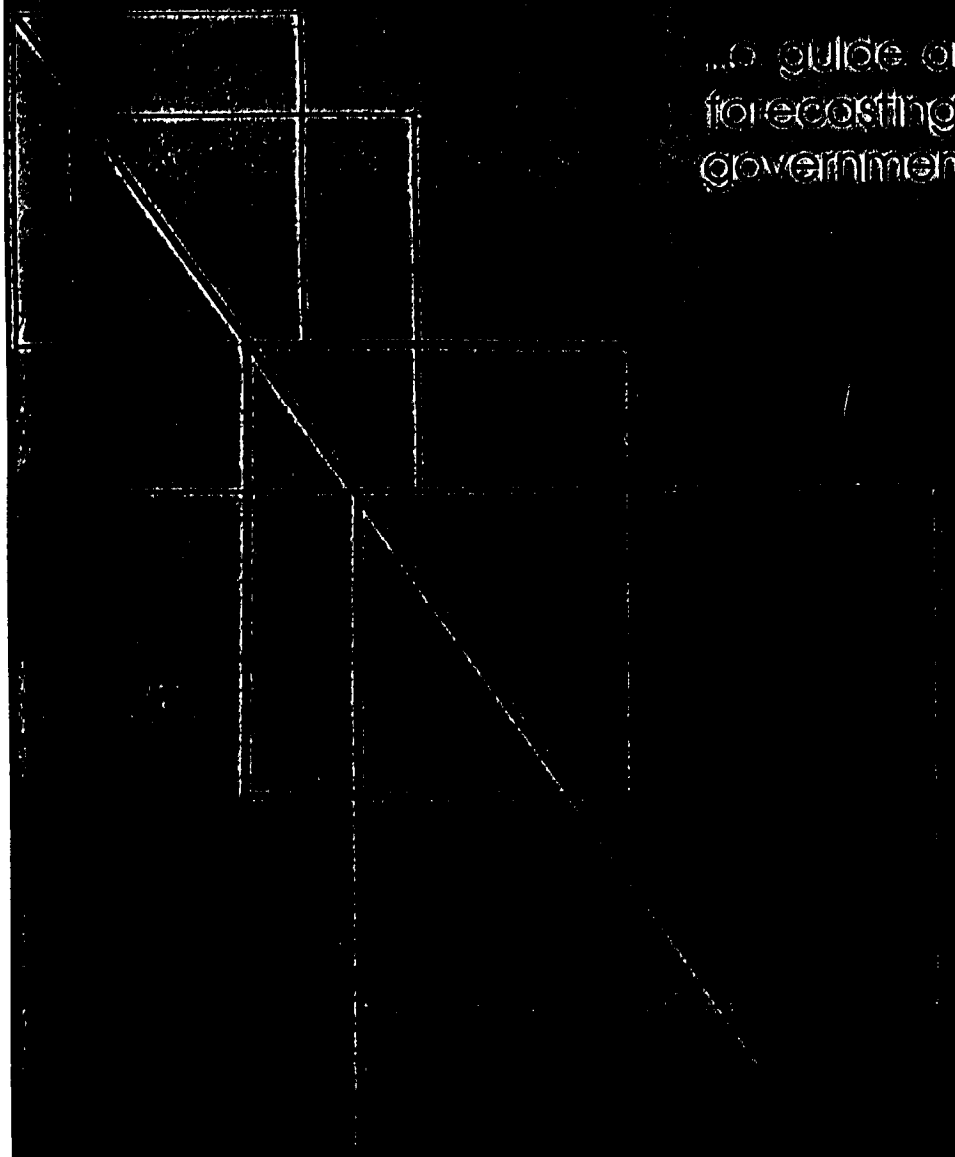
Handbook on Government Work Force Requirements

...a guide and checklist for forecasting how many workers government agencies need



PREFACE

Most organizations find it hard to determine how many workers they need for a given period of time. Government agencies are especially reluctant to quantify this because their outputs are often indistinct, reversible, and seem unrelated to changes in their work force. We have issued several reports recommending improvements in the Federal work force requirements process and many agencies have requested or expressed a need for a guide to evaluate the process.

This handbook (and the checklist in app. I), prepared on the basis of past efforts by us and many others, summarizes the techniques used to evaluate certain Federal work force requirements. These techniques have been developed and published by various private and governmental research, educational, and industrial engineering organizations. We hope that they serve as a guide for those charged with determining the number of workers needed for a government workload that may be measurable but indefinite; quantifiable but uncertain.

We encourage the use of this handbook and solicit comments for improving it. Please send your comments to me at the Federal Personnel and Compensation Division, U.S. General Accounting Office, 441 G Street, NW., Room 4001, Washington, D.C., 20548.

H. L. Krieger
Director

We wish to acknowledge the helpful suggestions and critical evaluation of this handbook by many individuals dedicated to good work force management in the Air Force, Army, Navy, Defense Logistics agency, Social Security Administration, Office of Personnel Management, and other General Accounting Office divisions.

Contents

GLOSSARY

Available time for work	Amount of time available for working on the job after deducting weekends, holidays, leave, and training. It is used to convert the overall staff time required to full-time staff equivalents.
Budget submission	Documents showing the resources requested for the budget year and the supporting justification for the purpose and amount.
Effectiveness	Attaining desired results or benefits that are measurable.
Efficiency	Achieving the minimum cost in producing a specified level of output.
Full-time staff equivalents	The number of workers required to accomplish the workload for a given period in terms of full-time positions. It is used as a basis to analyze the costs and types of employees which can best accomplish the workload.
Manpower utilization	Manner in which an organization uses its personnel in terms of the efficiency in accomplishing its functions.
Methods study	Close analysis of procedures to eliminate unnecessary elements or operations.
Productivity	The efficient and effective use of an organization's resources to produce goods or services.

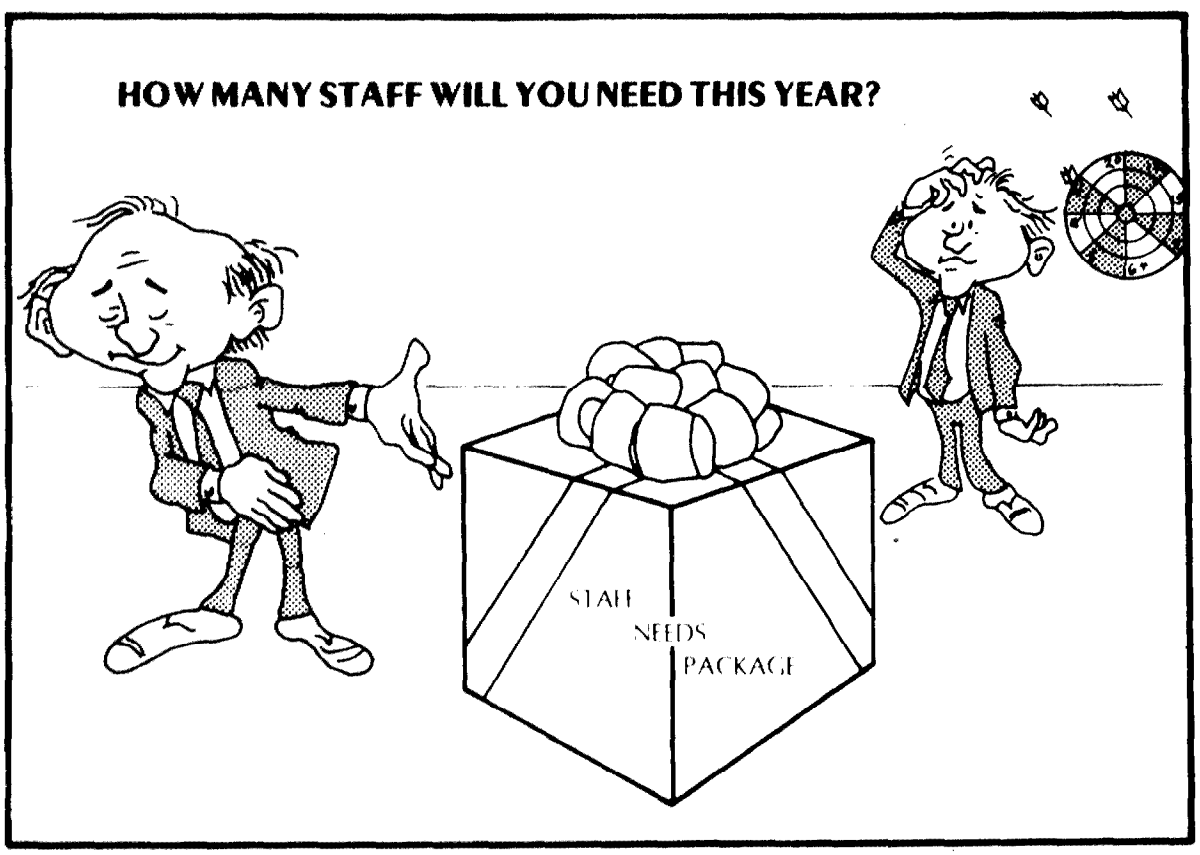
Reliability	Statistical accuracy of a standard. The standard time should be representative of that needed to accomplish the task.
Requirements	The staff needed in an organization to perform the work expected for a given period. They are developed through the application of work standards to workload forecasts and should be the basis for the organization's budget submissions.
Workload	Amount of work imposed upon, or assumed by a person or organization to be disposed of in a given amount time. It is the total number of work units for a specified period.
Workload forecast	The types and numbers of each type of work unit or workload necessary to achieve a desired objective over some future interval of time.
Work measurement	Collection of data on staff-hours or costs and production by work units, so that the relationship between output and staff-hours or costs can be calculated. It is used as a basis for determining requirements and other functions, such as personnel planning, scheduling, production, performance evaluation, and cost control.
Work standard	An expression of the time required for a qualified worker to accomplish a defined amount of work, under normal supervision conditions. It is used as a factor to convert the workload forecast to an estimate of staff time required.

Work unit	A specified amount of work or the results of an amount of work. After work units are selected they can be used to develop workload forecasts and work standards.
Validity	Deals with whether a standard reflects the way the task is currently being performed.

