IBM Data Processing Techniques

IBM Study Organization Plan

The Method Phase I

This manual discusses how to conduct the first phase of a system study, "Understanding the Present Business". It covers techniques for gathering data, and organizing it into a report entitled "Present Business Description". The reclassification of the existing business applications into goal-directed activities for study and analysis is explained and several approaches and examples are included.

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CHAPTER 1 - UNDERSTANDING THE PRESENT BUSINESS

This manual is a working guide for conducting business systems studies through the initial phase of the Study Organization Plan, understanding the present business.

LIFE SPAN OF A BUSINESS SYSTEM

The life cycle of a business system is divided into three stages: study and design, implementation, and operation. In the first stage, a new system is designed after studying the present system; in the second stage, the new system is installed; and in the final stage, the new system is placed in routine operation. Since technology of business management is continually being improved and updated, after some years of operation this cycle is repeated once more.

The Study Organization Plan is directed at the critical first stage. In this study and design stage, three phases are recognized: understand the present business, determine systems requirements, and design and communicate a new system.

SOP MANUALS

Five manuals describe the Study Organization Plan through its three phases: The Approach (IBM Special Edition Manual F20-8135), The Method I (F20-8136), II (F20-8137), and III (F20-8138), and Documentation Techniques (IBM Reference Manual C20-8075). The Approach manual introduces and explains SOP; Documentation Techniques describes the reporting forms of SOP and techniques for using them. The Approach and Documentation Techniques are needed to supplement the Method manuals in the conduct of a systems study.

PHASE I OBJECTIVES

In studying the business as it presently exists, a study team (one or more people responsible for the study who will be variously referred to as analysts, systems planners, or the study team) compiles select and useful data on the present business to support analysis of systems requirements and formulation of a unique systems design.

This data is organized into a report called the "Present Business Description". Initially, the business is described in broad, general terms; then it is described by activity classifications assigned by the study team. Under this latter approach, a business is viewed according to the activities or groups of operations which are necessary to carry out one or more specific goals of the business. This idea of looking at a business from more than one plane is much like the perspective an engineer employs in preparing a drawing for a complex casting. Side and end views are not sufficient; various cross sections are also required.

The Phase I report provides valuable insights into current operations, and establishes a firm base for further analysis by the study team. This report is more than a description of an enterprise. As a study team becomes acquainted with customs, practices, personnel, and operations of a business, it will discover areas of strength and weakness and develop an awareness of trouble spots and problems. Among other tasks, specific business goals are defined, and a suitable group of activities formulated; operations and functions are recorded; and evidence is acquired on areas with high affectable costs, those which are sensitive to reduction by introducing system changes.

VARIABILITY OF SOP APPLICATION

The Study Organization Plan is an instrument of variable magnifying power. Within its overall framework, it is possible to look briefly at a business, determine general goals and operating methods, sketch structure, and arrive at a picture of operations. On the other hand, it is possible to probe in great depth to produce an extremely detailed report of structure and operating dynamics. Which of these extremes, or which of the various in-between levels a study requires, can be determined only in terms of study purpose, team size, time allowed, and size and complexity of the business.

In performing a systems study, time is critical. Practically all studies are initiated to proceed through the full three-phase cycle. The latter two phases are particularly difficult to compress in time, so Phase I should be completed quickly, but adequately.

A Phase I study can be undertaken at several levels, to support various purposes. Management's aim may be to create an entirely new system, to substantially improve the function of an existing system, or to mechanize all or part of a system (mechanization changes the physical means for doing a job, but does not basically alter the procedure for performing it). Approach and methodology vary for each of these purposes. For example, detailed operational data is important to a mechanization study, since this is the information which will be used directly in writing procedures for the conversion. In a major systems design, however, general and structural data are of greater significance, because considerably more insight into the business is required to perform subsequent phases of analysis and design.

Three levels of language can be used to describe a business system: overview, systems view, and detail view. All of them are applicable at various times in studies for complete reconstruction, for improvement, or for mechanization. The language level is determined by the particular requirements of the study.

An overview provides broad understanding for the complete creative reconstruction of a business. This broad view of a large business discloses critical areas where the most dollars are being spent, or where the most profit is being made. In an advertising agency, for example, a preliminary overview might disclose that of four activities — films, technical literature, space advertising, industrial promotions — space advertising alone may be responsible for 80 percent of agency income. If profit figures for the other three are not out of line with capital investment and costs, space advertising becomes the important area for further study.

In addition, a preliminary overview may disclose parallel operations which have much in common, and therefore a study of one operation would be representative of the whole. In one distribution business, for example, there were 31 warehousing sites; three of these had limited assembly functions, while the other 28 simply stocked products. Of the 28, 20 carried a single product line; the other eight were multiple-line warehouses supplying major population centers. Studying one or two single-line warehouses, one multiple-line warehouse, and one limited assembly function produced an accurate and complete picture of the entire business.

Successively more depth of detail is represented by systems and detail views, respectively. Most studies require occasional "buttonhooking" down into these levels for operations that must be described more fully. The computer program in a mechanization study is an example of description at the detail view.

REPORT STRUCTURE

The method of preparing individual sections of the Present Business Description is discussed in following chapters. The general organization of the report is shown graphically in Figure 1 (layout and content of individual sections can vary considerably from business to business).

There are three major sections to the report: General, Structural, and Operational. The body of the report is preceded by an Introduction; an Appendix is added for important support documents.

The General Section contains a history of the enterprise, a statement of goals and policies, and an assessment of its position in relation to the competition. The Structural Section describes the inputs, outputs, and resources of the business. The Operational Section details the operating dynamics of an enterprise with emphasis on the flow of events, time cycles, and costs. It is in this final section that the business is first considered in terms of activities.

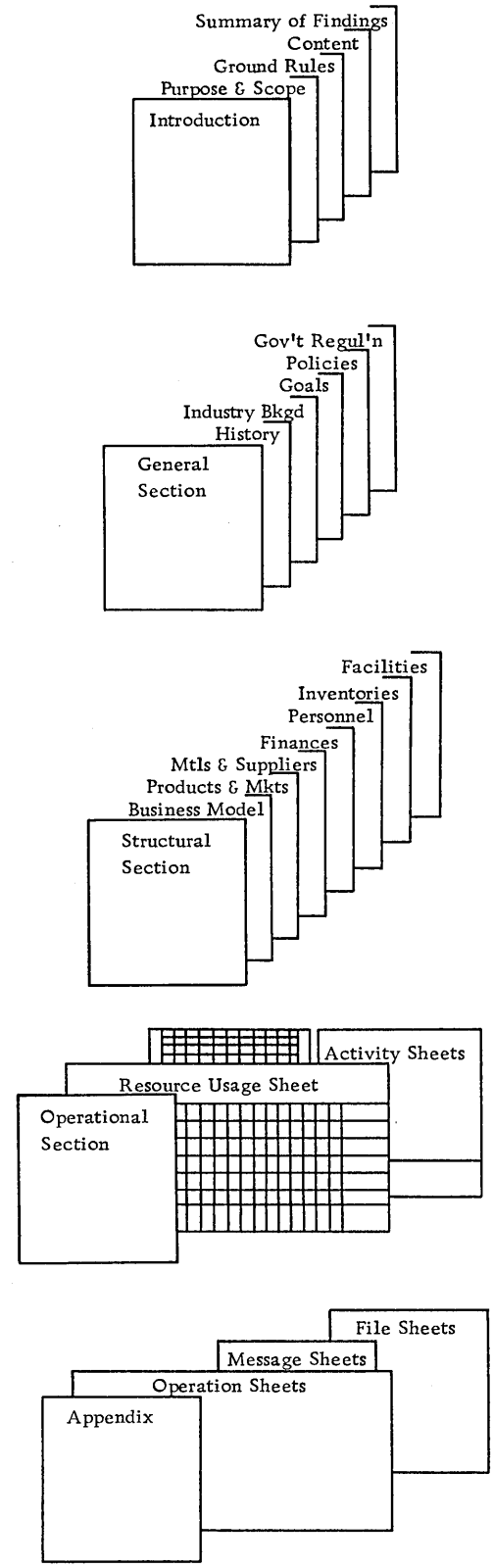

Figure 1.

STUDY PLAN

To conduct a Phase I study efficiently and in a minimum of time, a careful plan of action is required. Study scope, team composition, time schedules, and task assignments are planned in detail. This is an obvious requirement of any well administered study; however, no plan can envisage all the problems to be encountered, or the precise length of time each task will take. For example, in one recent study several product lines were to be examined as separate units. Although this seemed relatively straightforward an assignment, examination of the files revealed records were maintained by functional responsibility (engineering, manufacturing, accounting, etc.) and there was no continuity or classification for different product lines as they were processed through the business. Much unplanned-for time was spent analyzing files in each function to produce a complete product line analysis.

Even though a valid plan has been prepared prior to starting the study, experience has shown that it should be reviewed frequently, and modified to include recent events and changes in thinking. The initial plan, while subject to periodic adjustment, should have been good enough in the first place that total planned times and due dates are not severely affected by later events.

