.

A trainee must be ready and interested to learn, have the ability to be taught, and have desirable personality traits.

In any type of learning situation, the instructor should follow a planned step-by-step approach. The following four-step approach is recommended:

1. Preparation of the trainee. The trainee should be set at ease. His interest in the job should be aroused, and his training needs should be determined and evaluated.

*Victor J. Dankis, "Operational Management of the Systems Department," *Ideas for Management*, Proceedings of the International Systems Meeting, Systems and Procedures Association, 1960, p. 60.

2. Presentation of instructional material. Instruction should be kept simple but complete. It should proceed from the simple to the complex. Technical jargon should be avoided as much as possible; when used, it should be clearly explained. Each element in a job should be presented in an orderly precise manner and should be demonstrated to the trainee. Each element being taught should be repeated. Repetition is essential because few people completely understand the element being presented on the initial presentation. At all times, questions should be encouraged.

3. Performance tryout. The learning progress of the trainee should be evaluated by having him explain and do each element in a job. Repetition on this point is essential. At all times the instructor should be on the lookout to see that the trainee does not develop bad habits. Such habits, if detected, should be corrected immediately. Any criticism should be given in a courteous positive manner. A generous amount of praise for a job well done should always be given by the instructor.

4. Follow-up. The trainee should be checked frequently at short intervals to make certain that the correct thing is being done and to determine whether or not additional training, and what kind of additional training, is in order. At all times the trainee should be informed of the reasons for what is expected of him.

USE OF OUTSIDE CONSULTANTS IN SYSTEMS WORK

The use of outside consultants to organize the systems function is a common practice. To get utmost value from the services of outside consultants, the following guidelines should be of help to management in deciding whether or not a consultant is necessary when such services are being negotiated:[†]

- ▶ What will be the cost? Most consultants' services will cost more than the services of a regular full-time worker with a similar background.
- ▶ Are there employees inside the organization who have the background to carry out the work in question?
- ▶ Is the work in question of a short- or long-term nature? It might be less costly to put a specialist on the regular payroll rather than to hire a consultant.
- ▶ Has the work problem been accurately and precisely defined? This is an important consideration since an outside consultant might not be able to see the problem or to communicate it to others. As a result, this would be a waste of time and money. On the other hand, an outsider might be able to see a problem more clearly and more objectively than an insider.

[†]Other factors related to training personnel are discussed in Chapter 31.

†J. E. Panton, "A Guide for Hiring Management Consultants," *NOMA Management Bulletin*, Systems, April, 1963, pp. 22-23.

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If the services of a consultant are retained, management should seek out the best possible talent to do the job expected. It is important that the interests and background of a consultant be checked. Such factors as the following should be given consideration:

- ▶ Is the training and background of the consultant in line with the job you expect him to do? Check on his educational background, professional status and certification, professional writings, and projects he has worked on.
- ▶ Evaluate whether or not the above factors fit in with the job you expect of him. Seek out the opinion of other clients.
- ▶ Request him to outline in a general way the approach he intends to follow to do the job you want done. Analyze his plan of attack. Question it critically.
- ▶ Decide tentative target dates for various stages of the work assignment.
- ▶ Arrange for submission of periodic progress reports from the consultant for analysis and discussion. Decide how detailed you want these reports to be.

If these guidelines are followed, they should help to establish the right rapport between the consultant and the client and help to ensure that the client will derive maximum satisfaction from the services of consultants.

GUIDELINES FOR CONDUCTING SYSTEMS SURVEYS

A considerable volume of material is available today for conducting systems surveys. A survey may be defined as a critical view, i.e., an inspection, an examination, or a measure and estimate. In conducting a systems survey, an orderly number of steps should be followed if end results are to be achieved. The following plan and steps of action are recommended as an approach to organize, develop, execute, and administer a systems survey through progressive stages.

Stage A. Planning the Plan

- Step 1.* Define clearly the organizational boundaries within which the objectives of the plan are to be limited. Point out major organizational segments that are within the boundary.
- Step 2.* Outline, in general, the overall objectives of the plan and set a completion date.
- Step 3.* Make sure that boundaries and objectives are flexible if future changes must be made.
- Step 4.* Delegate authority and assign duties for (1) spelling out the plan in detail, (2) outlining programs and projects within the plan that may be developed individually, and

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(3) setting dates for their completion. For example:

- ▶ Estimating outcomes in savings and improvements.
- ▶ Determining personnel needs and other developmental expenses.
- ▶ Comparing and analyzing actual outcomes with estimates.
- ▶ Determining modifications, if necessary, at a future date.
- ▶ Coordinating all participating individuals and groups.
- ▶ Preparing periodic reports of progress of the plan.

Stage B. Elaborating on the Plan

Step 1. Describe, by using a graphic model, the basic systems and organizational structures needed to achieve overall objectives. Describe alternative models, if necessary.

Step 2. Compare present and future structures.

Step 3. Point out segments of the basic structure which may be progressively accomplished by individual effort; after completing *Stage E*, set dates for completion of intermediate segments of the plan.

Step 4. Determine major aspects of the plan at which flexibility for future modification must be constructed and integrated during the intermediate developmental stages.

Stage C. Outlining Programs and Projects

Step 1. List the significant functions performed by every major organizational segment.

Step 2. Fix relationships among intradepartmental functions.

Step 3. Fix relationships among interdepartmental functions.

Step 4. Spell out the major procedures for each major function.

Step 5. Spell out procedures which cross functional lines within major departments.