CHAPTER 1

INTRODUCTION

The process of determining reasonable staff needs is essential to maintaining or improving an organization's productivity. Overstaffing can lower productivity, while understaffing can cause unfulfilled program objectives, curtailed services, work backlogs, unnecessary overtime, and low responsiveness and morale. The requirements process includes such elements as unit selection, workload forecasts, conversions to basic staff needs, assessments of staff alternatives, and support for the budget process. Also, these elements can directly result in more efficient procedures and a more effective management evaluation process.



As total personnel costs for the Federal Government increase (now more than $80 billion annually), the political pressures increase to base agencies' budgets on a reasonable determination of staff requirements. Since legislators are concerned about controlling these resources, they want to be assured that budget justifications for staff are based on a realistic analysis of the work to be accomplished during the budget year. The Congress has expressed concern for agencies to determine their staff needs through a reliable and valid process. The Office of Management and Budget has also encouraged the use of budget techniques which insure that all programs are justified, as far as practicable, by an analysis of the personnel required to complete the work.

The General Accounting Office (GAO) has looked at various aspects of the requirements process in the past and has pointed out the need for more effective systems within the Government. It has issued several reports in areas such as work measurement, staffing standards, staff availability factors, and productivity. (See app. IV.)

This handbook combines GAO's experience in these areas into a set of guidelines for evaluating various aspects of the staff requirements process for any government agency. Standards listed represent many of the successful elements and criteria used by agencies that have an effective requirements process. These standards have been described in general terms so that they can be used to evaluate or audit agencies at more than one level. A summary checklist is also included (app. I) to help develop a plan for organizational self-improvement and to help identify weaknesses and problems.

CHAPTER 2

WHAT TO CONSIDER IN DESIGNING A STAFF REQUIREMENTS PLAN

Before designing a staff requirements plan, a manager should consider the overall strategy and techniques needed for identifying and measuring work, as well as their costs and benefits. For this plan to survive with management's acceptance, it should be compatible with existing resource management systems.

TECHNIQUES TO MEASURE WORK NEEDS

Since government agencies are, for the most part, service organizations, managers tend to believe that their workers and their functions cannot be adequately identified and measured. This implies that their employees are performing tasks which do not result in a useful end product. However, we believe that all organizations necessarily provide services or products which can be identified and measured with varying degrees of accuracy. For example, some "soft" measures of government services include inspections, cases, or projects completed; regulations enforced; individuals or property protected; and grants and loans approved. "Hard" measures of services might include purchase orders or supply transactions completed, pounds of mail processed, or tax returns audited.

It is generally agreed that service organizations' methodology and degree of accuracy for identifying and measuring work are different from industrial operations'. However, both types of organizations have similar steps in the requirements process. These steps (see ch. 3) can be used to more fully analyze service operations to project future workload and staff needs.

CAREFUL ADVANCED PLANNING

An organized approach to estimating work requirements is important for the plan's success. A step-by-step approach will reduce confusion, duplication, or important omissions. However, changing the current process or designing a new one can be a sizable investment. Costs for hiring, training, and maintaining qualified staff can be substantial. A careful evaluation of total costs in relation to benefits should thus precede a decision to keep or change elements of the requirements process.

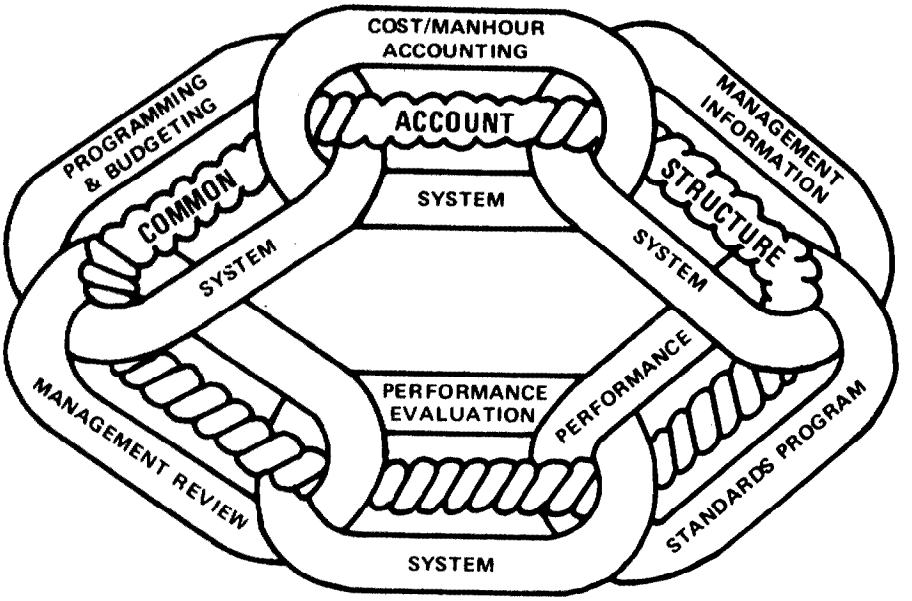
Internal conditions which may affect the various approaches to a plan should also be considered. A complex process may not insure success if it is incompatible with an organization's internal conditions. Key considerations are the organization's ability to absorb the changes, the adaptability of the current decisionmaking processes, and the roles of the various offices.

Little is gained by developing a staff requirements process which is too sophisticated for the organization to grasp and implement or which conflicts with continuing organizational roles. This situation may inhibit the accomplishment of major objectives and scuttle basic decisions on staff needs. If an organization devotes a large portion of its productive resources to implement the requirements process, the organization may not have enough resources for other priorities. This may result in the entire requirements process being dropped even though a simpler one might have survived.

INTEGRATION WITH OTHER SYSTEMS

The preliminary design stage of the requirements process should build on existing resource management systems without duplicating them. Extensive data may already be collected, analyzed, and available for use in determining staff requirements. To make the collection of resource management data easier, the requirements manager should use the same account structure as the budget analysts, accountants, and others. For example, the Defense Logistics Agency uses the same structure for programing, budgeting, cost accounting, data collection for management analysis, management review, and decisionmaking functions. The Social Security Administration uses the same workload reporting system as a basis for forecasting manpower and money requirements, analyzing cost, allocating programs and workloads, and providing the framework for measuring productivity.

Reducing the possibility of collecting and analyzing data in duplicate can enhance overall organizational efficiency. Participants in the design should include representatives from line organizations as well as those responsible for personnel operations, staff assignments, scheduling of work activities, budgeting, cost accounting, and other portions of the management information system. The following diagram has been used in several reports to illustrate the concept of an integrated management system.



CHAPTER 3

HOW TO DETERMINE STAFF NEEDS

An effective plan to determine staff needs will

--select a basic framework of work units for collecting data,

--project work activities using past information and data analysis,

--convert projected workload into staff time needed and then to full-time equivalents of personnel required,

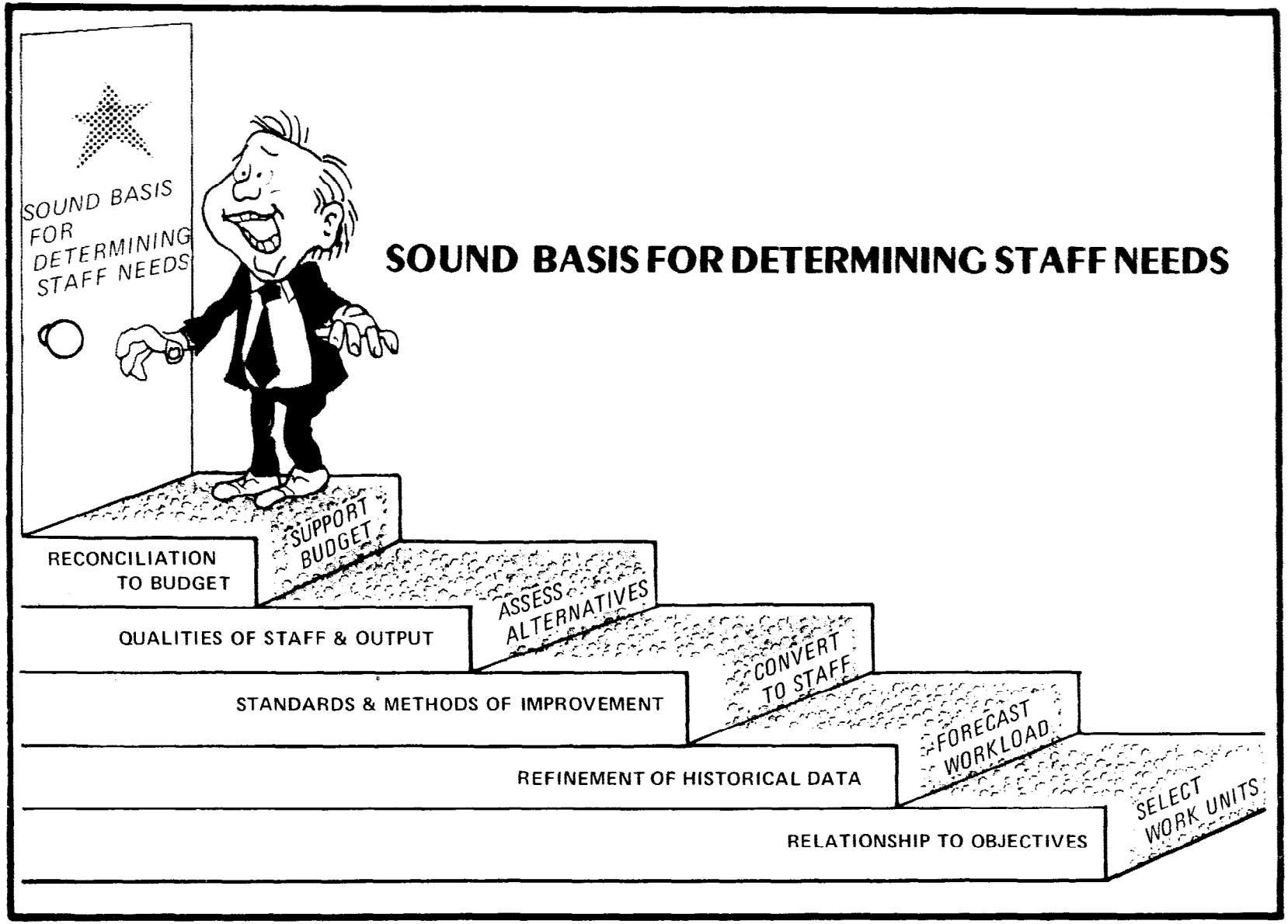
--analyze full-time equivalent requirements so that management can assess the most effective and economical alternatives for performing projected work activities, and

--support the budget process with these requirements.