CHAPTER 2 - GATHERING INFORMATION

Data is gathered for a Phase I report by:

- Searching Records (internal and external)
- Interviewing Personnel
- Sampling and Estimating

All three are used at various points in the study. Record searches predominate in enterprises with well organized file systems, while interviews are emphasized where the record system is less satisfactory. In addition, interviews are valuable to verify and refine derived data and observations.

To develop a data gathering plan, an analyst must first organize his own file system. One means of collecting General and Structural information in an orderly fashion is a binder with dividers for each major subject in the report. This has the advantage of visually demonstrating the degree of documentation for each topic as data is collected. Later, when the report is written, the analyst reorganizes the compiled data from his binder (and others, if the study is a large, decentralized one), and prepares a coherent narrative or series of exhibits to summarize findings.

SEARCHING RECORDS

Business information exists in many places, some external to the enterprise, others internal. In most cases, the analyst seeks out data from a wide variety of sources, then verifies his results with personnel who are closely acquainted with the subject matter.

Internal Sources - General and Structural Data

During early planning sessions with management, a study team secures a list of sources for material relating to the General and Structural Sections. If a large number of references are available, the problem is usually one of condensing pertinent facts.

Where the data has not been published or organized, a number of problems arise. To reconstruct information from files is time-consuming; in many companies, files are constantly in use, in poor condition, or maintained in classifications not useful to the study. The Marketing function files orders by customer order number; Engineering uses drawing numbers; Manufacturing keeps data by shop order, etc. Files may be dispersed and decentralized in large companies, and noncurrent information stored at some remote location, or consigned to a musty vault. When this happens, the analyst makes a preliminary list of requirements and requests clarification on how the data can best be obtained. A rather complete knowledge of files and records will be necessary in an extensive study; the sooner an analyst becomes acquainted with them, the easier his task will be.

External Sources - General and Structural Data

External data can be formal or informal. Trade publications, government statistics, and credit associations are formal sources, and their information is fairly standardized and objective. Brokerage reports are often quite revealing in their appraisals of a company. Informal sources, such as customers of a bank or policyholders of an insurance company, or the audience of a TV network, may be somewhat less objective while still offering critical and useful evaluations. Vendors and suppliers to manufacturing concerns are also in this category.

INTERVIEWS

The interview is perhaps the most fruitful, and also the most unpredictable form of securing information an analyst has available to him. It is valuable when he has the person's trust and confidence; it is unproductive when he has anything less. Many analysts using SOP as a guide have found that more data was gathered by interview (for Phase I, at least) than by any other single method.

Interviews start with the top levels of management, as a study is being planned. Middle- and first-line management will be the main sources of information during the study, along with professional specialists. Later, individual clerical and factory workers will be interviewed concerning their particular job assignments.

The confidence of persons being interviewed must be earned, not presumed. As anyone knows who has tried to introduce elementary changes resulting from a work simplification project, people can be suspicious and distrustful if there is even a vague threat (imagined or otherwise) to their job security. With this in mind, the analyst should make the initial interviews informal and concentrate on establishing a mutual working relationship. In the process of gathering data, an analyst conscientiously avoids any connotation of making a stop-watch study, or of appearing to be an efficiency expert. He must encourage the feeling that he has been "accepted" and is no longer a "rank outsider", while at the same time not getting involved in day-to-day problems. This would apply whether the analyst is making the study for his own company, or for an outside firm.

The presence of a thoroughly planned schedule will help to hold down a constant repetition of interviews, although analysts often find a few

individuals who are quite knowledgeable about a business and tend to lean more heavily on them. A balance among the personnel contacted prevents bias creeping into the information and spreads the interview load more evenly. As interviews are carried out, careful consideration is given to length of time for each session, frequency of repeats, and individual productiveness of each interview. There is no fixed rule for this: the person being interviewed is the best lead to what is appropriate for length and frequency of interview.

Interviews may be used at any point in a systems study, as the schematic representation of one study shows in Figure 2. Data gathering for the General and Structural Sections is mainly a problem of collecting information, with a nominal number of interviews injected to identify specific goals of the business, potential problem areas, and areas of high affectable costs.

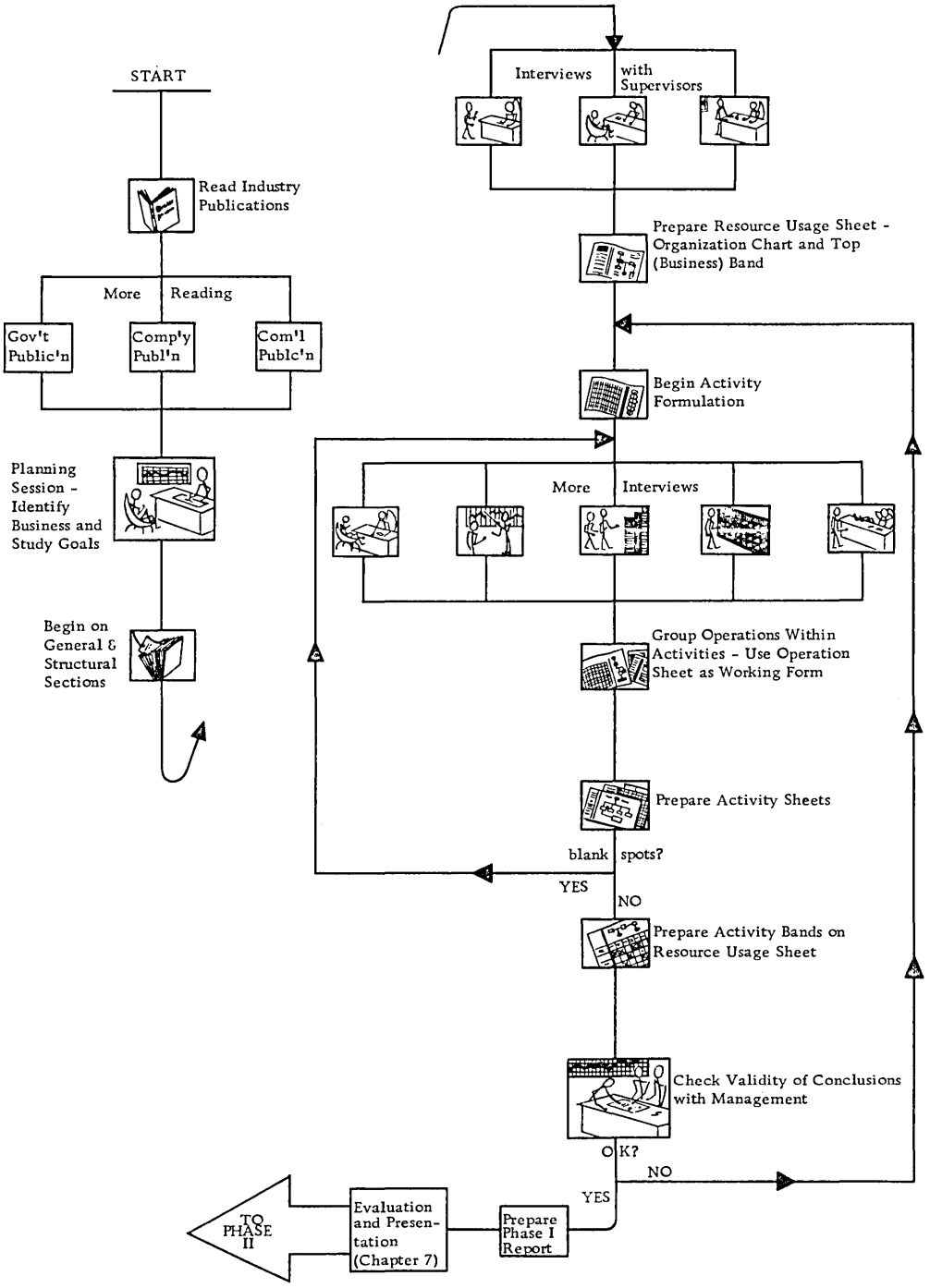

Figure 2. One typical procedure for collecting data and preparing a Phase I Report.

When operational data is being gathered, however, the analyst has to be much more introspective and interpretive, since he is now formulating activities to agree with what he has learned about the business. Much of the time he has no precedent to rely on, and replies to his questions reflect assumptions, estimates, and judgments. This requires resourcefulness on the part of the analyst to ensure that activity costs, time cycles, and flow of events are in the right ball park. One of his most important tasks, therefore, is to separate fact from opinion early in the study.

ESTIMATING AND SAMPLING

On occasion, file searches and interviews are less than adequate data gathering methods. This is particularly true in a business which is new and growing, where little management time or effort has yet been spent on such things as time standards, long-range budgets, planning records, or material costs. It also holds for the established business where more attention is paid to gross dollar budgets than to cost breakdowns of individual operations. In a recent case, a TELE-PROCESSING® system was being considered by a company, but there were no records of volume and frequency data upon which to base analysis of requirements.

Estimating

Estimating is an accepted method of developing data, but all estimates should be checked to control totals or verified by interview. If, for example, three activities (and no others) cut across a single department, activity costs in that department should roughly equal the overall department budget. However, if only one activity is to be studied, a realistic checkpoint outside the analyst's and supervisor's estimate should be developed.

Estimating data is a valid and acceptable procedure in systems work, and will save time as long as recognized checks and balances are applied to verify accuracy of the assumptions.