Step 6. Spell out procedures that cross major departmental lines.

Step 7. List the points of origin of activities for every procedure.

Step 8. Group related procedures, regardless of departmental lines, into programs for development.

Step 9. List the electronic potentialities suggested by functions, procedures, and activities.

Step 10. Divide programs into segments that might logically be assigned as individual projects, and set a completion date for each project.

Stage D. Estimating Results

Step 1. Provide for segregation of estimated outcomes for all projects by such classifications as cost savings, morale improvement, marketing advantage, etc.

Step 2. Set for each classification the internal and external sources

Step 3. Collect information; screen and record it in a format that lends itself to comparison with actual results after development.

Step 4. Set dates for when results in each classification should be achieved.

Stage E. Determining Personnel Needs and Other Developmental Costs

Step 1. Determine skills and type of organizational representation required for each project.

Step 2. Determine type and number of locations to be studied in each project as well as the size and structure of the survey team in each stage of development.

Step 3. Estimate personnel requirements from data collected in Steps 1 and 2 of this stage.

Step 4. Estimate other developmental costs such as forms, manuals, equipment, etc.

Stage F. Comparing Accomplishments With Estimates

Step 1. Record estimates with results reported after completion of project development.

Step 2. Analyze differences to determine reasons for discrepancies.

Step 3. Recommend action required to improve on results, if possible.

Stage G. Determining Adjustments

Step 1. Set bench marks, at appropriate intervals in the developmental stages of projects, for review to spot any factors which might need modification in any part of the plan.

Step 2. Review these factors to see whether the plans should be adjusted or whether the direction of the project should be changed.

Step 3. Adjust, if necessary, any parts of the plan that need adjusting in any way.

Stage H. Coordinating

Step 1. Ascertain that all individuals and groups participating in the master plan are doing so, and get from these individuals and groups departmental plans which have been developed.

Step 2. Screen departmental plans with departmental representatives within the total enterprise and get their agreement on all plans.

Step 3. Ascertain that continuous departmental coordination is enforced during all stages of the project development.

Stage I: Preparing Reports

Step 1. Maintain control over the progress of planning and project development so that summaries, periodic reports of progress, may be written and distributed to all concerned.

Step 2. Correlate developmental progress reports with the master report.

If systems survey results in installations, additional considerations must be taken: management must approve the installation of the proposed plan, and installation schedules must be planned outlining the recommendations and responsibilities for initiating the plan as well as responsibilities for implementation and follow-up.

This detailed plan for undertaking a systems survey or study should be helpful as a guide in undertaking systems projects, but the administrative manager must always bear in mind that no two studies would ever be concerned with exactly the same kind of data or the objectives to be achieved.

CONCLUSION

The purpose of this chapter has been to present a brief perspective of the systems and procedures function as well as to present other general aspects of systems management. In undertaking this task, the authors have drawn freely from the discoveries, formulations, and ideas of many practitioners in the systems field. They sincerely acknowledge their indebtedness to the many persons who have made important contributions to this area of management.

REVIEW AND DISCUSSION

1. Briefly discuss the impact of a systems change on a firm.
2. Assuming the soundness of a new or revised procedure, the success of the project will be pretty much assured if the preparatory work has been done with skill, foresight, and completeness, and if the installation of the procedure is undertaken skillfully. What guideposts can you suggest to help the installation team during the installation stage of a new procedure?
3. A good systems man should be interested in his management's ideas, thoughts, and plans for what is coming next. Discuss the value of participation by the systems man in management planning.
4. Discuss the potential benefits of a proper total systems to a company.
5. Is the concept of a total system of information handling limited to large companies that can afford costly electronic equipment? Discuss.
6. If any systems and procedures project undertaken by a company is to be meaningful and successful, it should evolve according to a definite sequence of steps. What do you envision as a logical sequence of steps in the planning and execution of any systems and procedures project?
7. Discuss the role of a systems analyst when a total integrated management system is under consideration.
8. What mental qualifications should management look for in recruiting and developing a systems and procedures staff?

... the effects that new data-processing systems will exert on management will be, primarily, continuations of changes already begun. Others will be largely or entirely new. In this time of transition, what precautionary measures can administrative office managers take to be sure that their firms do not lag or move ahead in the wrong direction?

Many years ago, Rudyard Kipling wrote:

*I keep six honest serving men
(They taught me all I knew)
Their names are Why and What and When
And Where and How and Who.*

The questioning approach has been recognized for some time and is a valuable aid in problem-solving situations. List a set of questions that an administrative manager might ask himself when evaluating and scheduling a systems project, and when deciding on priorities for the many and varied project requests that call for administrative action.

WORK SIMPLIFICATION

An important aspect of scientific office management, work simplification (work improvement), may be defined briefly as the organized application of common sense to find a better and easier way to do a job. The concept is not new. The invention of the wheel is a prime example of simplifying work. Another example is the abacus, the first known adding machine. In more recent times, the first typewriter and the first system of shorthand resulted from the application of the work simplification concept to office work.

The core of the concept, finding a better way, is based on the philosophy that there is always a better way and that the best way is never achieved. However, doing a job better does not mean working harder or faster; merely performing work more hurriedly speeds up *all* elements of a job, including those that should be eliminated entirely. Nor does it always mean investing in the new and different. Often, the intelligent use of present tools eliminates the need for additional expensive equipment.

ORIGIN OF WORK SIMPLIFICATION CONCEPT

Work simplification is an integral part of the scientific management movement started by Frederick Winslow Taylor in the late 1800's. He is frequently referred to as the "Father of Scientific Management"; he defined scientific management as "knowing exactly what you want men to do and seeing that they do it in the best and cheapest way."