PROPER SELECTION OF WORK UNITS

A work unit is an amount of labor treated separately for identification, measurement, and control. Work units are needed to define activities for measuring output in relation to resources. Industrial operations involving tangible products can easily be broken down into specific subunits which enter into the finished product. However, the services for many of the nonindustrial operations of government agencies are not easily analyzed according to work needed to develop output. For example, many of the professional services cannot be standardized because the work changes from day to day.

Even though it may be more difficult to specify activities under these circumstances, selecting appropriate work units will make the task of forecasting work activities and converting to staff needs much easier. Some important considerations for developing a work unit structure would include determining: (1) levels of work units which relate to organizational objectives, (2) categories of work units suitable for workload forecasting and converting to staff needs within an organization, and (3) distinct elements which are convenient for collecting data.


SOUND BASIS FOR DETERMINING STAFF NEEDS
SOUND BASIS FOR DETERMINING STAFF NEEDS
SUPPORT BUDGET
RECONCILIATION TO BUDGET
ASSESS ALTERNATIVES
QUALITIES OF STAFF & OUTPUT
CONVERT TO STAFF
STANDARDS & METHODS OF IMPROVEMENT
FORECAST WORKLOAD
REFINEMENT OF HISTORICAL DATA
SELECT WORK UNITS
RELATIONSHIP TO OBJECTIVES

Relating work units to objectives

The initial step in developing work units is to separate the organization's main objectives into successively lower levels of responsibilities and services provided. For example, the Defense Logistics Agency divides its overall mission into functional program areas, such as procurement activities, material management, storage activities, logistics services, and contract administration services. The next level of functions are then subdivided under the basic program area. Functions such as stock control and commodity management are under material management, and subfunctions such as requisition processing and inventory accounting are under stock control. By relating all the work units through this process, the overall work activity can be projected in relation to the organization's overall objectives.

Generally, this is a more cumbersome process in a government organization which provides services rather than goods. Organizations with industrial operations have the advantage of being able to identify objectives and tangible output in measurable monetary terms and to subdivide and trace this output to resources used.

Even though there are few or no physical outputs, service organizations can build a work unit structure by analyzing the primary output measures which best represent work effort expended, in the same manner that a physical product is subdivided. It may be necessary to use some completed document or other representative transaction as a primary output measure. For example, the Defense Logistics Agency uses such output measures as requisition line items processed manually and inventory and adjustment line items processed at its subfunction level.

Selecting suitable work units

The selection of work units and level of detail depends on whether they are suitable for forecasting workload and for developing and applying standards or factors for determining staff needs. For example, it would be meaningless to describe GAO's workload in terms of audits completed. There are many different types of audits and means for disclosing audit findings. These categories would not form the basis for a work unit structure since they cannot be projected to develop future workload or work force.

Instead, GAO's requirements process is based on a different work unit structure. First, it divides work units into basic program areas such as direct assistance; requests from the Congress; and types of audits, such as program results, economy, and efficiency. Work units are then subdivided according to functional and subfunctional areas within the Government, such as procurement and human resources, and according to priority areas, which need to be audited.

Work units can be measured at various levels: objectives; programs output; components related to output; and subcomponents, activities and tasks. Generally, the lowest level needed would be those work units which comprise the basic output or its main components. The less significant tasks can then be included in the next higher level of service or output.

Some organizations with work unit structures find it beneficial to measure the units at lower levels and then aggregate them to summary levels. However, the extra effort for the detail is usually justified on the basis of its contribution to management efficiency or performance evaluations, rather than on the basis of determining and justifying staff needs. Organizations which measure such detailed work units usually have industrial-type operations with repetitive tasks which can be analyzed and forecast with confidence.

Segregating work units into distinct elements

Work units also need to be separated so that managers can economically collect data on output and time and cost expended. Dividing the primary outputs into successively lower levels of mutually exclusive and all-inclusive work units assures that the overall staff needs will include all the work functions which need to be performed without counting some of the functions more than once. For example, the Social Security Administration aggregates component work units into major groupings of end product work units representing its major functional workloads or supporting functions. Component organizations are required to have subwork unit structures which tie into this overall workload functional structure (that is, each component ties indirectly to one and only one grouping).

In order to be counted, work units should be clearly and consistently defined. Planners should identify the source and types of data to be collected for each work unit. They should also select consistent points of count for output produced and effort expended.

Finally, the work units should be categorized so that the most economical means of collecting data can be used. Although planners should take advantage of existing data collection procedures they should assess the alternative of designing new data collection systems which might further advance the staff requirements process.

APPROPRIATE FORECASTING TECHNIQUES

If planners can project the number and type of work units to be accomplished during a given period, they have a good chance of setting up a system to estimate reasonable staff needs. Appendix II describes various categories of work forecasting techniques.

Most work forecasting techniques are characterized by uncertainty. Good planners try to select the techniques which will improve the confidence and reliability of the forecasts, realizing that the forecasts will always differ from the actual results. This hazard is usually less dangerous, however, than not attempting to predict work activities. Nevertheless, managers should not invest in elaborate forecasting techniques for highly uncertain future workloads such as those subject to unpredictable political conditions.

Work forecasts generally start with past work activities. Planners then refine the information through various techniques using theories of growth, quantitative reasoning, or actuarial analysis. The Defense Logistics Agency projects future workload from average production data collected from previous time periods. Additional factors are also considered, such as projected troop strength, military service supply requirements intelligence, and inventory adjustments.

A combination of subjective and objective elements usually dictates changes in the workload to predict future work activities. Although observable data should be given first priority, the value of expert judgment should not be discounted, especially when variables cannot be determined or expressed in probabilities. For example, experts' collective opinion on the passing of legislation affecting an organization's future workload could be extremely important to a forecast.

The vital role of work unit structure is evident in its applicability to an effective forecast. Work activities having different objectives or requiring different types of skills can be analyzed separately for individual forecasts. When dissimilar conditions are involved, the requirements forecast can be more precise by analyzing smaller segments of work activities. For example, the accuracy of workload projections at GAO are improved by separate forecasts in various issue areas. It can determine workload changes in certain areas of congressional concern rather than forecast on the basis of overall congressional concerns.

It is not always easy to identify conditions which change future workloads. An effective approach is to start with provisional forecasts and to continually revise or refine the techniques as causal factors are identified, reviewed, and validated for reasonableness and consistency. Comparing the prior year's forecasts with the current and prior year's accomplishments usually helps to validate the process.

CONVERSION OF WORK FORECASTS TO STAFF NEEDS

Work units relate output and input and also provide the basic building blocks to convert workload forecasts to staff time forecasts and then to equivalent full-time personnel required for a specific time period.

Developing standards to convert workload to time forecasts

Standards are prepared to indicate the work effort expected of a qualified worker at a pace ordinarily used under capable supervision to do a defined amount of work and meet a specified quality. They are usually stated in terms of the time required to perform a completed work unit of output. Some examples of standards are

--100 staff-days per report issued,

--25 staff-days per legal case closed,

--75 staff-days per grant approved,

--10 staff-days per project completed,

--50 staff-hours per tax return audited,

--2 staff-hours per pounds of mail delivered, and

--5 staff-minutes per supply transaction processed.

Standards can be developed for other purposes, such as work scheduling and production, performance evaluation, and cost control. However, from the viewpoint of requirements, they are important factors for converting the projected work activities into resources needed for a specific time period. Using the above standards, forecasted workloads can be converted to staff time forecasted as follows:

Standard	Workload forecasts	Staff-time forecasts
100 staff-days per report	10 reports	1,000 staff-days
25 staff-days per case	200 cases	5,000 staff-days
75 staff-days per grant	50 grants	3,750 staff-days
50 staff-hours per return	2,000 returns	100,000 staff-hours
2 staff-hours per pound of mail	10,000 lbs.	20,000 staff-hours
5 staff-minutes per transaction	100,000 transactions	500,000 staff-minutes

There are many techniques for developing staff standards. Most of them use work measurement, which is the collection and analysis of data on staff-hours and output by work units. Appendix III contains a synopsis of the major standard development techniques used to convert work activities to staff needs. Some standards are more precise because they use industrial engineering techniques, such as time study, work sampling, standard data, and predetermined time systems for formally analyzing and measuring the elements of particular jobs. Other standards, which are less reliable but less expensive, rely on managerial judgment, professional or technical expertise, and statistical analysis of past performance.

In preparing nonengineered standards, it is generally assumed that past performance has used the most efficient methods and that future conditions will be the same. Where better methods are identified and workable, planners would be foolish not to account for them in applying nonengineered standards. Engineered standards, however, generally include methods studies in attempts to improve the efficiency and