Sampling

Sampling is a measuring technique which can be applied formally or quite informally. In its more formal usage (work sampling), it can be employed to analyze the actions of people, machines, or events in terms of time. Sampling is particularly useful on nonrecurring or irregularly occurring events where procedures have not been issued or data is not available.

Its chief advantage lies in the low cost observation of actions without disrupting or intruding on normal work routines. From a relatively few observations, inferences can be drawn concerning the total work under study. The analyst actually uses some form of sampling, however informal, at all points in a study. Analysis of last month's incoming orders, random selection of one file drawer for review, and observation of clerks working in a tool crib at 10:00 a.m. are examples of informal sampling.

When tracing a single activity through a business or working in an area where data is not available or not classified, sampling becomes a near necessity. In a tabulating area, for example, the analyst may want to find the amount of machine and operator time consumed by customer billing in relation to the amount of time spent performing all operations.

If sampling is delegated, the analyst should determine sample size and the specific times that observations are to be made (a customer billing sample on the 30th of the month probably would not be representative of the effect this job has on the facility over a month). In sampling, a few simple safeguards will prevent disasters such as the Literary Digest experienced in forecasting the election of Alf Landon.

SUMMARY

There is no one best method of gathering data for a Phase I report. The study team combines file searching, interviewing, estimating, and sampling, depending on the nature of the problem at hand. Subsequent chapters will deal more extensively with the complex factors involved in gathering time and cost data by activity during the operational investigation.

CHAPTER 3 - THE GENERAL SECTION

The General Section clearly and concisely conveys the major features of a business in narrative form to management, the study team, and other interested readers alike.

It is composed of five parts:

- History and Framework
- Industry Background
- Goals and Objectives
- Policies and Practices
- Government Regulation

In this chapter, these topics will be discussed for each part of the General Section:

- Type of data required
- Examples and what they show
- Sources of information

Chapter 7 explains how to organize this data into report form.

HISTORY AND FRAMEWORK

The present goals and practices of a business are often shaped from the important events in its history. This part of the report is an identification of major milestones of progress from the past which have influenced the present direction of a business.

Type of Data

Important historical information includes ideas, attitudes, and opinions of key management and research personnel, excerpts from the original charter, reasons for starting the company, mergers and spinoffs, expansion or curtailment of product lines and services, and reasons for changes in name or products. In addition, the growth of the physical plant and numbers of employees over the years is mentioned, along with a very general identification of products and services.

Example

The history and framework of Butodale Electronics*, quoted below, is an example of how the information can be displayed:

> The Butodale Electronics Company was established in 1946, incorporated in the State of Massachusetts. It was founded by four engineers and scientists who had worked together for a number of years in a large corporation on advanced government project work. Their main objective was to aid research laboratories and manufacturers in design and production of the latest radar, radio, and other electronic equipment.
>
> It is significant that the corporation sales have increased in thirteen years from $170,000 in 1947 to 15.9 million in 1959. Some of the major milestones in the last five years were:
>
> 1. Established the Worcester Computation Center to develop new fields of application for the analog computer (e.g., heat transfer, nuclear engineering, management control engineering).
> 2. Established the Long Beach and Rio de Janeiro Computation Centers to extend what was started at Worcester and to educate prospective customers in the use of analog computer techniques.
> 3. Opened additional sales offices in Chicago and Fort Worth.
> 4. Greatly expanded and modernized the plant in Danvers.
> 5. Instituted a major drive to secure overseas business, particularly in South America.
>
> Butodale's major product lines have expanded during this period to include small general-purpose analog computers, instruments, and data plotters. (None of these new lines have developed to more than 10% of the annual sales dollar.)

The above material implies certain objectives (e.g., expansion of overseas operations), and even provides reasons for starting the company. The remainder of this statement goes on to describe recently added product lines.

Butodale history runs one and one-half pages, while the history of National Bank of Commerce requires three and one-half pages. Length is not critical, as long as the narrative reveals currently useful facts.

Sources of Information

In the initial meetings with management, certain general information was requested: annual reports, current and back issues; a prospectus, if one exists; copies of speeches made by management personnel about the business; employee orientation handbooks;

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*Examples of the various sections of a Phase I report are adapted for this text from four actual case studies. Names and identifying locations have been changed, but the substance of the material quoted here is taken from the final reports produced by these studies.

The four companies are called: Butodale Electronics, a 15-year-old Massachusetts corporation specializing in analog computers; Worthington Hardware, a family-held wholesaling organization in San Francisco; the National Bank of Commerce, a moderate-sized bank in Topeka, Kansas; and Custodian Life Insurance Company, once a stock company, now a mutual company in Rockford, Ill.

published texts which discuss company history. From such material, a history of key events about a company can be put together. In addition, large commerical banks such as New York's Chase Manhattan, First National City, and Manufacturers Hanover Trust, California's Bank of America, or Philadelphia's First Pennsylvania, often publish reviews of important industries which are available as source data. These summaries are oriented mostly toward the investing public, but are handy references for history and background as well as other subjects.

Standard sources of financial and operating data such as Standard & Poor's, Dun & Bradstreet, and other industrial and commercial registers, can be scanned for general information. Biographical registers like "Who's Who in Commerce and Industry" are valuable when the personality of one man strongly affects the enterprise.

INDUSTRY BACKGROUND

This part of the report places the business into perspective within its industry. Comparative data which indicates why one company is successful and another is not, is included, along with facts on the entire industry. Areas of concentration, strengths and weaknesses, and market potential of the major companies is assessed here.

Type of Data

The nature of the industry is briefly summarized, showing demand for its products and services, technological developments leading to progress, growth characteristics, and growth trends. Among individual companies, comparable statistics can be prepared on sales volume, product and service likenesses and differences, territories served, profit margins, and other factors. This is sometimes difficult to do, since many multi-product line companies do not release statistics by divisions.

Example

Butodale finds itself in the elctronics industry and specifically in the analog computer area. Analog computers, in the sense of their use today, are only ten to fifteen years old and fall into two categories, general-purpose and special-purpose computers. There is considerable competition in this industry; some of the biggest competitors are ABC Instrument, Jones Instrument and National Systems, Inc. The company feels there will be continued growth for the general-purpose computer but this growth may not be at the same rate as in the past. Naturally, arriving at these conclusions, there is considerable stress put on to find new markets and new products. In order to uncover these areas and products the company has set up a New Products Committee and Market Analysis Section. It is the specific purpose of these groups to plan future growth and to direct engineering effort towards this growth in order that the company may maintain a planned growth pattern of 20% per annum, or greater.

Some of the product areas under scrutiny are instruments, special-purpose computers, and process control. Likewise, industry statistical analyses by marketing areas are developed in order to concentrate effort in the proper industries. There has been no designed plan to integrate this company through component manufacture; however, it is not opposed to this type of growth if necessary to insure reliable source of supply, and if excess capacity can be sold profitably. Recently the company absorbed the Premium Capacitors Company and is now building high-quality capacitors.

Sources of Information

A useful source of background information is the industry's technical paper or magazine. Almost every industry is served by at least one such publication; some are quite objective and informative. Editorial and research staffs of these publications frequently have files of industry statistics; a few publications issue an annual statistical review which summarizes the state of the industry or field of operations. "Electrical Merchandising" and "Aviation Week" each publish a special issue every year which gives statistics on the retail electrical appliance trade and the aviation industry, respectively. "Electronics" publishes, in the first issue of the year, a special report on the state of the electronics business, with projections for the year to come.

The Department of Commerce publishes a wealth of material on U. S. industry and trade. Government data as a rule is more objective, and at the same time less current than information found in business publications. The Census of Business and Manufacture, for example, maintains diversified statistics on industry which can be used to verify other data. The Department of Agriculture publishes data on the food processing industry; information on the alcoholic beverage trade can be secured from the Treasury Department; data on the drug business may be requested from the Department of Health, Education and Welfare.

GOALS AND OBJECTIVES

A clear understanding of business goals is necessary before activities can be properly formulated, and the emphasis is on specific rather than general goals.

Type of Data

The goal definition is a relatively brief list of a half dozen or more specific statements.

Examples

In Butodale, the initial goal statement read:

> A major objective of this corporation is to expand sales and profits which will guarantee a proper return to stockholders and offer continued opportunity to employees.
>
> The present sales goal is to increase approximately 20%; a net profit goal of approximately 7% of sales and 15% of net worth has been established. These seem to be readily attainable goals, based on past performance; they have been charted against other companies in the industry, both large and small, seem to be definitely in line, and may very well be exceeded.

However, statements like "expand sales" and "guarantee a proper return to stockholders" were considered much too vague and general. In subsequent discussions it was revised to read:

1. Manufacture and sell standard computer equipment and accessories.
2. Design and manufacture special computer models and accessories to satisfy individual specifications and requirements.
3. Offer computation services and engineering consultation on a fee basis to industry, commerce, and schools, among others.
4. Manufacture spare parts and components for sale to the trade.
5. Repair and maintain installed equipment.
6. Conduct research on new products and services to support present lines and initiate new ones within Butodale's area of knowledge and proficiency.
7. Compensate employees and suppliers for services, and provide a satisfactory return for investors.
8. Demonstrate competence and quality in every product to clearly show advantage over competitive equipment.