Taylor pioneered in applying scientific methods to the problems of management in manufacturing and industry. He was most concerned with finding what constituted "a fair day's work," and he was the first to use time study to set standards for work and production. He emphasized the value of fitting the worker to the job and of first defining the best method of doing a job and then teaching it to selected workers.

Following Taylor, the Gilbreths advanced the scientific management concept by their analytical treatment of motion study. Two of their most important contributions were the application of laboratory techniques to motion study

principles and the standardization of basic motion patterns. Later Morgensen, Schell, and Porter combined the basic concepts of motion study with a way of thinking and called the combination *work simplification*. As the work simplification concept became an accepted part of the overall scientific management movement, many aids to the improvement of work performance were developed and introduced such as the application of statistical techniques for the measurement of work, time-standards formulas, and process analysis.

The work simplification concept, first developed as a management tool for improving the performance of factory work, was soon recognized as an aid to improving the performance of office work. As early as 1915, William H. Lefingwell was applying scientific management techniques to office functions. His principles of scientific office management,* first published in 1921, have been reproduced and used year after year without any revisions.

IMPORTANCE

Today the need for simplifying work is even greater, and the needs of automation will increase the requirements even further. Simplifying work prior to automation is an important factor that cannot be overlooked, so that management can better utilize the skills of all workers for optimum work performance.

The advent of more nonrepetitive manual work in business and industry and increasing labor costs are still other important reasons for the need for better understanding and application of work simplification. Automation per se is not the panacea for the mounting paperwork problems management is facing, and we should not lose sight of this fact in trying to find solutions to these problems.

Work simplification will grow in importance because the concept is being accepted and supported more and more. Employees are beginning to know more about it, i.e., why it is useful and needed. Management today has a keener and broader insight about workers, needs, desires, and drives. Thus there is greater overall understanding and agreement of the results and benefits of work simplification to both employees and management. This change in attitude is descriptively expressed as, "The difference between enthusiastic cooperation and dignified acquiescence."

A prodigious stream of research study is presently under way in many areas (electronics, psychology, physiology, operations research, and systems theory) to create new techniques to aid management in performing work simplification.

Work simplification has been an important factor in increasing our standard of living by increasing productivity and reducing and eliminating waste. It is important for every worker to be interested in simplifying his own work and the

work of those he supervises. Work simplification provides means which give any person a better and clearer insight into what work is and what it is comprised of.*

FUNDAMENTAL PRINCIPLES OF WORK SIMPLIFICATION

Having reviewed the origin, development, and importance of work simplification, we should at this point consider the four fundamental principles of it:

1. Activity (anything that goes on in business: operations, moves, storages, delays) should be productive. Productivity is defined as directly accomplishing end results.
2. Activity should be arranged so that work flows smoothly from one operation to another in a balanced pattern of motion on the part of the worker.
3. Activity should be kept simple. Complex and involved means of accomplishing results should be avoided.
4. Participation of workers is essential. This participation leads to understanding, and understanding in turn arouses interest, creativity, and initiative. The end result is willing and enthusiastic cooperation.

APPLYING WORK SIMPLIFICATION PRINCIPLES

Work simplification is accomplished by applying a logical, orderly step-by-step approach to the solution of a problem. A generally accepted approach in problem-solving incorporates the following five steps:

1. Select a situation (problem) for study
2. Get all the facts, i.e., list all possibilities for solution.
3. Analyze all the facts.
4. Develop an improvement.
5. Apply the improvement.

Others have added steps to this basic five-step approach and have used different terminology. Basically, however, the approaches are the same.

In selecting a work simplification problem, it is essential to put things in order and to determine what problem areas need improvement first. Among the office activities that often need improvement are jobs of the following types:

1. Bottleneck jobs that slow down the smooth flow of work.
2. Jobs that involve much walking back and forth for materials and tools.

*Lefingwell and Roblison, *Textbook of Office Management*, 3rd ed. New York: McGraw-Hill Book Company, Inc., 1950, pp. 38-47.

*Gerald Nadler, *Work Simplification*. New York: McGraw-Hill Book Company, Inc., 1957, p. 264.

3. Jobs where costs are high.
4. Jobs that involve waste of various kinds, e.g., time, energy, and materials.
5. Jobs that involve repetitiveness or volume.
6. Jobs that involve excessive handling, backtracking, and crisscrossing.
7. Jobs where manpower requirements appear to be out of proportion.
8. Jobs that cause grievances.
9. Jobs that involve too many details or red tape.
10. Jobs that are safety hazards.
11. Jobs where no recent improvements have been made.
12. Jobs involving excessive supervision.
13. Jobs where workers ask too many obvious questions.
14. Jobs where the value of the end result may be questionable.

Many other kinds of jobs could be added to this list, which is not intended to be all-inclusive. Whatever the problem, it should be clearly defined and all facets subjected to a questioning attitude. Can it be eliminated? Why is it necessary? Can it be simplified, and how? What is the end result? If the value and necessity of an activity cannot be justified, perhaps it can be eliminated. If an entire activity can be eliminated, not only is present waste eliminated, but also the waste that would be incurred in a study of a nonproductive activity.