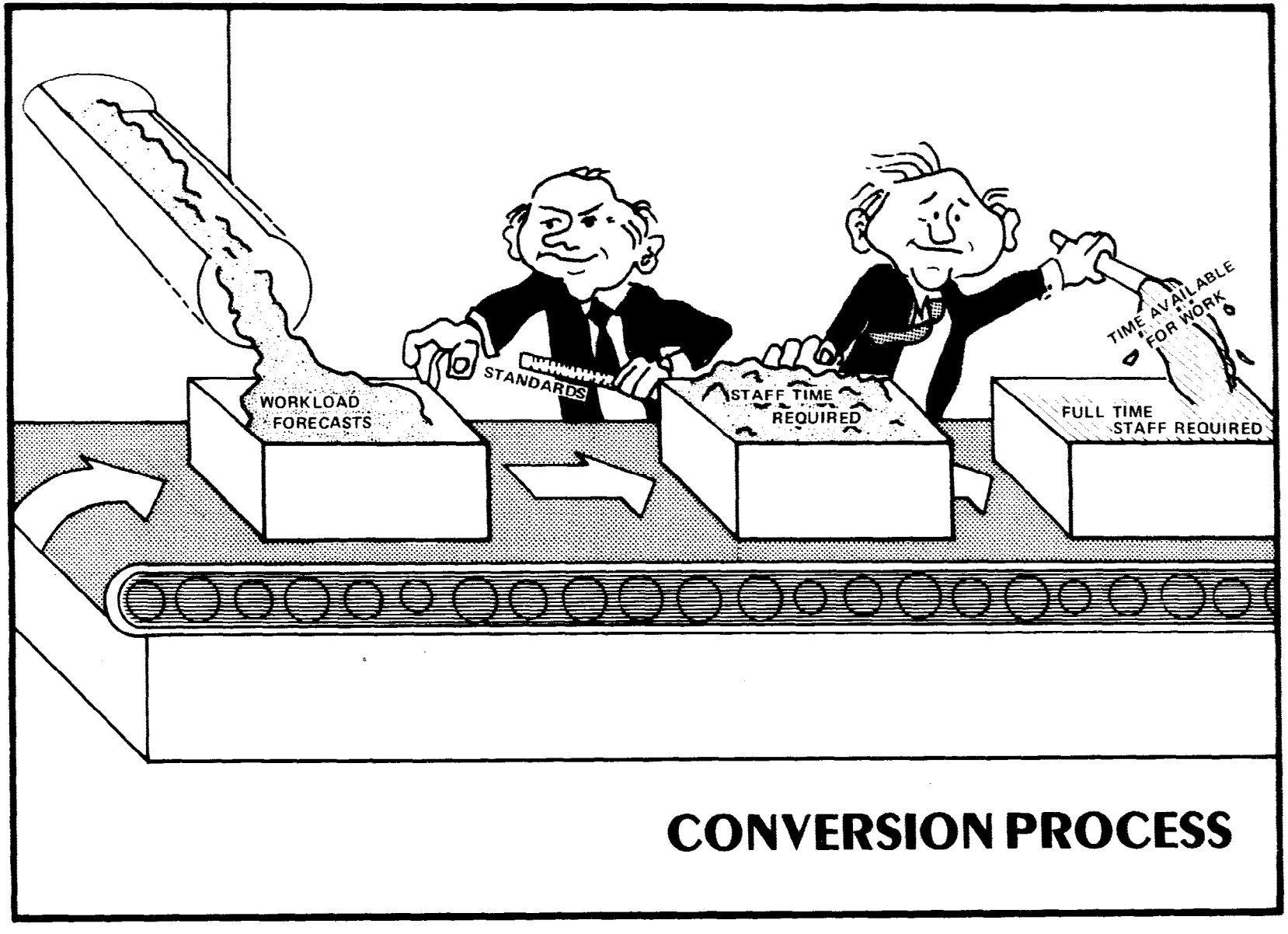
effectiveness of work activities. Even though the organization may not have the resources and skills to immediately develop standards which reflect improved procedures, the standards still can be used to identify and prevent lower productivity in the future.

Obviously, the more precise and sophisticated techniques will require more resources, higher quality staff, and an organization with management and experience capable of absorbing and using those techniques. Therefore, the organization may need to build up the system as it becomes more experienced. An original standards system consisting of provisional averages or ranges of data, which may be based only on the judgments or logs of work activities, should enable managers to close the gap between actual and expected time.

Converting staff time forecasts into staff required

Estimates of available productive time per worker are used to convert staff time requirements to number of full-time staff or "staff equivalents" required for the workload. Current and complete records on time which is not spent in performing work activities, such as for holidays, leave, and training, should be maintained so that the average available time for work can be determined. However, deficiencies have been found 1/ in agency availability estimates which distort the staff requirements process. For example, availability estimates have been inconsistent within and between agencies and have not been kept current or documented. Time spent on the job for personal needs, rest, unavoidable delays, coffee breaks, and on special duties also increases the number of workers needed. Agencies often have a basis for estimating their impact when developing precise standards.

1/Estimates of Federal Employees' Available Time for Work Distort Work Force Requirements (FPCD-78-21, Mar. 6, 1978).


WORKLOAD
FORECASTS
STANDARDS
STAFF TIME
REQUIRED
TIME AVAILABLE
FOR WORK
FULL TIME
STAFF REQUIRED
CONVERSION PROCESS

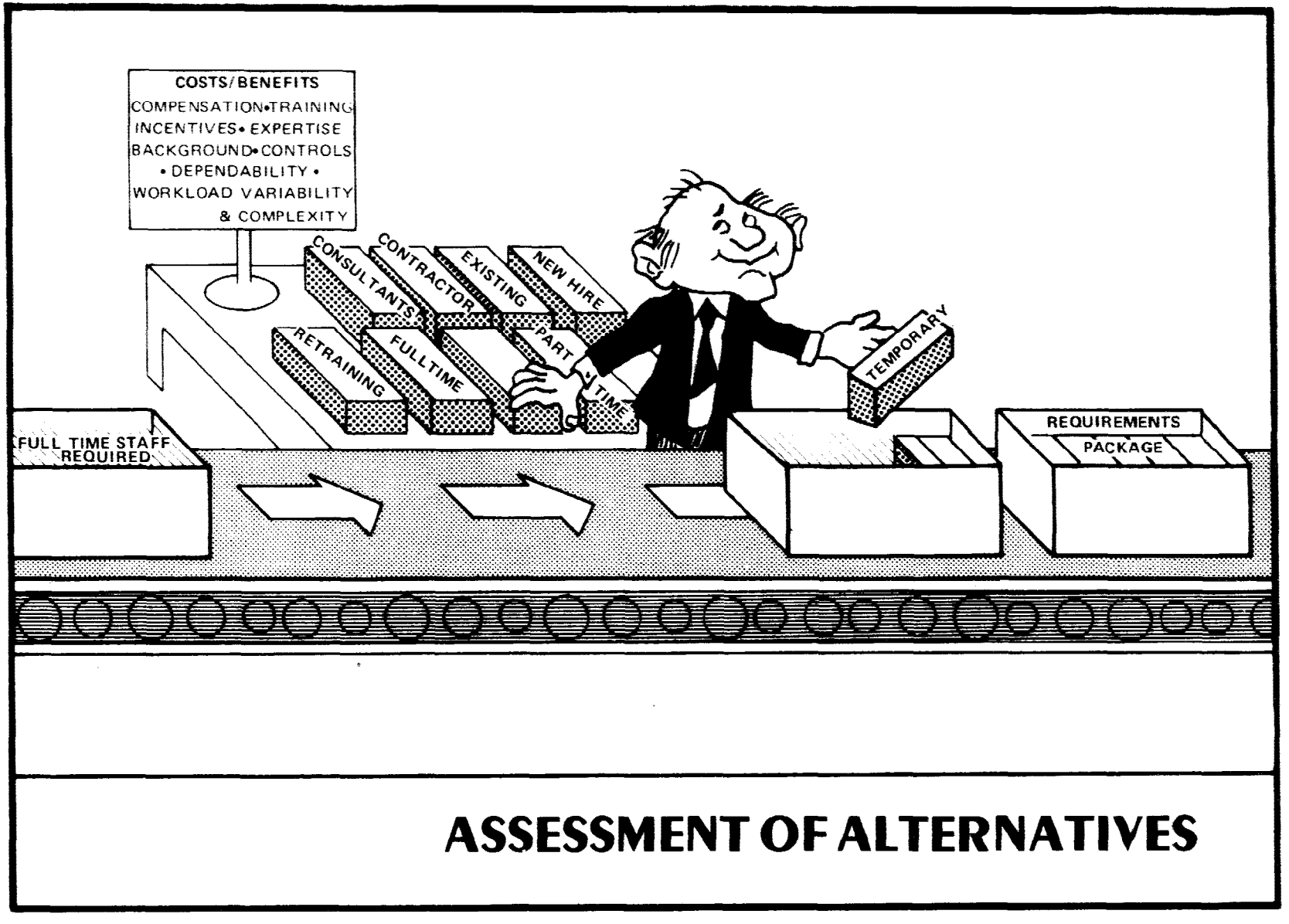
ASSESSMENT OF STAFF ALTERNATIVES

The full-time equivalents should be analyzed so that alternative uses of personnel resources can be assessed. In this way organizations can better decide on the background of personnel needed and whether the work should be performed by existing personnel or by hired full-time, part-time, or contract personnel.

Assessing qualities of staff and output

In analyzing staff requirements, managers should consider the employee qualities needed to accomplish the workload. Problems with morale and productivity may result if the staff is under- or over-qualified. An example would be the variations in skills and background needed for performing legal functions in the government. A legal aide or general investigator doing the work of a criminal investigator or lawyer would probably lower an agency's productivity. If the situation was reversed, morale and productivity would also drop because the employees would lose a sense of accomplishment; also, using a higher graded employee to do lower graded work would increase production costs. Therefore, not only should the appropriate number of workers to meet requirements be determined but the qualities of these workers as well. The description of qualities should include backgrounds, skill levels, and occupational specialties required in each functional area.

In addition, there may be special problems in determining staff requirements for some professional, supervisory, and executive positions where the quality of output is more significant than the quantity of output. The need for output quality in relation to the organization's objectives should be continuously assessed for such staff requirements. Both the quality and quantity of output should be sufficient to result in valid requirements. The high cost of quality output should be compared with the actual contribution to the objectives and with the costs of using qualified consultants on a less than full-time basis. For example, new agencies in highly technical areas may find it less costly for contractors to perform some of their functions because of the high quality and varied levels of expertise required. The need for quality staff in certain skills may not warrant hiring full-time staff with these qualifications.



ASSESSMENT OF ALTERNATIVES

Yet an excessive reliance on contractors for continuing work can greatly limit an organization's staffing options and management control. For example, the use of contractors to develop standards may limit the organization's flexibility to use its own employees to maintain the system.