This second statement was far more definitive, and reveals the goal structure of the business.

In Custodian Life, most goals were identified with a standard of attainment.

> Competition is the dominant factor in the insurance industry and reaches into many different areas of a life insurance company. Since World War II, ordinary life insurance in force in the U.S. has tripled, while group and credit insurance have shown even greater increases. Custodian Life confronts this highly competitive, rapidly expanding marketplace with these goals and objectives:
>
> - New business production each year to equal 16% of the insurance in force at the beginning of the year.
> - A net gain in insurance in force of 10% each year.
> - A termination rate not greater than 6% per year of the insurance in force at the beginning of the year.
> - Development of the accident and health insurance business by an increase in the annualized premium of 49% over the previous year (1959).
> - Expansion of operations into seven additional states in 1960.
> - A well balanced operation with proper consideration given to all groups within the company.

This statement could have been more specifically directed toward the individual services the company offers and the markets it serves, but is adequate as it stands.

Sources of Information

While directives, management statements, and other internal publications offer clues to business goals and objectives, the ultimate sources of information are the personal views of owners or top-level management. As the Butodale example pointed out, managers often express goals quite generally and not in the specific terms required for the study. A rather searching self-examination may therefore be necessary to produce adequate goal statements.

POLICIES AND PRACTICES

The goals and objectives of a business are implemented by its policies and practices. Some are common to the industry or field of concentration; others will depart from industry practice as suits the requirements of a specific business.

Type of Data

Policies or courses of corporate action are characterized by a code of ethics, a plan for expanding into new territory, the approach to advertising and publicity, attitude toward employees and promotion, and the like. Policies are ideas, attitudes, and philosophies, as distinguished from procedures or methods, and the analyst must keep these differences in mind as he compiles the policy statement.

Examples

Butodale's policies are heavily employee-oriented:

> Some of the major policies instituted by Butodale have unquestionably helped the company attain its position of eminence in the analog computer industry. One of these policies is the corporation's attitute toward its employees. Butodale has developed a labor philosophy in which it endeavors not to infringe on the private lives of its people, while offering liberal employee fringe benefits, including educa-

tional opportunities. The company makes a strenuous effort to keep layoffs to an absolute minimum. This policy has resulted in a fine labor-management atmosphere. It has made itself felt in pride of workmanship and company loyalty which are hard to equal in modern industry.

On the other hand, policies and practices for National Bank of Commerce are more detailed:

For individual and Commercial
(customers and prospects)

1. Accessible, flexible facilities for deposit and receipt of cash, checks, bonds, drafts, and other negotiable documents.
2. Interest paying system to encourage time deposits.
3. Safekeeping facilities for valuable records.
4. Personal, confidential, knowledgeable consultation on all financial matters.

For Correspondent Bank
(customers and prospects)

1. Direct sending service and fast collection of cash items.
2. Full draft collection service.
3. Fast currency and coin shipment service.
4. Valuable document safekeeping facilities.
5. Assistance on large loans and advice on trust matters.

For Loan
(customers and prospects)

1. Facilities and experienced personnel available for consultation and financial advice on all loan matters.
2. Readily accessible facilities for the closing of (and payment on) personal, commercial, or mortgage loans.
3. Extensive advertising program to attract loan prospects to the bank for consultation.
4. Specialist available with a broad knowledge of income-producing investments.
5. Specialists available having detailed financial status information on local individuals and businesses.
6. Analysts available who are well informed on relative valuations of all types of property.
7. Flexible interest charging structure to encourage large loans and rewards for those who pay when due.

Planned practices to meet goals are:

1. Expand advertising program to reach more potential customers.
2. Enlarge drive-up banking facilities.
3. Increase emphasis on "Installment" type loans.
4. Modernize and reorganize physical and manpower facilities as necessary for most efficient operation.
5. Establish an electronic data center using the latest data processing equipment for processing paperwork; offer such services to local industry at a minimum cost.

Sources of Information

Most companies document and publish standing operating procedures, operating and policy instructions, directives, and other internal declarations stating corporate goals, standards, and attitudes. Published information of this type should always be supplemented with statements from top management to verify current application and proper interpretation. Company advertisements and publicity releases also reflect the corporate personality, indicating areas in which the company currently operates or seeks to become established. House publications, too, frequently discuss policies, practices, and attitudes, but they cannot be considered as totally objective in their viewpoints.

GOVERNMENT REGULATION

Government regulations at federal, state, and local levels influence the way a business is conducted.

Type of Data

The discussion on regulations should answer three basic questions:

- Which government regulations help the company do business (e.g., charters, tariffs, franchises, enabling acts, subsidies)?
- Which restrict its business activities (e.g., consent decrees, utility regulations, regulations on financial enterprises)?
- Which affect its recordkeeping practices?

For example, rulings of the Civil Aeronautics Board determine form and content of some airline reports; rules of the Federal Communications Commission require certain reports from communications facilities in specific form; rulings of the Securities & Exchange Commission affect the recordkeeping of brokerage houses. However, the general requirements of the SEC affecting stock issue for publicly held corporations would not be spelled out in the report, nor would laws regarding monopolistic practices and restraint of trade. There may be informal government regulation as well as that formalized in laws, such as attitude of the local government regarding industrial waste. This should be noted here as well.

Examples

Both permissive and restrictive regulations are mentioned in the National Bank of Commerce report:

> National Bank of Commerce, organized in 1891, was chartered for business under the National Bank Act of 1864. The National Bank Act created a Bureau of Controller of Currency in the Treasury Department. The Controller, who is Director of the Bureau, has the power to charter national banks and is responsible for the examination, supervision, and rules relating to the operation and powers of such banks. Where state banking regulations are in conflict with national regulations, the national bank is normally required to comply with the state regulation.
>
> National Bank of Commerce, like all member banks, must operate within the limits of the 22 regulations of the Federal Reserve System. Responsibility for Federal Reserve policy and decisions rests on the Board of Governors, who are appointed by the President and approved by the Senate for a term of 14 years; the twelve Federal Reserve banks; and the Federal Reserve Open Market Committee. All national banks must be members of the Federal Reserve System, hold Federal Reserve stock, and maintain legal reserve moneys on deposit in their district Federal Reserve Bank. National banks must furnish a financial report when requested by Federal Reserve, and are members of the Federal Deposit Insurance Corporation, which guarantees each depositor against loss up to a maximum of $10,000.
>
> National Bank of Commerce must constantly adjust policies and operational procedures to meet the requirements of new Federal Reserve regulation interpretations.

The statement then lists the 22 areas covered by the regulations of the Federal Reserve System.

Regulations may not always have a direct effect on an enterprise, but still may influence business policies. A brief statement in the Butodale report illustrates the point:

> Government regulations do not play a major role in company plans. However, a very high percentage, perhaps 60% of sales, are subject to renegotiation. Since the government presently thinks 14% of sales is a fair return, this has an effect on profit objectives.

Monopoly and antitrust laws, labor laws, fair-employment laws, and income tax regulations are noted if they uniquely affect business operations.

Sources of Information

General information on government regulations can be found in industry textbooks and trade journals; annual reports and other company publications sometimes disclose their effect on a business.

Commerce and financial laws enacted by the various states, for example, are specifically restrictive on banking and insurance operations; utilities are closely regulated by state utility commissions. Consent decrees entered into by a business are another example of restrictive regulation. Franchises are examples of permissive regulations, as are federal laws which grant subsidies to industries. Summaries of this legislation, or perhaps the laws themselves, should be read to gain an accurate appraisal of their impact on a business. The company counsel's assistance may be solicited in making this appraisal.

In the routine functioning of a business, inputs are received from suppliers, and processed through operations to become outputs for customers; in the course of processing, resources of finances, inventories, facilities, and personnel are employed.

The Structural Section is concerned with three of these four major elements of a business:

Inputs (Materials and Suppliers)
Outputs (Products and Markets)
Resources (Finances, Personnel, Inventories, Facilities)

Interrelationships among the elements (operations will be discussed in Chapter 6) are established in a business model, which prefaces the section.

Narrative form is again used in the Structural Section, but because of the greater amount of statistical information, graphical displays are included to help clarify the narrative.

Data gathering for the Structural Section usually coincides with the collection of general data, so sources will be much the same as those outlined in the previous chapter.

BUSINESS MODEL

A model of the business sets up the framework for the Structural Section, and establishes a classification system for displaying data. The model for Butodale Electronics (Figure 3) is typical for a manufacturing concern.