After putting a job to critical questioning and clearly identifying, defining, and evaluating a problem in terms of end results, then identify objectives to be reached through work simplification. Decide where to begin and end the study at this particular point, and be most observing and critical. See every job in the light of three steps: (1) make-ready, (2) do, and (3) put-away steps. Do not overlook the obvious or minimize the small points. Remember what Henry Ford once said, "I owe all my success in life to paying attention to the little things that other men believed to be unimportant." A prime source of work improvement is the elimination, as far as possible, of make-ready and put-away steps. Too often they add to the cost of work, but not to its value.

USING THE FIVE-STEP APPROACH*

As an illustration of the use of the five-step approach to solve a work-simplification problem, let us follow a typical office problem through the first two steps to get the *feel* of the approach.

USING THE FIVE-STEP APPROACH

Step 1—Select a Situation for Study

The volume of office correspondence and the cost of handling it are much too high this year. Find the reason(s) for the increase to determine whether it may be reduced without sacrificing profits, good will, and workers' morale.

Step 2—Get all the Facts—List all Possibilities for Solution

This step is a *must* for effective analysis. Ask these questions: What? When? Where? How? Who? Why? In the problem we are studying here, the *what* of the increased volume of correspondence goes beyond the fact that more letters have been received and answered. The amount of increase in volume must be measured. Find out what kinds of letters have caused the increase. What is the length of these letters? What is the language content of the letters?

Now, where is the problem? Is there a specific department or operation where the increase has occurred? *When* may involve a seasonal increase. *How* includes the dictation and typing methods. Were the letters machine dictated or personally dictated? Were they transcribed on a manual or electric typewriter? What kind of skill did the dictator and transcriber have? What experience? Here again the major elements must be measured and evaluated.

The answers to *why* in relation to each of the foregoing factors are equally important. *Why* answers reveal the reasons for the status quo and point up opinions, likes and dislikes, and many elements of human relations. Answers to questions like these present the causes of a problem in clearer perspective and enable the work analyst to define the problem more accurately and concretely.

It should be stated here that different types of fact-finding aids are available for recording information in an organized form. These aids are discussed in Chapter 16, and include the task list, the work distribution chart, the vertical flow process chart, the flow diagram chart, and man and machine process charts.

Check lists are also helpful in gathering facts. While general check lists may be used as guides and memory aids, to be used most effectively such lists should be tailored to the specific problem under investigation. A check list of items pertaining to machine equipment, working conditions, design, inspection requirements, material handling, materials, tools, and fixtures, setup and tools, and miscellaneous items helps the work analyst to make a more precise analysis.

Step 3—Analyze All the Facts

Having gathered the facts, take another look at the problem and carefully weigh the end results to be obtained from the analysis. At this point, end results can be measured against the cost of obtaining them. If the advantages of continuing the analysis do not outweigh the disadvantages, the study can be dropped.

If the problem passes the second general evaluation, subject all facts once again to a detailed, searching analysis. In other words, ask again what? where? when? who? how? why? Now you are especially interested in *why*. Why there? Why then? Why by this person?

At this point, consider again the first three fundamental principles of work simplification: activity should (1) be productive, (2) flow smoothly, and (3) be kept simple. If answers to questions negate these principles, make a questioning note of the exceptions. It is important to recognize also that activities can be classified differently into operations, moves, inspections, delays, and storages. In paperwork activities, *only an operation is productive*. Moves, inspections, delays or storages, while they may be necessary to accomplish end results, are not truly productive, as the term has been defined. The typing of a 4-part letter, an original and three carbon copies, will illustrate this point. The assembling of four sheets of paper and three sheets of carbon paper, positioning them into alignment for insertion in the typewriter, inserting them in the typewriter, removing and separating the sheets after the actual typing operation, are all nonproductive operations. The only real productive part of the operation is the actual typing, i.e., putting the information on the paper.

In Step 3, where facts are analyzed and where every detail is challenged, consider the answers to these questions: Where is it done? Why is it done there? When is it done? and Why is it done then? Apply these questions to each step. These questions can be evaluated in the light of the second fundamental principle: *Activity should be arranged to allow for the smooth flow of work from one operation to another in a process or a balanced pattern of motion on the part of a worker in performing any activity*. Again it is necessary to question any doubtful factors in the continuing analysis. As a next step, question *who* is doing the performing and *why* this particular person. These questions should be applied to every step in an activity in relation to the first two fundamental principles cited earlier. In terms of productivity, it is important to match workers and jobs. The degree of skill a worker has and his experience should be the determining factors in job assignment. The physical location of work stations and materials should also be taken into consideration, as this factor may be directly related to smooth work flow or may indicate possibilities for combining or changing the sequence of operations.

Next consider *how* an operation is done, and *why* it is done in this way. These questions are put to test for each step in an operation. The answers to these questions are evaluated in relation to the third fundamental principle: *Activity should be kept simple*.

Step 4—Develop an Improvement

Now consider the possibility of eliminating, combining, changing (place, sequence, or person), and simplifying. Asking the questions *what* and *why* may lead to elimination. Frequently, many operations that are studied for improvement should have been eliminated at the beginning. Elimination of a *do* activity automatically eliminates the linking *make ready* and *put away* steps. Questioning *where*, *when*, and *who* might lead to combining. When two operations can be combined, many times they can be accomplished for the labor cost of only

one. Also, moves and storages between two operations are eliminated. Applying *where*, *when*, and *who* questions may lead to other improvements. After considering every possibility of eliminating, combining, and changing sequence, place, or person, ask *how* the operation is done. If possible, evaluate each *do* operation in relation to the third fundamental principle: *activity should be kept simple*. If improvement is indicated at this stage, you may wish to apply the entire five-step pattern to the operation to determine where improvement can best be made. After all the *do* operations have been analyzed, as outlined, you are now ready to follow the analytical approach suggested in relation to inspections, moves, storages, and delays.