Assessing workload variability

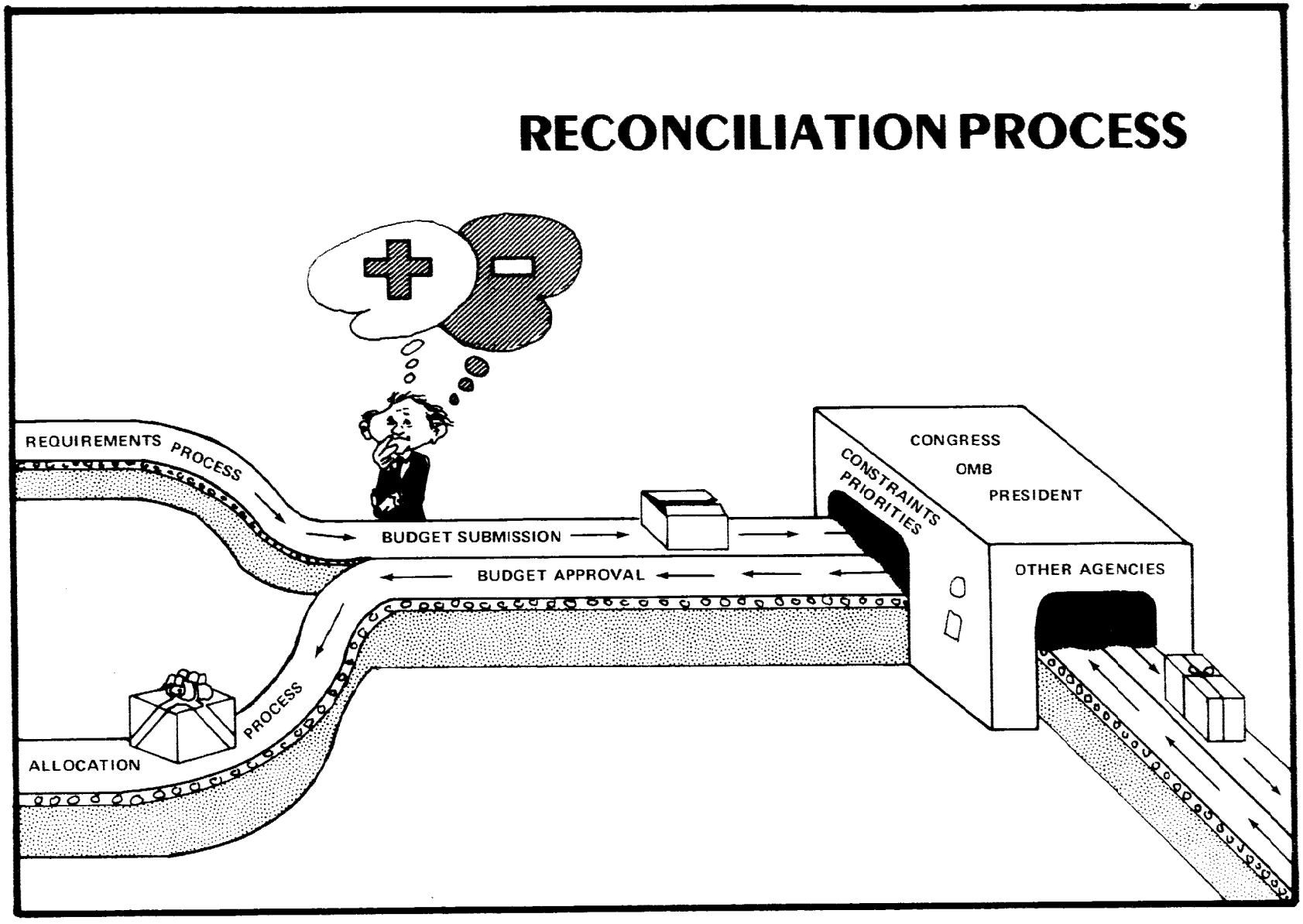
Variable workload may also influence the analysis of requirements for full-time and less than full-time positions. There may be valid requirements during peak periods of work which cannot be met by effective use of personnel. Hiring full-time personnel for the total requirements may result in nonproductive time. An assessment would determine whether it would be more economical to require existing full-time personnel to work overtime or to hire part-time or temporary employees. Several items should be assessed: the costs involved, such as hiring, training, salariesm and benefits under each alternative; learning curves; fatigue patterns; and the amount of supervision and overhead required for alternative use of personnel resources.

Likewise, cyclical workloads can cause significant variations from an organization's normal staff needs. These periodic surges, if not recognized, could mislead managers in stating needs.

REQUIREMENTS SUPPORT THE BUDGET PROCESS

Staff requirements should be tied into the budget justification and allocation process. If the budget requests 100 more employees than had been determined in the requirements process, the manager should be able to trace this difference to specific causes. This task will be easier if the requirements process is integrated with the accounting and budgeting processes and if account structures and classification systems are compatible.

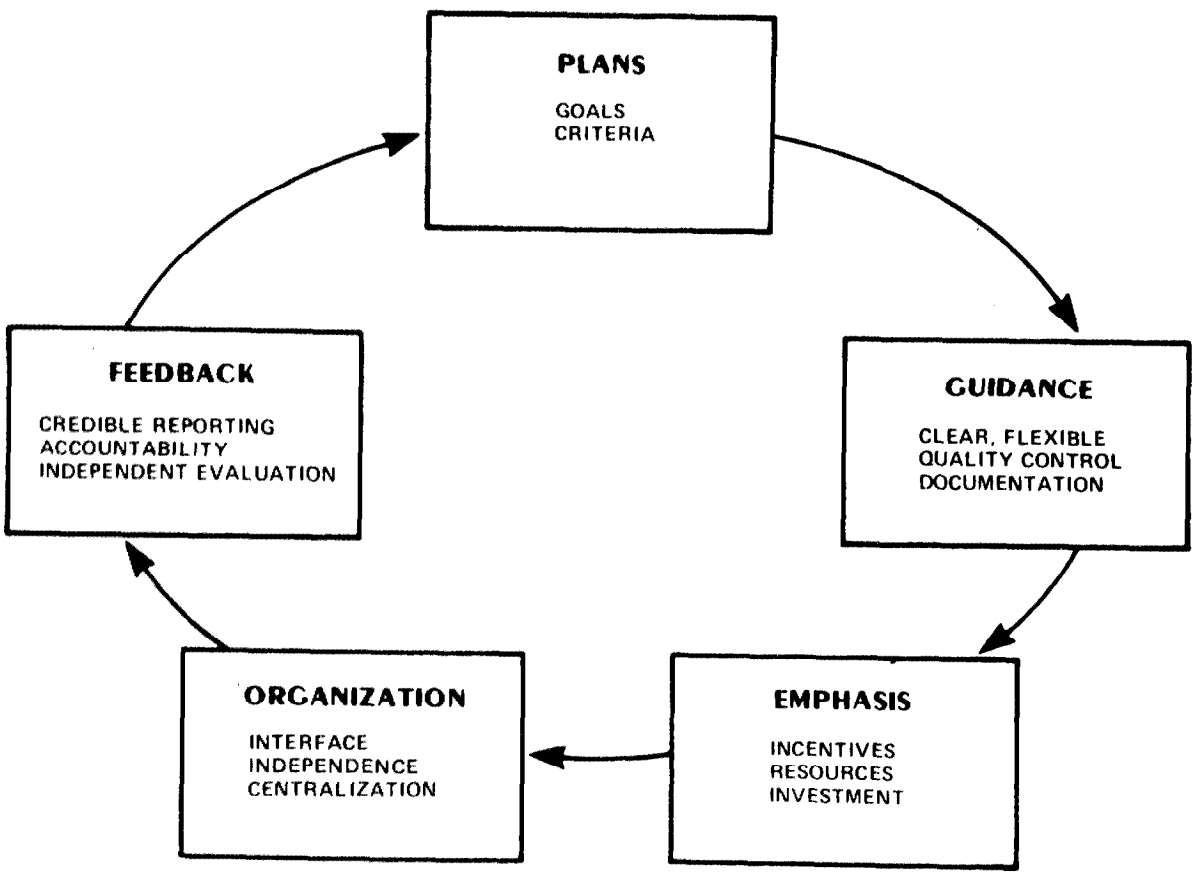
The proper determination of staff requirements will also assist the budget allocation process. The fixed and variable staff needs should be identified separately so that, if the authorized budget is less than the requirements, the resources can be applied first to the functions which have fixed requirements. In addition, if jobs and functions have been put into categories and priorities by objectives, the proper mix of jobs can be determined in the allocation process.


RECONCILIATION PROCESS
REQUIREMENTS PROCESS
BUDGET SUBMISSION
BUDGET APPROVAL
CONGRESS
OMB
PRESIDENT
CONSTRAINTS
PRIORITIES
OTHER AGENCIES
PROCESS
ALLOCATION

CHAPTER 4

MANAGEMENT CONTROLS

Management controls are necessary to insure that the objectives of the requirements process will be met. Forward planning and design, the initial step in a management control effort, has been discussed in chapter 2. In implementing these controls, management must (1) establish plans and procedures for carrying out its policies and (2) assure that an adequate and sufficient staff is available to maintain these controls, to carry out the requirements process efficiently, and to provide feedback on how the requirements process is working.



IMPLEMENTATION PLAN (POLICIES)

As various aspects of the requirements process are implemented, management needs to formulate policies for determining staff requirements effectively and efficiently. Goals should be set to develop, review, and update standards and forecasting procedures periodically. These goals should constitute a plan which shows the milestones for improvements over the present coverage by function. For example, the plan for standards coverage should allow improvements to be made in order of priority. Major emphasis should initially be placed on getting these jobs under provisional standards and then followed by improving methods. Finally, more precise standards should be developed if deemed cost beneficial.

Provisional standards should be based on the most efficient and economical methods. If practical, methods studies to eliminate nonessential or duplicate operations should be done in the early stages of standard development; otherwise, the provisional data should be adjusted to reflect the "should take" time after establishing priorities in conjunction with other standards development activities. Finally, the planner should decide the extent that more precise standards are feasible and practical.

Plans should include the goal of keeping standards and forecasts up to date. Standards need to be adjusted to reflect changes in organizational structure, procedures, methods, equipment, or facilities which have resulted in more efficient operations. Even without major changes, standards should be periodically updated since some productivity improvement is normal in most jobs. Goals for improving workload forecasting techniques should also be part of the overall plan since outdated workload projections can alter requirements significantly.

GUIDELINES AND PROCEDURES

Management should prepare guidelines for those responsible for determining staff requirements. These guidelines should be clear, concise, and applicable to all managers involved in the requirements process. They should reflect goals and objectives of management in all organizations associated with determining requirements.

Explicit procedures, applicable to each organization, should be issued and updated to identify and define appropriate techniques, variables, and convenient sources of data

useful in the requirements process. They should be flexible enough to allow managers to be creative in developing the most effective techniques.