Elements of the business model will vary in emphasis for different industries and enterprises. Physical inputs and outputs are stressed in most models for a manufacturing enterprise, for example, while resources predominate in analyzing an employment agency. Deposits and loans are input and output

MARKET

VENDORS

850 Total Suppliers
125 Suppliers - 10k to 100k annually
15 Suppliers - 100k & over annually

CUSTOMERS

Direct Government	21%
Government Sub-Contract	38%
Commercial - Industrial	32%
Foreign	9%
	100%

INPUTS

MATERIALS - 45% of Sales Dollars

Transistors
Tubes
Resistors
Wire
Potentiometers
Display devices
Input-output units
Diodes
Transformers
Relays
Capacitors
Clippers
Converters

OUTPUTS

PRODUCTS

General purpose analog computer	72%
Special purpose analog computer	2%
Data plotters	6%
Plotters	9%
Instruments & Recorders	3%
Engineering & special fabrication	8%
	100%

NOTE: 9% of all output goes to South American operations

COMPANY OPERATIONS

Marketing - Engineering - Production - Accounting - Purchasing

RESOURCES

Finances		Personnel	1069	Inventory		Facilities	
Sales	15.9	Executives	9	Finished Goods	1.5	Plants	1
Net Profits	.9	Marketing	80	Shop Stores	1.7	Sales Offices	4
Current Assets	15.9	Engineering	217	Work in Process	6.7	Computation Centers	3
Current Liabilities	9.8	Accounting & Personnel	29			South American Headquarters	1
		Public Relations	1				
		Purchasing & Supply	71				
		Mfg	537				
		Maintenance	28				
		Computer Centers	41				
		Overseas	56				

Figure 3. Butodale Electronics Business Model

classifications for a financial institution, but money in general belongs in resources for other enterprises.

PRODUCTS AND MARKETS

Under Products and Markets, the outputs of a business are analyzed along with the consumers who use these outputs.

Type of Data

The market for an enterprise's products and services is broadly described, with emphasis on sales and distribution characteristics of existing and planned products as well as information on past and future trends of product demand. Methods of marketing are analyzed. Does the enterprise sell directly to the public, or through agents, wholesalers, retailers, and franchised dealers? What specific promotional or advertising strategies are used? What part of the sales dollar does advertising represent? How do products compare with those of the competition?

Discussions of sales or distribution methods also provide insight into the marketing aggressiveness of an enterprise. A map is plotted to show locations of sales offices and warehouses, sales representatives, and sales wholesalers or retailers. If products or services are sold on long-term contracts, this is mentioned.

Information on trends in product mix, shifts in the composition of income, and breakdown of income by major product lines is noted where it contributes to a total picture of the market.

Examples

In Worthington Hardware, the description of products starts by breaking Worthington's sales into nine classes (departments):

The Worthington Hardware Company maintains an inventory of approximately 35,000 items. These items are shown in a general catalog (the index to this catalog is attached in order to identify the products).

The 35,000 items are classified into departments as follows:

Department	Estimated % of Total Items
Athletics	8
Guns & Ammunition	4
Fishing Tackle	7
Electrical	7
Housewares	22
Stoves	2
General	17
Tools	24
Builders' Hardware	9

This discloses the range of products, and to some extent defines the market area. Builders' hardware, for instance, is purchased mainly by the building trade. The Worthington organization is predominantly sales-oriented, as could be expected of a wholesale distributor, and the analysis in Figure 6 compares income, profits, and expenses for the nine departments. A note which explains the way some figures are adjusted is included:

Overall, hardware departments contribute approximately 70 percent of sales and sporting goods departments 30 percent. Promotion department's sales were included in all department sales prior to 1961. The promotions department plans to publish a promotion booklet four times a year for hardware (spring, summer, fall and Christmas), and once a year for sporting goods (Christmas).

Departmental Profit Picture - 1960

Department	Thousand $ Gross Margin	% Gross Margin	% Expenses	Net P/L %	P/L % to Total Sales
Athletics	121	18.9	19.5	- .6	- .04
Guns and Ammunition	188	18.1	16.6	1.5	.25
Fishing Tackle	67	10.8	18.9	-8.1	- .73
Electrical	83	16.2	14.8	1.4	.12
Housewares	176	16.3	19.4	-3.1	- .58
Stoves	13	24.9	24.1	.8	.08
General	160	22.7	22.9	- .2	- .19
Tools	155	20.6	19.6	1.0	.20
Builders' Hardware	167	21.9	21.8	.1	.03
Total	1130	Avg. 18.3	Avg. 19.2	Avg. - .9	Avg. - .86

Comparison of Departmental Sales

	1960 (9 mos.)	1961 (9 mos.)	% + or -
Athletics	9.4	9.1	- .3
Guns and Ammunition	14.7	14.9	+ .2
Fishing Tackle	11.6	7.9	- 3.7
Electrical	6.3	7.1	+ .8
Housewares	18.2	16.3	- 1.9
Stoves	.3	.4	+ .1
General	12.5	10.8	- 1.7
Tools	12.5	12.8	+ .3
Builders' Hardware	14.6	14.4	- .2
Promotions	--	6.3	--

Figure 4. Two product breakdowns from the Worthington Hardware Structural Section

The market could be explained satisfactorily in terms of departmental output and profit margins for Worthington, but the same type of display was not suitable for Bank of Commerce. Instead (and just as effectively), the market for services was described by showing how the level of available loan funds is determined, and itemizing the types of output services which use these funds.

Output Products

The National Bank of Commerce furnishes loan money and banking services primarily in Shawnee and Wabaunsee Counties.

Amount of loan money available for output to customers is determined as follows:

Total Deposit money
Less outstanding Regular Loan money
Less Long-term outstanding Investment Loan money
Less Cash and Reserve
Equals Available loanable funds.

Output Services

1. Demand Deposit

Check collection and payment service is offered in order to increase the percentage of demand deposits that can be loaned (or invested) to create interest and fee income. A small fee is charged to cover a portion of the handling costs.

2. Time Deposits

Interest dividends are paid to savings depositors to encourage larger deposits and therefore increase loanable funds.

3. Loan

Secured or unsecured loans for long or short terms are offered. Men experienced in all types of loan financing are available to the bank's customers and prospects.

4. Trust

Trust service is offered to encourage new and retain existing trust deposit funds. A fee charged for administration of estate and pension trusts creates income for the bank.

5. Correspondent Check Clearing & Collection

Correspondent check clearing and collection service primarily benefits local industry and surrounding banks. Rapid clearing and collection service encourages large deposits, which creates more loanable funds.

6. Safe Deposit

Document safekeeping service is offered to provide a maximum security area for a customer's valuable documents. Fees for use of the Safe Deposit area create income for the bank.

Borrowing Customers (Receivers of output money)

Individuals

Commercial Businesses

Government

Local, state, national (includes bonds and securities)

Types of Loans	PER CENT OF OUTSTANDING TOTAL
Real Estate	20%
Financial institution	4%
Purchase or carrying securities	3%
Farm loans	5%
Commercial and industrial	48%
Automobile installment	6%
Retail consumer installment	5%
Single-payment household and personal expenditures	9%

A general policy of the bank is to have outstanding loans equal about 40% of total deposits.

Depositing Customers (Receiving Output Services)

Individuals

At the present time the bank has 24,000 individual deposit customers. Records show a total of 36,500 accounts. However, studies show a 50% account duplication between saving and checking. About 95% of the customers are located in Topeka, which had a population of 103,000 persons in 1960.

Commercial

2200 community business establishments are customers of the National Bank of Commerce. The records actually show 2500 accounts, but some customers have multiple accounts. Both large and small businesses use the service offered. Statistics reveal 95% of the commercial customers are located in Shawnee County, and some 5% are in Wabaunsee County.

Banks

Out of 709 banks in Kansas, 277 have active correspondent agreements with The National Bank of Commerce. The records show 365 accounts; however, 88 are considered inactive. The primary market appears to be the area within an 80 mile radius of Topeka due to one-day check clearing desired by most banks. About eight banks in the primary market area offer correspondent bank service and are considered competitors.

Government

Local, state, and Federal government units are customers. The Federal government is the largest single depositor.

A significant time span should be used when illustrating product trends as in the Butodale example (Figure 5).

Dollar volumes of business are broken out geographically or regionally (Figure 6), by distribution channel, and by customer or customer type if this contributes to a balanced explanation.

In Figure 7, which shows four exhibits furnished by Custodian Life, the information does not fall under exact product classifications but does illustrate sources, trends, and profit-expense relationships, many of which are important output factors.

Sources of Information

Sales catalogs and other promotional literature supply data on products or services, and the marketing executive will be able to provide extensive analyses of his markets. More often than not there will be a number of reports compiled to show sales figures by special categories. For example:

- Sales tabulations by customer order, store, warehouse, industry, region, territory, and salesman
- Industry and company sales forecasts
- Shipments reports
- Advertising outlays
- Product line profit margins
- Budget sales output
- Financial operations statements
- Sales quota reports
- Warehouse turnover
- Sales expense reports

MATERIALS AND SUPPLIERS

Just as Products and Markets examines business outputs, Materials and Suppliers describes inputs to the enterprise.

Type of Data

Input materials and services are classified by source, type, total and unit cost, availability, cyclic need, or other features. Major suppliers (sources) are ranked according to annual dollar volume. Procurement practices and competitive conditions in the market are appraised; they affect many segments of the business.

In the Structural Section, an analyst is concerned only with input materials, services, and resources which are essential to fulfilling goals of the business. Thus, office supplies of a manufacturing enterprise, or water used to cool grinding equipment in a job shop are excluded, while raw materials used in the manufacturing enterprise to produce goods ultimately sold on the market are included.