Remember that all *do* operations should be studied first to find out whether they can be eliminated, combined, or simplified. Do not begin a study with the *make ready* or *put away* factors. Both of these factors are nonproductive and are contingent on the *do* factors or operations.

Step 5—Apply the Improvement

The job of any systems analyst is not complete until this final step is taken. Before installing any new improvement, be sure that analysis up to this point is accurate; check and recheck. Be sure that facts, and not opinions, have been considered and that causes, and not effects, have entered the analysis. It is a good idea at this point to have the analysis reviewed by others with an objective eye. It is also a good idea to conduct a trial run of the new improvement and to consider all technical aspects and human elements that enter into the analysis.

The application of the new improvement involves getting approval from management and actually installing the new improvement—evaluating the results of the new improvement in relation to expected outcomes, and following up the improvement from time to time to see whether it is understood and working. Clear up any doubts. Follow-up should be a continuous process, and it should always be undertaken with the purpose of making further improvements.

When making recommendations to sell a new improvement to management, write a clear concise statement of the problem, the objectives to be reached, and the anticipated outcomes in savings. The evaluation report can be made more concrete and meaningful when accompanied by charts of the present and proposed improvement showing any other supporting data.

Follow-up studies will point up advantages of any improvements, and these improvements can then be measured and compared with old methods and with any savings at the time the new method was proposed. Keep in mind, however, that what is good today may not be good tomorrow. Therefore it is essential to maintain a continuing, questioning attitude with a view to making further improvements that may develop from any changes. Changes will occur because business activity in today's dynamic economy is not static. The true experimenter never rests on his present laurels. He will reach for the stars, and even though he does not get one, he will derive much satisfaction from trying.

GROUP BRAINSTORMING

In addition to the systematic questioning approach that is commonly used in problem solving, another technique, *group brainstorming*,¹ has gained considerable popularity and acceptance.

The term *brainstorming* (organized ideation by groups) was pioneered by A. F. Osborn in 1939 as a group-process technique to produce creative thinking in problem solving. When properly organized and controlled, a group can use this technique to get members of a group to be creatively productive.

According to James L. Wright, ex-president of the National Press Club, our federal cabinets have been good or bad according to the degree to which they have encouraged ideas. A President's cabinet is at its best when all members are encouraged to express ideas freely on any national problem. . . .

But cabinets have too much to decide, and must therefore concentrate on judicial thinking almost to the exclusion of sparking new ideas; whereas a brainstorm group devotes itself solely to creative thinking. The only permanent panel in our government ever to be reported was the Advanced Study Group created by General Eisenhower. . . .

The sole function assigned to this group was to imagine warfare in the future, and to think up suggestions accordingly. General Eisenhower stipulated that his group was to be "divorced of all practical and mundane things of today."

Dr. Osborn reports that the quantitative results of group ideation is beyond question. He cites that one group in his organization held seven brainstorming sessions in one month. Forty-five suggestions were given for a home-appliance timer. Another session produced 124 suggestions on ways to sell more blouses. For another customer, 150 people in his company were split into 15 groups to brainstorm just one problem. The members of the 15 groups came up with 177 ideas of which 177 were finally chosen as concrete suggestions.

Reasons for Brainstorming Success

The power of association is a two-way current. When a group member thinks of an idea, he automatically stirs his own imagination toward other ideas. At the same time, his ideas stimulate the associative powers of others. This contagion was described as follows: "When you really get going in a brainstorm session, a spark in one mind will light up a lot of bang-up ideas in the others, like a string of crackers." Another reason advanced for the creative productivity of brainstorming centers around the principle of *social facilitation*. This specific principle has been corroborated by various scientific studies. "Tests have demonstrated

that 'free association' on the part of adults are from 65 to 93 percent more numerous in group activity than when working alone. This same fact was confirmed by the Human Engineering Laboratory of Stevens Institute. According to its director, Johnson O'Connor, men and women show greater creative imagination in groups than individually." Another reason is the stimulative effect of rivalry. Back in 1897, psychological studies pointed up the power of *pacemaking*. At a future date psychologists proved that competition does increase accomplishment in mental work by adults or children by 50 percent or more. This motivation counts more in ideation than in almost any other type of mental activity, because true creativity depends largely on the application of effort.

Guides for Brainstorming Sessions

Creative thinking in brainstorming sessions is decreased unless certain basic principles are understood and followed clearly by members participating in the group. The following principles must be adhered to:

1. Judicial judgment is not in order. Any criticism of ideas expressed must be deferred.
2. *Free-wheeling* is encouraged. The wilder the ideas, the better.
3. Quantity of ideas is encouraged. The more ideas, the greater the likelihood of good ideas.
4. Combination and improvement are encouraged. In addition to contributing ideas of their own, members in a group should suggest how ideas of others in the group can be improved or how two or more suggestions can be joined into another idea.

The leader of the group should make every effort to keep the group sessions informal and to heartily encourage all to "think up or shut up!"

The group leader should be on the alert for the formation of cliques within the group, keep the group sessions on a steady and forward path, and he should do all that he can to establish an atmosphere of *esprit de corps*. The only "formal" function of a session should be a written record of all ideas suggested, but this record should be kept on a reportorial rather than a stenographic basis. Each group member should get a copy of all ideas presented at each session.