It should be clear that any and all techniques must be considered in the forecasting and standards process. The relative merits of each technique should be assessed for each case. Rigid rules should not restrict the number of techniques. The procedures should merely require a study of costs, benefits, and reliability of a technique that may fit the circumstances.

Provisions for quality control

The procedures should address quality control in terms of reliability and validity of data. The level of quality control desired for the data collection and computations should be well defined in the procedures. For example, procedures for engineered standards should have goals for statistical confidence and reliability. In addition, procedures should be designed to minimize statistical errors and to assure that samples are representative. Explicit procedures should require and govern the review of all data before it is applied.

Sufficient documentation

It is important in developing, reviewing, and updating standards and forecasts, that the basis for judgments be documented and retained so that they may be examined in the course of any future improvement or evaluation process. There are no fixed criteria for the amount of documentation needed. Ideally, it should be the most economical system for documentation and provide the support needed for an adequate review process.

MANAGEMENT EMPHASIS--PERSONNEL RESOURCES

Management emphasis at all organization levels, indicating the importance of using work measurement and forecasting techniques, is a prerequisite for a successful requirements process. Top-level support is vital to develop the process, continue it consistently, and to insure that objectives are met. Sufficient numbers of qualified personnel, including supervisors, should be devoted to forecasting workload and converting it to staff needs. They should have the background and experience to be competent in the various techniques.

High-level quality should be maintained through employees' training and development. If appropriate, management should establish career fields with incentives for employees wishing to include requirements analysis in their professional development. This should reduce staff turnover and redundant training efforts and increase productivity in the requirements process.

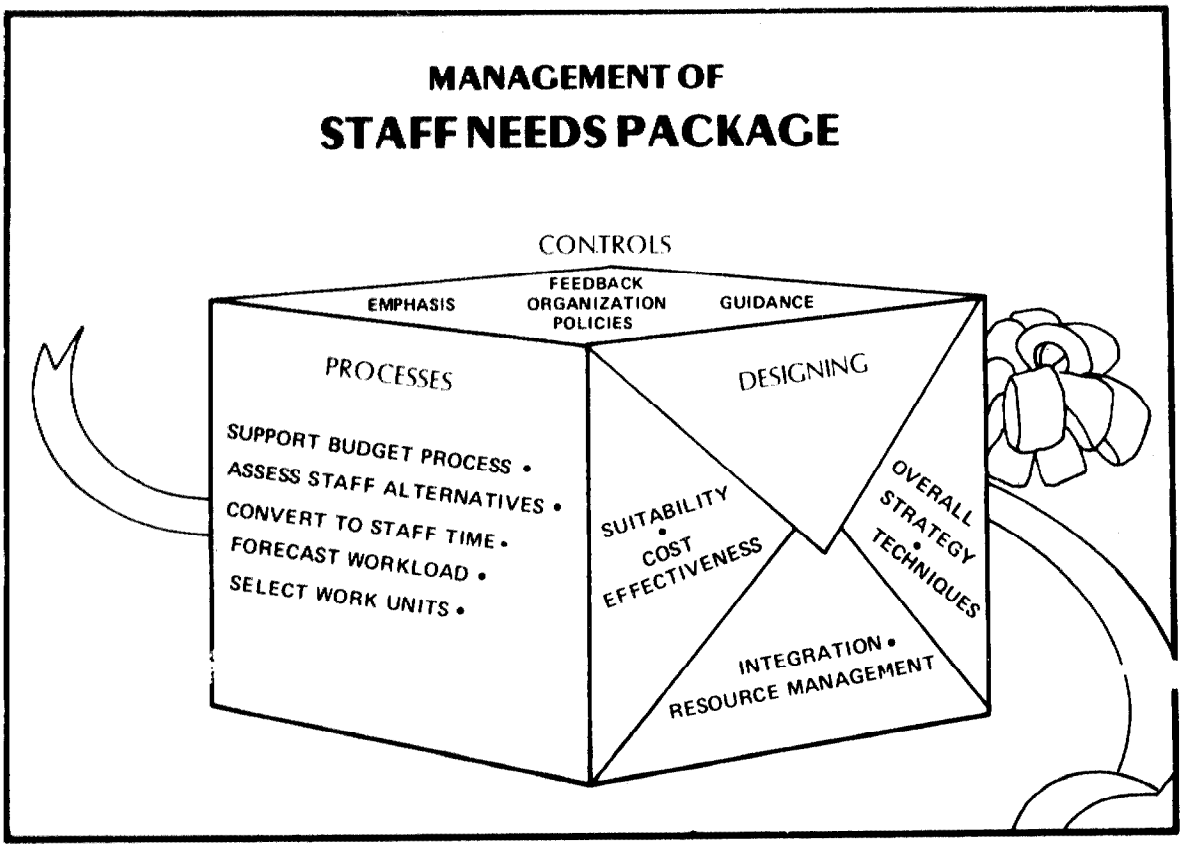
ORGANIZATIONAL PLACEMENT

The organizational placement of the requirements process should insure contact with all levels of management, avoid unnecessary duplication with other groups, and be independent of those with an interest in expanding their own staff. Formalizing the structure into a written format clarifies the relationships of the various functions and provides a framework for future analysis.

An organizational document should clearly state managers' responsibilities for accomplishing objectives and functions for the requirements process. If updated periodically, this document could be used as input for developing criteria for appraising an individual manager's performance.

People who determine staff needs should not also justify resources for the same organization. For example, the work of those responsible for developing standards should not be reviewed by a manager responsible for justifying the staff needs of his or her particular organization or by one who reports directly to budget personnel. If in-house experts are used to provide input to standards, their work should be reviewed by an independent and experienced staff member.

The extent to which the elements of a requirements process should be centralized depends on many factors, including the organization's size and needs. However, with elements of the standards and forecasting staff centrally located, there is a greater potential for management emphasis at the highest levels of the organization. It should also result in more independence and allow policies and procedures to be implemented consistently. Finally, potential savings could be available through the sharing of standardized procedures, where applicable, throughout the organization.



FEEDBACK SYSTEM

Reporting systems will enable decisionmakers to monitor conformance with objectives, policies, plans, and guidelines. Such feedback systems could include periodic reports of certain key information needed by management on an overall or an exception basis. In addition, periodic audits or evaluations should indicate whether the activities supporting the requirements process are accomplishing their objectives.

Credible reporting system

An effective reporting system allows appropriate levels of management to monitor significant deviations from the plan. It helps managers determine the best possible program direction in the future and to identify where work measurement and forecasting have been successful, the reasons for success, and the areas needing greater emphasis.

Costs and benefits should be regularly reported. For example, savings from developing and applying standards and method improvements studies should be reported by lower level managers so that the costs of implementing these techniques can be compared. This information can be used as a basis to appraise the results of individual managers' work against preestablished performance criteria. It can also be collected and analyzed to continue the initial cost-benefit analysis through implementation of the requirements process. Managers selecting the forecasting technique must consider the degree of reliability possible or needed in relation to cost. If the work for the future period is highly uncertain, only a great need for very accurate projections could justify extensive time and effort.

The most expensive standards should normally be used only for work which has many repetitive tasks or where the costs of the standards development can be offset by sharing data and improvements among several operations. An audit trail of information should be established so that a more complete analysis can be made by management and later by independent evaluators. For example, the resources saved from a reduction in one area may be used in another priority area. The audit trail should enable management to compare the effectiveness and efficiency of resources in both areas.

Feedback systems need to monitor only the bare skeleton of the overall plan and policies. Exception reports should be required on key information. For example, standards which have exceeded certain levels of tolerance may be reported under such a system. When actual performance of certain work is outside a specified percent of tolerance, analysts should report the cause to management. It may signal a need to change the standards or to improve an unacceptable level of performance.

If the above reporting systems can be incorporated with an overall automated management information system, the resulting system can gain advantages in timeliness and efficiency which would not be possible in a manual, nonintegrated system.

Independent periodic evaluation

Independent periodic evaluations of the system will enable management to determine whether the manpower requirements process has adequate controls and is achieving its objectives. The evaluations should be performed by an organization which reports directly to upper level management and which conforms to high-quality audit standards.

APPENDIX I

CHECKLIST FOR DETERMINING PERSONNEL REQUIREMENTS

I. Considerations before starting

A. Are identification and measurement techniques considered in the design of the system?

1. Is there an effort to measure the output and related components in terms of human effort?

2. Is this related to a measurement of human effort required to produce the output or provide the service?

B. Has there been adequate forward planning for the system?

1. Have goals and objectives been defined and described?

2. Does the plan clearly state what the system will accomplish?

3. Have resource needs been identified and compared with those available?

4. Have political influences been identified and plans made to deal with them?

5. Has the necessary cooperation with essential system contacts been obtained?

6. Have the potential economic benefits and costs of designing, modifying, and implementing the system been assessed?

7. Will the organization as a whole be capable of grasping and implementing the system?

C. Has the system been designed in coordination with other organizational systems?

1. Was the system designed with the assistance of representatives from organizations which will use or come in contact with the elements of the requirements?

2. Are other reports or systems using related information and procedures?

APPENDIX I

3. Does the system make full use of existing data already reported, collected, or analyzed?

4. Is there a common account structure incorporating elements of all systems?

II. How to determine staff needs

A. Have work units been properly selected?

1. Are work units clearly related to objectives?

2. Are these units then related through levels of programs, functions, and subfunctions?

3. Do the work units contribute to forecasting workload and developing standards?

4. Has the proper level of detail for work units been assessed?

5. Are the work units in each level clearcut (i.e., contain elements which are mutually exclusive and all inclusive)?

6. Are work units clearly and consistently defined?

7. Are work units clearly identified as to source and types of data which need to be collected?

8. Does the point of count for the work output and the effort expended coincide?

9. Are the work units categorized so that the most economical means of collecting data can be utilized?

B. Does the organization have appropriate work forecasting techniques?

1. Are work units suitable for projecting workload at the levels needed?

2. Is the historical data on workload refined through appropriate forecasting techniques?

3. Are separate forecasts made for each aggregation of work units which have different objectives or require different types of skill or effort?