In some types of vertically integrated enterprises and some service organizations, relatively few products are procured from outside companies. Several large U.S. manufacturing enterprises, for instance, are so organized that subsidiaries supply everything from raw materials to subsystems of the finished product. Under these conditions, if only one division of the company is being analyzed, the others are treated as outside environment and therefore become potential customers or vendors (outputs or inputs) for the business.

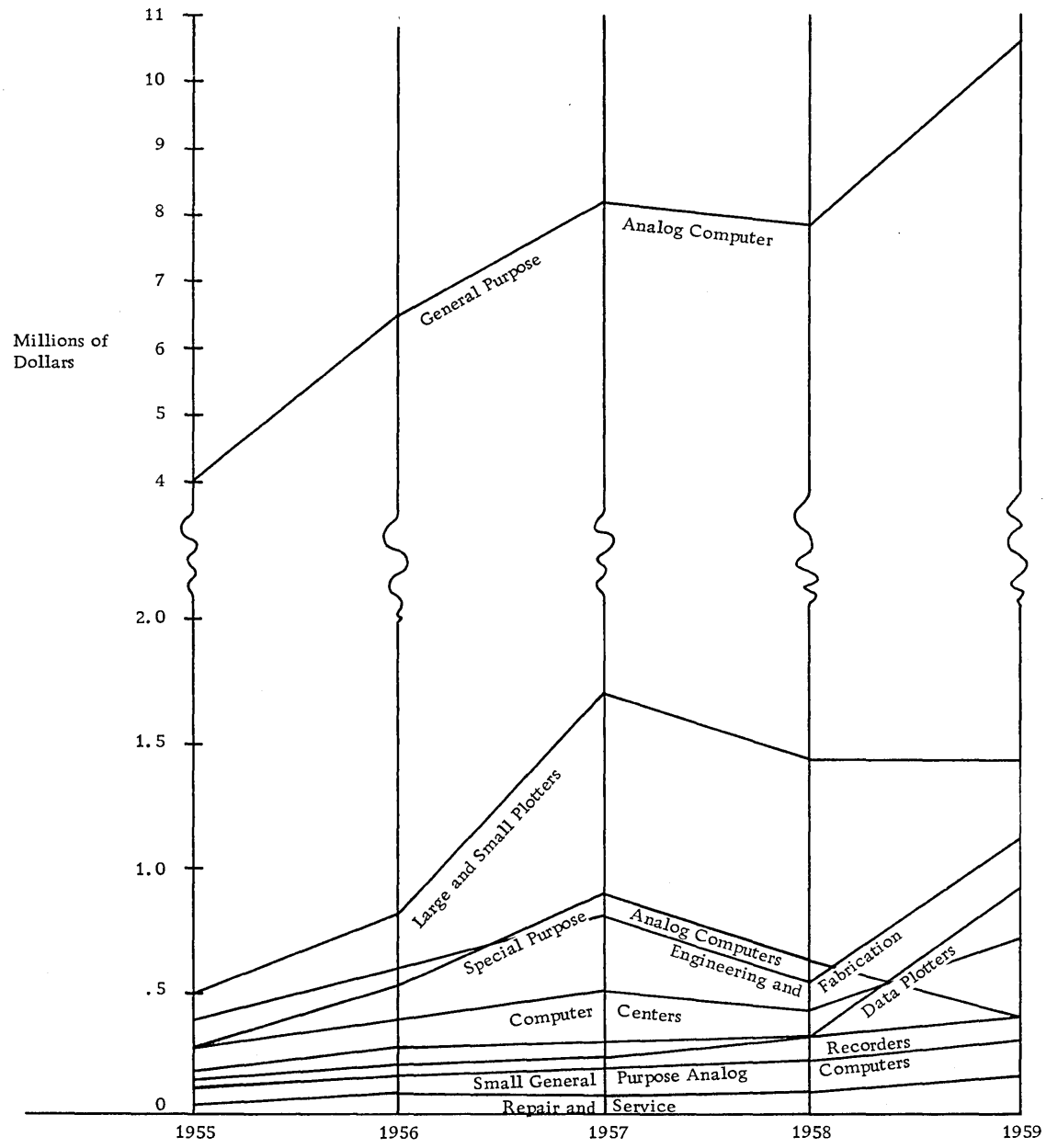


Figure 5. Butodale Sales by Product Over Five-Year Period

Examples

Procurement and inventory practices are noted in this statement from Butodale on the problems of delivery and quality control:

> Approximately 45 percent of the sales dollar at Butodale is the cost of material. Some of the major purchased materials include steel, transistors, tubes, potentiometers, display devices, transformers, capacitors, connectors, relays, wire, and resistors. At present Butodale controls this material by the ABC method, discussed in the inventory subsection. It is important to note that the time lag for material purchased varies from two weeks to four months. An order record card is sent to the buyer, who originates the purchase authorization. Different buyers handle different classes of items. Fifty percent of the time the buyer inspects the order record card; selection is automatic the rest of the time. Ninety percent of the items handled through the inventory control section have Butodale part numbers, which makes processing very fast. When

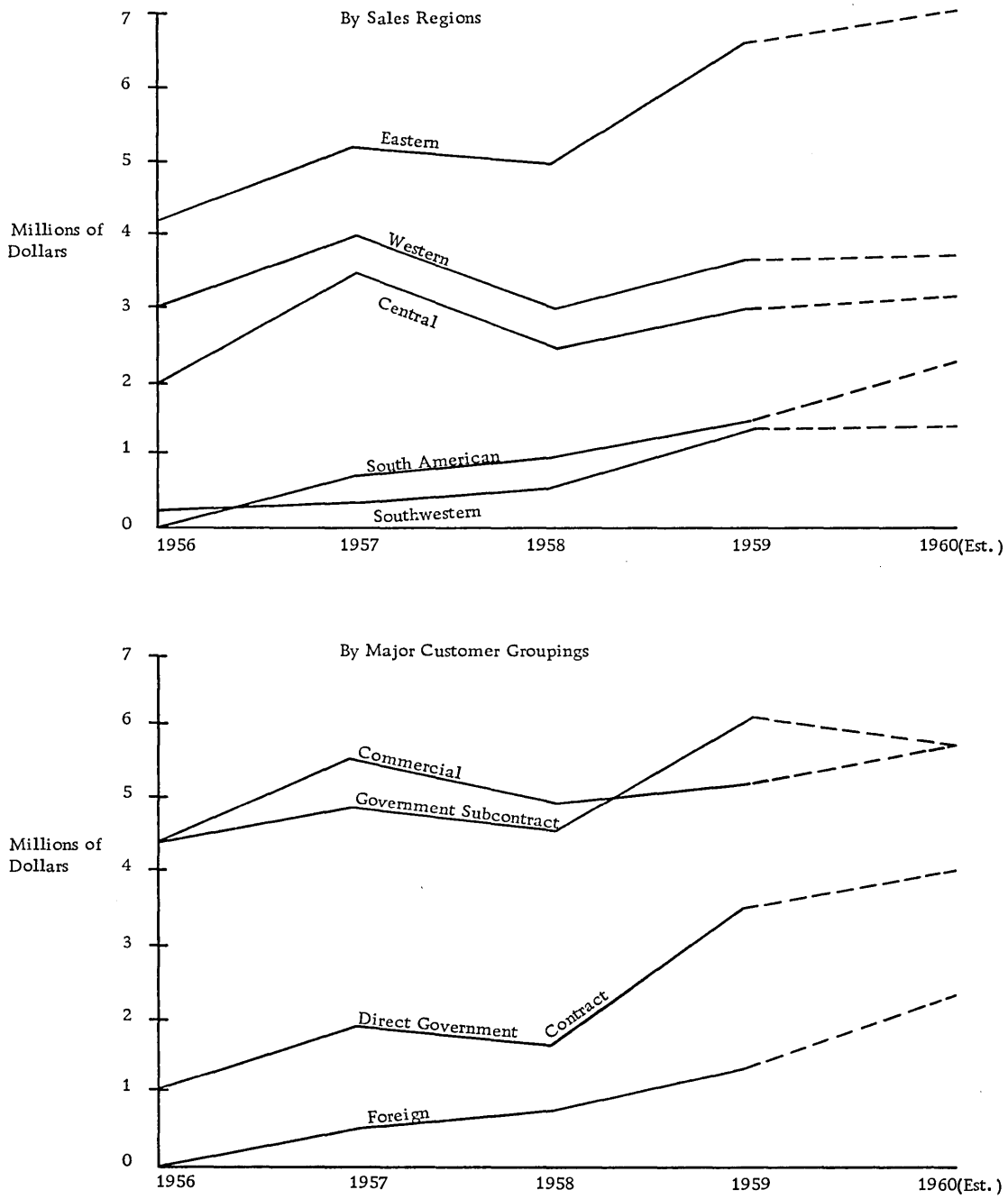


Figure 6. Butodale Sales by Customer Group and Region

part numbers are missing or not assigned, it is difficult to determine if there is such an item, or if it is ordered directly by name and charged to a project.