Subjects and Personnel

Subjects for brainstorming should be specific, clear, and concrete rather than general. The goal should be one target at a time. The more familiar, simple, and talkable the subject the better. Too much fact-gathering information is not encouraged; this tends to hinder spontaneity. Factual justification should be put off

¹Principles and Procedures of Brainstorming (Organized Ideation by Groups)," reprinted in *Applied Imagination* by Alex F. Osborn. New York: Charles Scribner's Sons. Re-

The ideal number of individuals participating in a session is about ten. There is no restriction as to the mental caliber of the group. Groups composed of individuals with no experience as well as groups composed of experienced and inexperienced individuals have done well; however, a veteran or two in a group is helpful in getting the ball rolling. Sessions can be composed of males, females, or both.

Application of Group Brainstorming

The technique of brainstorming is not limited merely to the solving of business problems. It is applicable in solving all types of problems and the range is limitless if the basic principles are applied and specifically followed, especially the temporary deferment of judgment. The technique has real merit in trying to seek out alternative ways of performing the job in an environment conducive to creative thinking.

Brainstorming, as well as other operational techniques of creative thinking* such as free associations, forced relationships, attribute listing, input-output technique, etc., along with the systematic use of questions are ways of getting one's thinking out of a rut in producing ideas to get people to work smarter and not harder.

GAINING PARTICIPATION AND ACCEPTANCE

Discovering a better way to do something is futile unless you can sell and install the better way. These factors are just as important as analyzing a problem and preparing a new method. Selling work simplification requires knowledge of human behavior. Three basic characteristics of human behavior must be overcome before an effective job in work simplification can be done:

1. Resistance to change.
2. Resistance to the new.
3. Resentment of criticism.

Workers have to be made to understand that changes are necessary if one is to progress, that the *new* is really an honest and sincere attempt to improve, and that constructive and timely criticism is helpful. If a tree cannot bend, it breaks. Likewise, if a worker is not flexible and responsive to change, he will crack under the strain of opposition. Complacency may be a problem in work-improvement efforts because workers may not want to be disturbed. Old ingrained habits that

*Max D. Richards and William A. Nielander, "Operational Techniques of Creative Thinking," *Readings in Management*, 2nd ed. Cincinnati: South-Western Publishing Company, 1967, pp. 251-264.

would require work to alter can be a problem. Insecurity stemming from not knowing what is ahead of a change may cause trouble. The best way to overcome these obstacles is through participation. If workers are permitted to have a voice in the changes that are to be made, and if they are clearly informed about how a change is going to affect them, most will be more than willing to cooperate. Participation creates teamwork, understanding, mutual confidence, and respect. In turn, fears, mistrust, suspicion, and uncertainty are overcome or alleviated.

Resistance to change is almost instinctive. Doing something differently might upset comfortable ingrained habits. Change might call for thinking and planning. It may also involve risk: the risk of failure in not measuring up to the new pattern. How to gain this participation in installing a work simplification program is explained well in an article by Nathaniel Stewart that is summarized in the following section.

INSTALLING A WORK SIMPLIFICATION PROGRAM

Consider the following plan of action when installing a work simplification program:

1. Gain agreement and confidence that a problem really exists and needs action. Once workers are convinced that a problem is real and that there is a need to solve it, they will join you on the road to action.
2. Inform all persons concerned that a change is being considered and keep them informed. The shock of an unannounced change is bad for workers' morale.
3. Select those workers who will participate in the change on the basis of official rank and skill, or both, but build participation and acceptance on a foundation of clear understanding.
4. Single out the real leader of a group and work through him to get the approval and the alliance of workers involved. This leader may be the nominal head of a group or he may have influence because of seniority, personality, etc. Gaining his approval will expedite action. Failure to gain his approval might result in increased resistance.
5. Cite testimonials from other companies to motivate and convince workers that the change being suggested is working well elsewhere. People, in general, like to be identified with successful undertakings.
6. Cite advantages that will come to the workers personally from the change, such as less work pressure, better pay, less fatigue. If a change is personalized and tied to workers' needs, wants, and hopes, it helps them to see that there is no conflict of interest between their gain and the company's gain.

Nathaniel Stewart, "Are They Ready for Change?" *Management Review*, October, 1961, pp. 4-11. Summarized by permission of the publisher.

7. Schedule a meeting to initially present the proposed change. The presentation should be assigned to a leader acceptable to the group; otherwise, there may be resistance.

8. Present the proposed change in writing to all concerned and elicit suggestions from them. This plan will help to dispel the feeling that the proposed change was *all decided* from the very beginning.

9. Make a special appeal to the open-mindedness of those concerned and suggest an experimental period to try the change. Most individuals like to be thought of as being open-minded. They do not like to be marked as being prejudiced. Make the best possible use of this trial period because it can be very helpful in bridging the gap between the planning and final installation stages.

10. In stating the proposal for a change, avoid giving the image that it is unduly restrictive. Restraint arouses resentment. Avoid making workers feel that they are being policed while they are in the process of orientation, learning, and adjustment. At this point, be observant, take notes, and be sure to discuss with the workers what is going on. Do not impose rigid and formal controls too soon.

11. Allow time for workers to adjust. Do not forget that it takes time to acquire new skills, to break old habits, to establish new relationships, or even to adjust to familiar things from a new angle.

THE HAWTHORNE EXPERIMENT

Back in the 1920's and 1930's some interesting research studies were in progress at the Hawthorne plant of Western Electric. These studies indicated that improvement of various kinds of working conditions resulted in increased productivity. However, studies in the experiment also indicated that workers' morale was an important factor affecting their productivity.