4. Does a comparison of prior and current work forecasts with prior year's accomplishments appear reasonable?

5. Are the forecasts regularly validated and revised as necessary?

C. Is adequate attention given to the conversion of forecasts to requirements?

1. Are work measurement techniques used to develop standards to the maximum extent feasible?

2. Are the most precise and cost-effective techniques used?

3. Are methods improvement studies incorporated to the extent feasible?

4. Are accurate records kept on nonproductive time so that average available time can be determined and used as a factor for converting to full-time staff years required?

D. Is there an assessment of alternative personnel?

1. Do the requirements describe the qualities needed in sufficient detail so that the staff is not over- or under-qualified?

2. Is the cost of high-quality output assessed against the contribution to objectives and the costs of utilizing qualified consultants on a less than full-time basis?

3. Have alternative strategies been developed and analyzed for filling requirements by

--training present employees,

--utilizing overtime, or

--hiring additional part-time or temporary contract personnel.

4. Does the organization utilize other than full-time permanent personnel during period of peak workloads? Is it the most economical alternative? Are cyclical surges recognized?

5. Has the organization considered the cost and benefits as well as learning curves, fatique patterns, and amount of supervision and overhead required for alternative use of personnel resources?

E. Do the requirements support the budget process?

1. Is there adequate support for the budget justification data so that any differences from the requirements can be traced?

2. Are fixed and priority needs separately identified so that the proper mix of jobs can be determined in the allocation process?

III. System of Management Controls

A. Does management review policies pertaining to the requirements process and formulate goals and plans accordingly?

1. Do the plans include current and planned coverage of standards, forecasts, and milestones for improved coverage?

2. Are criteria developed to apply intensive management to jobs which use a lot of resources, and gradual coverage and improvement efforts to other jobs on a priority basis?

3. Is there a proper balance between gross forms of work measurement, methods improvements studies, and more precise standards?

4. Are standards and forecasts updated as institutional changes result in improved efficiencies?

5. Do goals established for more precise standards prevent proper emphasis being placed on methods studies?

B. Does management provide sufficient guidelines on its plans and objectives?

1. Are the guidelines clear, concise, and applicable to all involved in the requirements process?

2. Are the procedures flexible? Are all techniques considered in the forecasting and standards process?

APPENDIX I

3. Are provisions adequate for quality control?

4. Are appropriate procedures designed to prevent statistical errors and assure that samples are accurate and representative?

5. Are there explicit procedures for reviewing data before applying it?

6. Is highly variable data reviewed sufficiently to determine whether there has been a distorting factor?

7. Do the procedures cover the need for documentation?

8. Do the procedures define and identify techniques, variables, and sources for collecting and analyzing information?

C. Has there been sufficient high-level attention given to staffing needs for the requirements process?

1. Have qualifications and standards for required personnel been established and used in recruiting?

2. Do job descriptions reflect the necessary skills and competency required?

3. Have personnel been provided with the necessary training?

4. Do personnel assigned to specific jobs have adequate qualifications for them?

5. Are they qualified by ability, skills, education, and training to accomplish the jobs?

6. Do the essential functions assigned to the requirements process have a sustained level of sufficient personnel assigned to maintain an effective system?

7. Does the overall career management system allow for adequate movement and development in the staff requirements process?

D. Has the organizational framework been assessed?

1. Is there adequate coordination with all levels of management?

2. Is there unnecessary duplication with other organizations?

3. Does the organizational structure clearly indicate functions performed, personnel qualifications needed, levels of responsibility, and interrelationships of the various groups involved?

4. Is there a clear statement of managers' responsibilities for accomplishing objectives and functions within the requirements process? Can it be used as input for developing criteria for appraising individual managers' performance?

5. Are key personnel who justify resources for the overall organization sufficiently independent from individuals who have a major role in determining staff needs? Do they report to a high enough level?

6. Are the individuals, who are selected to develop work standards, independent from the organizational elements to which the standards apply?

7. Is the input of in-house technical expertise reviewed with objective standards before being incorporated into the process?

8. Is the centralized staff sufficient to provide consistent guidance and monitor the process' implementation?

E. Does management maintain an adequate feedback system to monitor the requirements?

1. Is there an effective reporting system to enable management to monitor the process of its plans?

2. Is the information reported consistent, accurate, and meaningful to management?

3. Is the information reported and used to hold managers accountable and to appraise their performance?

4. Is cost effective analysis continued in the reporting process?

5. Are savings resulting from standards and methods improvements compared against the cost involved and goals established?

APPENDIX I

6. Are the most expensive standards only used for work which has a high volume of repetitive tasks or which can be shared with other work units?

7. Is there a management by exception reporting process?

8. Does the system flag potentially outdated or invalid standards for review?

9. Does management regularly monitor the process through its feedback mechanism and make adjustments as necessary?

10. Is the requirements process subject to review by an independent audit group?

APPENDIX II

FORECASTING TECHNIQUES (note a)

Forecasting techniques can be classified into a limited number of groups. However, within each group a wide variety of mathematical methods may be employed. By classifying the techniques in the manner shown, the different patterns of logic have been separated. The five groups are:

1. Simple extrapolations of raw historical data.

2. Simple extrapolations of smoothed historical data.

3. Historical data extrapolated with the aid of various theories of growth or change (and expert advice).

4. Historical data extrapolated with qualitative reasoning.

5. Actuarial (statistical) analysis.

Simple extrapolation of historical data

Historical data may be plotted on graph paper and the trend manually extrapolated. The same effect may be achieved by mathematical computation. The basic assumption is that past trends will continue unchanged.

Simple extrapolations of smoothed historical data

Historical data frequently shows random variations from period to period, making it difficult to readily perceive trends. This is particularly noticeable when the data points are obtained for short intervals of time. Various graphic smoothing techniques may be applied to plotted data. Mathematical techniques may be applied to achieve the same result.

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a/This summary of forecasting techniques was developed by Marvin E. Mundel in his book, "Measuring and Enhancing the Productivity of Service and Government Organizations." Other concepts from his books have contributed to the handbook guidelines.

Historical data extrapolated with the aid of various theories of growth or change

In some cases it is possible to speculate meaningfully about the rate of growth of a workload. For instance, if a new service is provided, little historical data may be available. However, it may have been suggested to the forecasters that the following growth reasoning may be applied:

1. The level or demand is Y.

2. The time interval to reach demand Y is X.

3. A typical growth curve will be followed.

Historical data extrapolated with qualitative reasoning

This method, to some extent, is an adjunct to the previous method. It refers to the use of a reasoning process resulting in the introduction of new assumptions. This method might come into play, for instance, with a forecast of counterfeit coin cases as a period of inflation approaches. The logic might be as follows:

1. We have a clear-cut trend, using historical data, with respect to the number of coin currency counterfeiting cases.

2. It was, in the past, profitable to counterfeit coins (provided you were stupid enough to ignore the risk of arrest and imprisonment).

3. However, with inflation, the profit margin in counterfeiting has shrunk.

Qualitative conclusion from above:

A change will take place with respect to workload growth. The growth theories which were used to date, and which may have been valid, no longer hold. We must adduce a new theory with respect to the growth (or decline) of workload, as a function of time, which starts with our last data point, but which ignores previous trends.

APPENDIX II

Actuarial (statistical) analysis

Actuarial (statistical) analysis refers to a systematic examination of historical data as a function of assignable causes, using mathematical and statistical approaches. The objective is to determine those factors that causally affect workload, determine their weight and effect, and obtain a prediction more closely based on causes than on simple or modified extrapolations.

For instance, on a highway, "accidents which need assistance" may be postulated to be a function of such factors as:

1. Car miles per year, daylight
2. Car miles per year, dark--premidnight
3. Car miles per year, dark--midnight to dawn
4. Number of 30° curves
5. Number of 45° curves, etc.
6. Number of inclines
7. Number of turns per mile, and so forth

From such data, and historical data concerning accidents, a workload forecast of "accidents requiring assistance" could be made as a function of a number of these variables.

In most cases, such actuarial (statistical) forecasts are more accurate than simple or growth theory aided extrapolations but, as with most forecasts, the assumption that previous trends will continue is still implicit. The improvement, using actuarial methods, is the departure from the single cause theory implicit in simple extrapolation.

WORK MEASUREMENT TECHNIQUES (note a)

The following are the principal techniques by which work measurement standards are developed:

--Technical estimates.

--Historical estimates (statistical).

--Staffing pattern.

--Work sampling.

--Predetermined time systems.

--Standard data.

Engineered standards are developed using time study, work sampling, standard data, and predetermined time systems. Engineered standards are the "should take" time to perform a task or operation. They should be developed by specially trained analysts and include documentation of the:

--Method or procedure used when the standard was developed.

--Observed or synthesized time values used in determining the final standard time.

--Computations used to establish statistical reliability.

--Rating or leveling observed during performance.

--Allowances used in computation of standard.

--Computations made in developing standard.

Nonengineered standards are developed using any of the techniques listed. Historical estimates (statistical) and technical estimates are most commonly used.

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a/This description of work measurement techniques has been extracted from special report #3 expanding the report, "Measuring and Enhancing Productivity in the Federal Government." Other concepts in this handbook have also been drawn from that source, which was conducted as a joint project by GAO, the Office of Personnel Management, and the Office of Management and Budget.

APPENDIX III

A. Work measurement techniques and their application

Techniques	Types of operations	Examples of operations
Technical estimate	a. Highly technical or irregular work	Maintenance, rebuild, repair of complex items
	b. Scheduling and controlling projects for priority, status, evaluation and costing	Technical, engineering, and research projects
Historical estimates (statistical)	a. Irregular work where a work unit may be determined	Administrative, non-direct labor, warehousing
Staffing pattern	a. Highly irregular work for which no work unit may be determined	Administrative, support activities
Work sampling	a. Irregular work where a work unit is highly correlated to work input	Clerical, rebuild, repair, warehousing, facility maintenance, non-direct labor
	b. Development of management information. (NOTE: not used to establish work measment standards)	Determination of delays, utilization of people and equipment, work distribution, feasibility studies performance checks
Direct time study	a. Repetitive, short cycle work performed at essentially one work station	Parts assembly, machining, packaging, typing, filing, editing, packing
	b. Irregular, medium to long cycle work, frequently performed by moving about several work stations	Janitorial, clerical, rebuild, repair, warehousing

APPENDIX III

Techniques	Types of operations	Examples of operations
Predetermined time standards or basic standard data	a. Repetitive short cycle work where volume is high	Assembly, machining, packaging, packing, shipping, stock picking, editing
	b. Check as to consistency of direct time study standards	Assembly, machining, machine operations
Standard data	a. Repetitive short and medium cycle work where volume is high	Assembly, machining, packaging, typing, filing, editing
	b. Repetitive work where volume is low, or long irregular cycle work where work volume is high	Assembly, machining, packaging, rebuild, repair, maintenance, clerical, warehousing

APPENDIX III

B. Work Measurement Technique Descriptions

TECHNICAL ESTIMATES

Description

Breaking the job down into elements and having a technically trained person make a technical estimate of how long each of the job elements should take.