The company has about 850 suppliers, 125 of whom are considered major suppliers; 110 of these major suppliers receive $10,000 to $100,000 of business annually, and the remaining 15 receive $100,000 or more annually. The company endeavors to have multiple sources, but because of the high quality of Butodale equipment, this is not always possible. A limited number of very expensive attachments for systems input and output are required; the purchase of these units is forecast and an agreement negotiated with the supplier, giving an annual requirement with portions to be delivered at specified dates. This arrangement seems to work satisfactorily. In view of high quality standards, all incoming material must go through a stringent quality-control check. This occasionally causes material shortages if inferior material is received. Records are maintained to reflect these conditions, and to eliminate recurrence of such conditions.

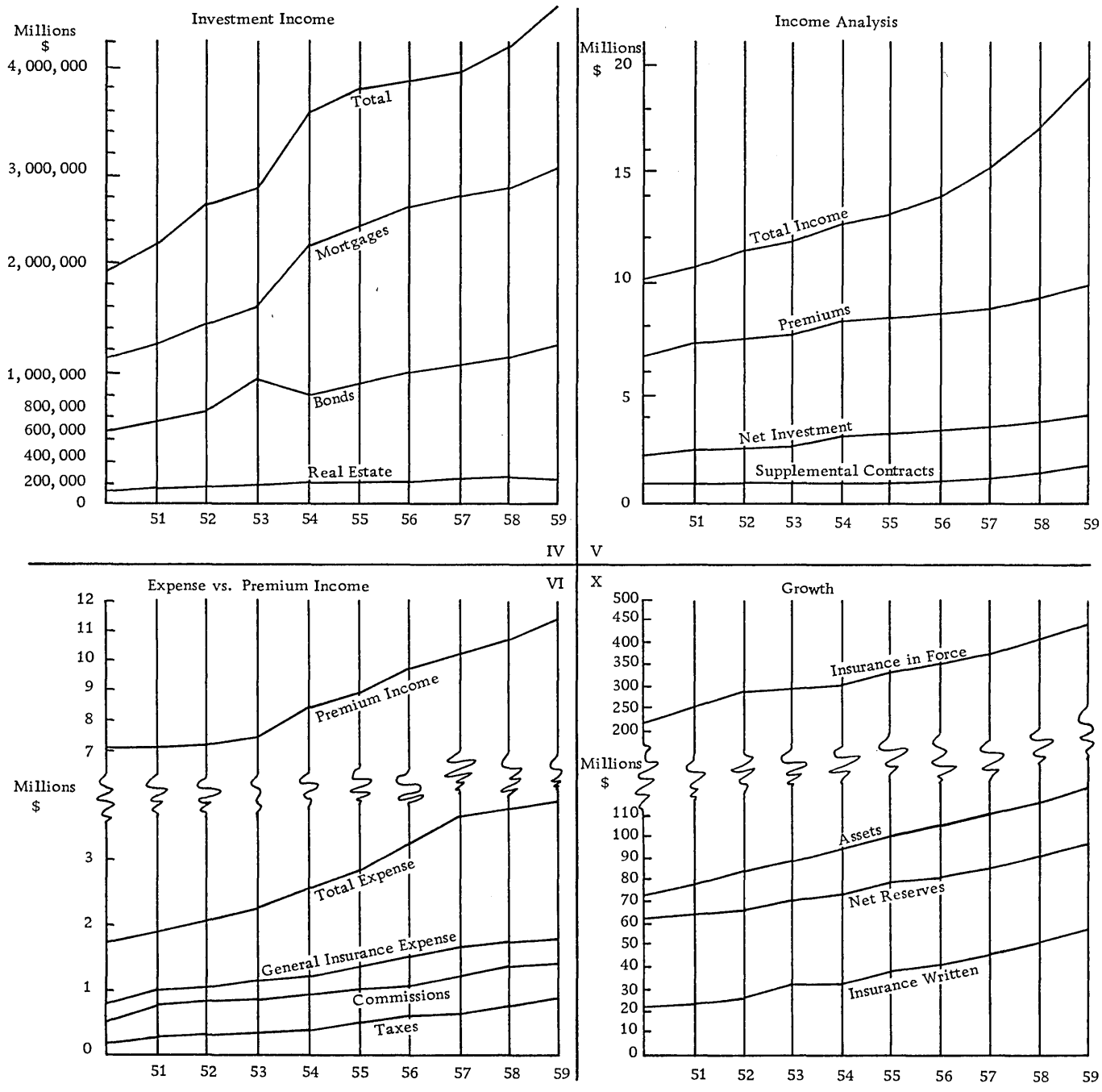


Figure 7. Four Graphs Supporting the Custodian Life Structural Report

On the other hand, a hardware company has few raw and in-process inventory problems. A straightforward listing of purchases and turnovers for each product line (Figure 8) readily demonstrates the status and movement of shelf goods at Worthington.

	Purchases	% Total	Average Inventory	% Total	Turnover
Athletics	$ 331,850	10	$ 157,905	11	2.4
Guns & Ammunition	561,362	17	256,297	18	2.6
Fishing Tackle	287,549	8	172,309	12	1.9
Electrical	242,294	7	110,865	8	2.9
Housewares	512,356	16	137,474	10	4.3
Stoves	26,091	1	36,969	3	1.0
General	302,370	9	115,530	8	3.3
Tools	395,163	12	118,287	9	4.6
Builders' Hardware	401,165	12	213,704	15	2.5
Promotions	261,125	8	88,337	6	3.8
Total	$3,321,325	100	$1,407,677	100	3.0

Figure 8. Worthington Hardware analysis of purchases

In some types of businesses, such as public utilities, availability of supplies must be projected over long periods. For these cases, reserve and emergency sources are described. In lending institutions, the nature of input fundings, types of investors providing funds, and data on amount of funds secured in the various categories is included. The materials and suppliers narrative for Custodian Life is a case in point:

> Insurance companies must look to the field of investments to put their premium dollars to effective use. These investments provide a return which is an important factor in the successful operation of the business. Custodian Life looks to three major classes of suppliers to provide these materials (better referred to as investments) which bring a steady income to the company.
>
> The first class, and most important, is the mortgage market, in which $69 million, or 54% of the ledger assets, were invested on July 31, 1960. The mortgage investment policy is directed towards single residential loans and two-family residential buildings. However, multifamily and commercial buildings are approved, with the maximum loan on such properties being $300,000. The general terms and limitations applicable to each class of mortgage are determined by the investment committee based upon recommendations made by the mortgage loan department. In 1959, the net income from mortgages was $2,973,411.
>
> The second class of supplier is the bond market, in which $48 million, or 38 percent of the ledger assets, were invested on July 31, 1960. U.S. Treasury issues are by far the greatest single market, followed by public utility securities in strong second place. The remainder of the market is diversified with balanced holdings in industrials, municipals, Canadian Governments and railroads. The net interest earned in 1959 from bonds amounted to $1,457,223.
>
> The third class is real estate. This is a very minor item, representing less than 1 percent of the ledger assets. The real estate holdings consist primarily of the home office buildings and several properties adjoining the home office.
>
> Operating in the three markets listed above, the Custodian Life had a net investment income of $4,602,119 in 1959. This amount was second only to the premium income, and provided resources with which to operate the company successfully.

Figure 7, displayed earlier in the chapter, reveals trends and relationships for several of these input factors.

Sources of Information

Data is usually secured from the purchasing department or accounts payable unit in the accounting organization. Summaries of dollar expenditures by individual suppliers are often compiled for a number of different reasons; for example, the Small Business Administration requires periodic reports from government contractors on purchases placed with small business concerns. Accounts payable units maintain records by vendor to prevent duplicate invoicing; cost accounting keeps records on unit costs; quality control and inspection sections have data on vendor performance. Any or all of these functions are checked for vendor information.

In addition, current operating reports contain information on commodity lead time, material cost variance, vendor evaluation, and analysis of cash payments reports, etc.

Although inventories were mentioned in one or two examples, the full story on raw, in-process, and finished stock inventories should be saved for Inventories.

RESOURCES — FINANCIAL

Finances are relatively easy to document if the company is publicly held and government regulations require its public disclosure, though divisional and departmental data may be restricted. Where a company is a partnership or a closed corporation, financial data are usually confidential; the analyst must guard against disclosure to unauthorized persons.

Type of Data

The foundation for the Finance section is a balance sheet of financial operations, a statement of income and retained earnings, and an overhead or expense statement. The form of the balance sheet and earnings

report as prepared for the annual report is satisfactory for displaying this data. Emphasis on detail varies with the type of enterprise; for example, the statement of a bank's status usually lists outstanding loans separately under assets, and deposits, capital, and reserves under liabilities. Reserves held by an insurance company, or receivable and debt-retirement items of a finance company may be similarly featured. A consolidated overhead or expense report is the principal input for cost allocations to the Resource Usage Sheet.

Financial statements generally should be appended with notes to explain or amplify important transactions.

Example

Company balance sheets and statements of earnings are not illustrated in this manual, since their form and content is published widely in annual and other reports. However, trends (such as financial progress of the enterprise compared to its industry, or to major competitors, or to industry leaders) can be plotted on graphs. Exhibits from the National Bank of Commerce demonstrate this type of display (see Figure 9).