Fritz J. Roethlisberger was a prominent member of the research team. He writes:

People at work are not so different from people in other aspects of life. They are not entirely creatures of logic. They have feelings. They like to feel important and to have their work recognized as important. Although they are interested in the size of their pay envelopes, this is not a matter of first concern. Sometimes they are more interested in having their pay reflect accurately the relative social importance to them of the different jobs they do. Sometimes even still more important to them than maintenance of socially accepted wage differentials is the way their superiors treat them.

They like to work in an atmosphere of approval. They like to be praised rather than blamed. They do not like to admit their mistakes—at least not publicly. They like to know what is expected of them and where they stand in relation to their boss's expectations. They like to have some warning of the changes that affect them.

They like to feel independent in their relation to their supervisors. They like to be able to express their feelings to them without being misunderstood. They like to be listened to and to have their feelings and points of view taken into account.

They like to be consulted about, and participate in, the actions that will affect them personally.

In short, employees, like most people, want to be treated as belonging to and being an integral part of a group.

Robert N. Lehrer,* in generalizing and summarizing on the results of the Hawthorne study, states:

The logic of efficiency (i.e., maximum production for maximum profit) ran counter to the logic of sentiment except in those cases where the logic of sentiment was oriented in the direction of psychological and social values that produced efficiency as a by-product. There was considerable evidence to indicate that workers will react unfavorably to any behavior forced on them from above without their participation in shaping the decisions and understanding of objectives and means for achieving the objectives.

Productivity increases when such increases help achieve satisfaction of the basic needs of the inner man.

SUCCESSFUL WORK SIMPLIFICATION PROGRAMS: A CASE SUMMARY

Successful work simplification programs center on well-planned approaches. For example:|

A \$165,000 saving in six months was the happy result of a Midwest chemical plant's new work-simplification program . . . one that took advantage of important help from the "gut level" to put its procedures across.

The plant's methods engineer kicked off the program with a meeting of first-line supervisors to discuss anticipated problems. Then he organized a supervisors' task force to work out new approaches, and the training department set up training sessions to help the group overcome resistance to change from production workers.

Remembering a prime sore spot in a previous (unsuccessful) program, the task force's first recommendation was a time allowance to permit smooth integration of new procedures into the regular work schedule. The methods engineer "bought" this immediately . . . and the encouraged supervisors soon made the new program a going concern. Quick returns were:

First month, 31 revised methods; second month, 106; and for the balance of a six-month trial period a fixed quota of 75 revisions per month was easily reached.

The previous simplification program, though well conceived, failed because it had too strong an "ivory tower" approach for first-line supervision to swallow. Management found that it bred resentment instead of willing cooperation.

*Robert N. Lehrer, *Work Simplification*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1957, p. 117.

|"Communication In Action," American Management Association, January-February, 1969.

INCLUSION

Each employee in an organization from the top level to the bottom level has to be encouraged to do his best. He must feel that he is an important member of the work team and that his individual contributions to production add up to profit and security. He must also realize that work simplification, effectively employed, results in profit and security for all. The effects of work simplification are not elusive. They can be seen in the form of additional profits and can provide a basis for promotion. Finally, it is important to remember that the desire of workers to contribute and to feel a part of an organization may be achieved as a result of work simplification. The morale of a work force can spell success or failure for any organization. Also, remember that work simplification is no magic formula for all ills and that a program in work simplification must be directed with clear vision, creative thought, and an understanding of human behavior. A program should not get bogged down by too many gadgets, which can destroy perspective. Too many individuals become enamored by methods and minute detail. Like the philosopher in Francis Bacon's *Advancement of Learning*, "We gaze upwards to the stars and fall into the water. If we had looked down, we might have seen the stars in the water, but looking aloft we could not see the water in the stars."

REVIEW AND DISCUSSION

1. Discuss benefits likely to accrue from a work-simplification program.
2. What special contribution did William H. Lefingwell make to the area of office management?
3. List and briefly discuss the *five-step approach* used in work simplification.
4. What are the four fundamental principles of work simplification?
5. What kinds of jobs might one look into as having potential for work improvement study?
6. Can you suggest any jobs other than those mentioned in the text that might possibly be ripe for work-improvement study? Why?
7. What factors should be considered in developing and selling work simplification in a company?
8. How does the saying, "There is a time for everything" tie in with the concept of work simplification?
9. Every job operation has three basic steps. What are these steps or operations? In work-simplification study, which do you consider to be the most important one? Why?
10. How can work simplification be successfully achieved in a firm?
11. What special significance does the saying, "A problem well defined is half solved," have in work-simplification study?
12. Conduct a brainstorming session with assigned members of your group. Brainstorm the topic, "How Can Office Operations Be Simplified?"

MOTION STUDY

Motion study, one aspect of work simplification, may be defined as the analysis of the motions performed by a worker to determine whether or not the motions are the best that can be used, at the time of the study, to perform work. The purpose of motion study is to eliminate wastefulness resulting from unnecessary, ill-directed, inefficient motions. The positive outcomes from motion study were stated by the Gilbreths:

The greatest waste in the world comes from needless, ill-directed, and ineffective motions. These motions are unnecessary and preventable. Their existence in the past was excusable, because there was no knowledge of how to dispense with them. That excuse no longer obtains. The methods and devices of waste elimination are known and are being constantly used. But the knowledge of how to make these great world-wide economies is being disseminated at an astonishingly slow pace.