What is required?

A person technically qualified to recognize the various phases of the work to be accomplished.

What must be done?

Job broken down into phases and time estimated for each phase. Experience and/or past performance data will form the basis for the time estimates.

How long will it take?

From minutes to days depending upon the complexity of the job.

What are the characteristics?

This type of standard is based upon the personnel judgment of the person making the estimate. His technical estimate of how long it should take to do the job may vary greatly from how long it actually takes to do the job. Thus, it is difficult to accurately assign a cause to deviations from standard.

Advantages

1. May be only technique available to establish time limits on certain types of jobs (technical projects, research projects, etc.).

2. Relatively cheap (in relationship to time).

Disadvantages

1. Time to do the job is an estimate; thus, worker's actual time may show wide variance (poor control device).

2. No way of knowing what methods are used to do the job.

APPENDIX III

HISTORICAL ESTIMATES (STATISTICAL)

Description

Data obtained from records of past performance relating labor time expenditures with some measure of the amount of work produced. (The data may be analyzed by statistical means.)

What is required?

Data on past performance of individual jobs, producing like product, expressed in

1. staff-hours expended, and
2. units produced.

What must be done?

A relationship between units of product and staff-hours expended must be found and statistically validated.

How long will it take?

From days to weeks to months, depending upon the amount of data required or available.

What are the characteristics?

This type of standard is based upon the assumption that what has happened in the past is good practice and that what will happen in the future will not alter the relationship between units of product and staff-hours expended. As a result, it is difficult to identify a significant deviation from standard and more difficult to accurately assign a cause.

Advantages

1. Sometimes, this is the only technique available for extensive coverage in a hurry.

Disadvantages

1. Accepts past performance as satisfactory (poor control device).
2. No way of knowing if past and present methods are the same.

STAFFING PATTERN

Description

A ratio of the number of personnel required to the number of personnel supported or to the number of units of output.

NOTE: A staffing ratio is not always classified as a work measurement standard. It is considered to be a work measurement standard only when it is related to a measure of output. If it is merely an expression of a percent of direct labor or budget dollar or one clerk per ten professionals, it is not considered to be a work measurement standard because there is no unit of output. It may be developed using an engineered or nonengineered technique.

What is required?

A person with a semi-broad management background technically qualified to recognize the various phases of the work to be accomplished. person must have appreciation of management process so as to be able to determine various relationships and effects of support and supported functions.

What must be done?

Job broken down into major functional areas and identified as support or supported functions. Relationships, direct and nondirect, among areas must be identified. Comparisons should be made to similar functional areas and relationships which seem from judgment to be working in a satisfactory manner.

How long will it take?

From minutes to days, depending upon the complexity of the job.

What are the characteristics?

This type of standard is based upon the personnel background and judgment of the person(s) making the estimate. His estimate of situation depends greatly upon his ability to infer and draw analogies and conclusions based upon other existing similar situations. Difficult to determine cause of deviations from those anticipated. Cannot tell whether poor performance or poor conditions or incorrect original determination.

APPENDIX III

Advantages

1. May be only technique available to establish staffing requirements.

2. Relatively quick and cheap.

Disadvantages

1. Accepts past relationship as being sound.

2. No real way of knowing validity.

APPENDIX III

WORK SAMPLING

Description

A sampling type study wherein an observer at random intervals observes and determines categories of productive and nonproductive effort of the activity being observed.

What is required?

An opportunity for an observer to note which categories of work or nonwork the operator or operators are engaged in at the random times he makes his observations.

What must be done?

The job must be broken down into categories of work and nonwork and these categories described; at random intervals the activity must be observed and the observations classified into the proper categories with sufficient observations taken to get a reliable sample; the performance of the operator or operators is compared to the concept of normal, and allowances are made for personal and unavoidable delays. During the period the job is being observed, a production count must be obtained (unit of measure) and the total time of the study must be recorded. With the above information, the allowed time for the various units of production can be determined.

How long will it take?

From one week to several months, based upon the number of different types of work and nonwork being observed (complexity of the activities being observed).

What are the characteristics?

This type of standard will give substantially the same results as time study standards where there is a clear distinction between working time and idle time. In establish ing a work sampling standard, the observers must be alert for slight methods changes on the part of the operators. This type of study does not allow as fine a breakdown of activities and delays as time study. The job content and the standard time are specified in general terms. Because job conditions (such as method, quality, and operator performance) are standardized, it is relatively easy to identify a deviation from standard and to assign a cause for the deviation.

APPENDIX III

Advantages

1. Can be used to measure activities which are impractical or costly to measure by other means.

2. Requires less time (can study several operators or machines at once).

3. Generally less costly than time study.

Disadvantages

1. Not generally economical for studying a single operator.

2. Methods Control may not be as precise at Time Study.

3. Operator may change work pattern without being observed.

APPENDIX III

TIME STUDY

Description

A study (by stopwatch or motion picture camera) and analysis of an actual job performance followed by a synthesis of the data obtained into a standard time for doing the job.

What is required?

An opportunity for a trained observer to time an individual job actually being performed by a definite method (preferably the improved and standardized method).

What must be done?

The job method must be completely described, the cycle or elemental times must be obtained by use of stopwatch or motion picture camera, the performance of the operator or operators compared to concept of normal, and allowances made for personal and unavoidable delays. With the above information, the allowed time for the various units of production can be determined.

How long will it take?

From 2 to 3 hours (or even minutes) for simple, short-cycle jobs to days or weeks for complex, long-cycle jobs.

What are the characteristics?

This type of standard is generally considered a valid and reliable basis for establishing time standards. The job content and the standard time are specifically defined. Because the method, quality, working conditions, and operator performance are standardized (highly), it is easy to identify a deviation from standard and to assign a cause for the deviation.

Advantages

1. Detailed methods description (good for control purposes).
2. Relatively accurate work measurement technique.
3. Obtain actual time values for jobs being observed.

APPENDIX III

Disadvantages

1. Each job must be observed and the performance pace rated.

2. Not economically applicable to all jobs.

APPENDIX III

PREDETERMINED TIME SYSTEMS

Description

Proprietary times systems using time data for the basic motion that is synthesized into a standard time for a job. Includes Methods Time Measurement (MTM) and General Purpose Data (GPD).

What is required?

Dimensioned sketch of workplace layout and product along with information about other features of the job. Requires that the person applying the predetermined time system be completely familiar with the system and able to identify the basic motions pertinent to the job being studied.

What must be done?

The method for performing the job must first be described in terms of elements, then the elements broken down into basic motions pertinent to the particular predetermined time system, time values for the various basic motions chosen from tables, and allowances made for personal and unavoidable delays. With the above information, the allowed time for the various units of production can be determined.

How long will it take?

From 2 to 3 hours, or even minutes, for simple, short-cycle jobs to days for complex, long-cycle jobs.

What are the characteristics?

This type of standard is as valid and reliable as time study for setting time standards. Where predetermined time system time values are used to set standards on all the activities, the various standard times will be more consistent for all the standards. Good work measurement technique used to establish standard time on manual jobs before the jobs are begun. Can be used for control purposes where all or most of the activities are covered by similar type standards.

Advantages

1. More consistency between time values.
2. Eliminates performance rating by analyst.

APPENDIX III

3. Can be used to compare methods (provided there is no machine time).

4. Can set standard time for job prior to performing the job.

5. Provides a sound basis for engineered standard data.

Disadvantages

1. Judgment is required to identify basic motions.

2. Not (always) applicable to process controlled, machine controlled, and long or irregular cycle jobs.

3. Detailed type of analysis--costly.

APPENDIX III

STANDARD DATA

Description

Time data at the element level (may have been obtained from previous time studies) which is synthesized into a standard time for a job.

What is required?

Time values in the form of tables, curves, charts or formulae for units of work (elements) small enough to permit determining the step-by-step time required by any method involving these job elements. A person technically qualified to break the job down into its various elements and able to apply the correct time values to those job steps.

What must be done?

--To develop standard data

The data must be obtained by either time study, use of predetermined time system, work sampling, or possibly historical data. Preferably the elemental time values should be obtained by observing the element being performed in several different jobs. The data may be arranged in tables, curves, nomographs, alignment charts, multi-variable charts, and formulae for rapid and economical use.

--To establish work measurement standard

The method for performing the job must be broken down into elements, time values for the various elements selected from tables, curves, charts, or formulae, and allowances made for personal and unavoidable delays. With the above information, the allowed time for the various units of output can be determined.

How long will it take?

--To develop standard data

From weeks to months depending upon the amount of data necessary to set up the elemental standard data system.

--To establish work measurement standards

Minutes to hours to determine time values for jobs, depending upon the complexity of the job.

APPENDIX III

What are the characteristics?

This technique is generally considered to be a valid and reliable basis for establishing standards. However, when all activities are covered by elemental standard data, the various standard times will be more consistent for all the standards. A very good work measurement technique to use to establish standard time on jobs before the jobs are begun. Because job conditions are standardized, it is easy to identify a deviation from standard and to assign a cause for the deviation.

Advantages

1. More consistency between time values.
2. Can be used to compare methods.
3. Can set standard time for job prior to performing the job.
4. Inexpensive method to establish standard, once standard data has been developed.

Disadvantages

1. Requires time to build up standard data.
2. Costly to build up standard data.

RELATED GAO REPORTS

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Navy Aircraft Overhaul Depots Could Be More Productive (LCD-75-432, Dec. 28, 1975)

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Improvements Needed in Defense's Efforts to Use Work Measurement (LCD-76-401, Aug. 31, 1976)

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Continuous Management Attention Needed for Army to Improve Combat Unit Personnel Requirements (FPCD-78-61, Sept. 5, 1978)

APPENDIX IV

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