Closely related to motion study is time study,¹ which is the analysis of the time required to perform a unit or element of an operation. It usually takes place after motion study, if the two are used in conjunction. However, time study may be employed independently, for instance, in setting wage rates on work operations. Similarly, motion study does not depend on time study. Both are employed in the study of systems and procedures, and both have a definite place in the evolution of scientific management.

Frank B. Gilbreth and his wife, Lillian M. Gilbreth, pioneers of the application of the scientific method to the problems of industry, developed the original principles of motion economy on which motion study is based. Although modified to some extent by others, these principles are essentially the same today as when they were first published in 1923. The Gilbreths believed that the qualitative analysis of motion study should precede the quantitative analysis of time study. This approach is not accepted by some work analysts. However, since time study involves obtaining times for elements of work, accurate and complete analysis of times becomes difficult to get if data have not first been gathered and analyzed

¹Frank B. and Lillian M. Gilbreth, *Applied Motion Study*. New York: Macmillan Co., 1919, p. 57

[The technique of time study is discussed in more detail in Part VII.]

MOTION STUDY

regarding the method of the operation. The Gilbreth's approach, qualitative analysis before quantitative analysis, recognizes this factor, and their approach is, in general, the best one to follow.

Few will question the many important and concrete outcomes of the work of the Gilbreths, i.e., process charting, and micro-motion analysis study, but their most important contributions to the management field were the laboratory approach to work study and their avid interest and emphasis with the human element.

MOTION STUDY IN THE OFFICE

Since office operations are subject to more detailed and individual variation than most factory operations, detailed motion studies have not been employed too widely. However, motion study does have a practical and valuable place in the study of improving office operations, especially those operations of a highly repetitive nature where appreciable cost savings can be made. As a case in point, The Standard Register Company received an invitation from a large manufacturer of toilet and drug articles to conduct a study of his procedure for receiving materials. The study revealed that four separate systems were employed: one for packaged material, one for raw material, one for maintenance material, and one for miscellaneous material.

The study also revealed that information was being unnecessarily duplicated. The four separate systems were combined and reduced to one five-copy system. The results of this study were a 32 percent reduction in clerical work, greater speed in distribution of receiving information, a simplified receiving system, and, of course, an overall reduction of operating costs.

The application of motion economy to office operations depends on a questioning attitude, experimentation, analysis and synthesis, creativity, adaptation, innovation, and judgment. The natural way to perform a task is to do it in the simple way. Sir Henry Deterding of the Royal Dutch Shell Oil Company once said: "There is a master key to success with which no man can fail. Its name is simplicity. I mean in the sense of reducing to the simplest terms every problem which besets us. Almost every man can succeed if only he will simplify everything in his life. That has been my working theory for forty years. As a very young man I stumbled on this fundamental truth that everything that is complicated is wrong. Simplicity rules everything worthwhile. Whenever I have met a problem, which after taking careful thought I could not reduce to simplicity, I have left it alone."

BASIC MOTIONS USED BY WORKERS

In their research studies, the Gilbreths advanced the idea that all physical operations are composed of elements, which they termed *therbligs* (Gilbreth spelled backwards, except that the *th* is not reversed). In their studies of motions used by

VARIABLES THAT AFFECT MOTION PATTERNS

workers, they isolated 18 therbligs or basic motions such as *select, grasp, inspect, preposition, search, assemble, etc.*

As previously mentioned, others have modified to some extent the original and basic therbligs conceived by the Gilbreths. For instance, Ralph Barnes lists 17 motions (Table 15-1)* on p. 244.

The original list of motions developed by the Gilbreths included the *find* therblig. *Find* takes place at the end of the search therblig and is really a mental reaction rather than a physical movement. It is used infrequently in micromotion analysis study. For these reasons it is excluded from this list of basic motions. The Gilbreths did not classify *hold* as a separate therblig. They conceived it as a form of *grasp*.

VARIABLES THAT AFFECT MOTION PATTERNS

A number of different elements (variables) affect the amount and kind of work that a worker can do. The work analyst should study each separately in analyzing any problem of motion reduction to determine whether they have any particular bearing on the problem under study. These variables fall into three categories: (1) variables of the worker such as anatomy, contentment, experience, and health, (2) variables of the work surroundings such as music, lighting, and ventilating, and (3) variables of the motions used by workers such as acceleration, inertia and momentum overcome, and length.*

The practical value of the study of these variables can be understood more clearly by illustration. The study of the anatomy of the worker will assist an analyst to adapt the surroundings and work tools to the worker, resulting in a decrease of the number of motions he must make, and make the necessary motions shorter and less fatiguing. For example, if a stenographer is left-handed, the relative position of the drawer in which she keeps her most frequently used work supplies in a double-pedestal desk is reversed. Instead of keeping these supplies in the right-corner drawer, her motions would be decreased, shortened, and less fatiguing if she kept the materials in the left-corner drawer.

How the variables of the worker's surroundings such as noise, light, heat, etc., can affect his motions, productivity, emotional and physical well being is discussed in Part II. How variables of the motions can affect a worker's motion pattern and effectiveness can be illustrated in considering speed. Usually, the faster the motions, the greater the output. However, there are other values of speed of motion besides the fact that time is decreased.

Momentum is the force effected by a moving mass. Speed increases momentum, and this momentum can be used advantageously to do work. For example, as a typist types from one line to another, her speed from the start of a line to the

*Ralph Barnes, *Motion and Time Study*, 4th ed., New York: John Wiley & Sons, Inc., 1958, pp. 118-121.