Sources of Information

Interviews with financial officers are necessary to find out what financial information is available, and what is classified. In a partnership or closed corporation, records are acquired from the accountant; if a division or department of a large company is under study, budgets and cost-distribution records are usually open for inspection upon request to the financial manager, while profit statements will have to be studied privately. Occasionally, data is just not turned over to the team for one reason or another; this happened recently in a study of a major electronics manufacturing concern. The study team compensated for the tight security on financial data by applying rules of thumb generated in the industry for companies of this size, and by diligently searching for leads in published articles and other appropriate external sources. The end result was an extremely accurate financial picture of the business.

RESOURCES — PERSONNEL

Personnel and organization data is collected in the early stages of the study, and expanded in both Structural and Operational Sections.

Type of Data

An organization chart is customarily the first element. If none exists, the analyst drafts one from data provided by the personnel (or equivalent) function and supplements it by interviews with department heads.

Reports which classify employees by organizational component, skill, location, remuneration class, and other categories often indicate important facts about the business which are not readily apparent from inspection of its organization chart.

Other valuable facts concerning personnel are union membership and union relations, local labor markets, turnover statistics, fringe benefits, stock

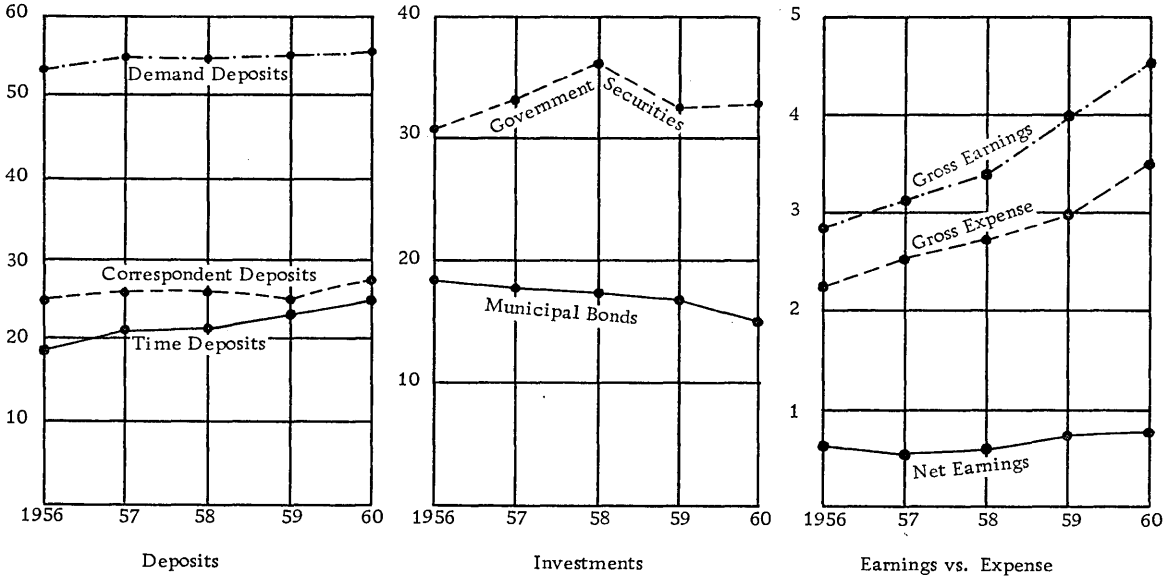


Figure 9. Three exhibits from the Finance section of National Bank of Commerce's Structural report.

options, and profit-sharing plans. Management attitudes on personnel subjects, and comparisons with other businesses drawing on the same labor pools are also included.

Example

The exhibit from Butodale (Figure 10) analyzes employees by department and job assignment.

Department		Total	Supervisory	Clerical	Other	Skilled	Semi-Skilled	Un-Skilled
Manufacturing	565							
Mfg. Process		81	5	7	0	9	23	37
Comp. Ass'y		152	8	0	0	2	14	128
Special Components		61	3	0	0	1	10	47
Final Ass'y		81	4	1	0	0	39	37
Mfg. Admin.		25	5	11	9	0	0	0
Sub-contracting		3	1	2	0	0	0	0
Qual. Control		109	11	7	6	21	53	11
Production Tool'g		19	1	1	17	0	0	0
Plant Suprvsn.		6	6	0	0	0	0	0
Maintenance		28	3	0	0	6	8	11
Engineering	217							
Eng. Ser.		97	6	11	80	0	0	0
Product Eng.		73	5	12	56	0	0	0
Other Eng.		47	5	2	40	0	0	0
Administration	38							
Accounting		21	3	18	0	0	0	0
Personnel		8	2	6	0	0	0	0
Exec. Office		9	9	0	0	0	0	0
Purchasing	71							
Material Control		15	1	10	4	0	0	0
Purchasing		22	1	14	7	0	0	0
Supply - R&S		34	4	7	0	0	13	10
Marketing	80							
Sales & Ser.		56	8	8	40	0	0	0
Parts Sales		10	2	8	0	0	0	0
Sales Admin.		14	4	4	6	0	0	0
		971	97	129	265	39	160	281

Figure 10. Butodale Personnel by Function and Department

Sources of Information

Analysis of personnel costs by organization component, product or project, and other cost-distribution categories is obtained from accounting or cost departments. Classifications of personnel are acquired from interviews with personnel administration and accounting.

RESOURCES — INVENTORIES

Inventories fall into two general classes: stock and files. Physical inventories of parts, assemblies, finished products, and money (in the case of financial enterprises) act as buffers, between the peaks of demand from the environment and the capacity to produce within the business. Information inventories (files) include operational experience, decision rules and logic, and historical data concerning operations. A file of account records, a sales catalog, and a library of programs for a computer are examples of information inventories.

Type of Data

Physical inventories should be classified by type (raw materials, components or parts, in-process or semi-finished assemblies, and completed products), inventory level, location, value of the stock, and cost of maintenance. In some cases, it is difficult to separate facilities from physical inventories; however, a distinction must be made between stocks consumed in the operation of the business, and permanent facilities. Thus, in the case of a water distillation plant, the tank is a facility, while water is an inventory.

Characteristics of inventories (the informational as well as the physical) which are useful include: level, flow (both inputs and outputs), turnover, age, cycle, demand, access, and reaction capability to changes in demand. Obsolescence factors are important: both information and stock become less valuable with the passage of time. In the case of stocks, value of raw materials is more accurately predictable than value of some kinds of finished products which are subject to obsolescence and deterioration.

Besides files of records, there are other kinds of information inventories which cannot be overlooked: standard procedures and instructions, and human experience and information retained in the minds of people. This is "edited" information which has been refined from years of application and practice, and while it may be less accessible than files, it is generally more valuable.

Example

Butodale has an inventory structure somewhat different from other manufacturing concerns, and a brief explanation of its features precedes the statistical summary:

Since a major portion of the end product is customized, it is not desirable to manufacture to inventory. However, because there are a large number of standard components used, Butodale endeavors to forecast Sales and stock a number of them for immediate support to production schedules. This means that work-in-process inventory is made up of both this preplanned stock and project stock where a system is being assembled and tested for a specific customer's order. It should be noted that G & A expense is applied to this w-i-p inventory.

The inventory is divided into the following major categories:

Shop Stores

Purchased parts and some fabricated mechanical parts used to support preplanned and project stock.

Work-in-process Inventory

Material and labor already expended against preplanned and project stock (including components completed except for final quality control).

Finished Goods Inventory

End products and components ready for sale or on customers' orders.

NOTE - Indirect Material includes low cost purchased parts and fabricated mechanical parts commonly used in components, and end products not carried as inventory.

Direct Material

Includes materials purchased directly for preplanned or project stock but not placed in Shop Stores inventory; it goes directly to work-in-process.

Inventory Breakdown

	Parts	Value
Shop Stores	3120	$1,675,381
Finished Goods	850	1,526,334
Work-in-Process		6,743,617
Preplanned Stock		2,750,000
Project Stock		3,182,894
In-Process - Stores	350	810,723
*Indirect Material	5000	410,385

*Not included in inventory; includes 3000 purchased parts and 2000 fabricated parts.

Inventory dollars are also listed by ABC class, since this control plan is a part of Butodale inventory practice:

Shop Stores Inventory Annual Usage

This is divided into these classes:

Class A	$10,000 or more annual use		
Class B	Less than $10,000 annual use, including items with long lead time and new items that may develop into Class A		
Class C	Items of low unit cost with common usage		
Total items in Shop Stores		3470	
Total annual use (issues from Shop Stores)			$5,645,250
Class A	90 items	$3,671,870	65% of $
Class B	240 items	673,840	11% of $
Class C	2790 items	1,299,540	24% of $

This analysis could have been strengthened by more detail on procedures and practices. Other summaries analyze shop stores by item and price category, as well as by classifications outisde of shop stores.

Sources of Information

Inventory records are located in accounting and manufacturing. Accounting records show inventory liquidations through shipments, classifications by type (raw, in-process, etc.), consignment and warehouse balances, and material budgets. Manufacturing maintains files in stockrooms, accumulation areas, and inventory control sections, and reports inventory status by units, age, manufacturing losses, amount of surplus and obsolete, and special budgets. Inventory policies and practices are secured from the inventory control supervisor or cost accountant.

RESOURCES — FACILITIES

The amount and kind of land a company occupies, and the size, value and arrangement of buildings, equipment, and communications networks are outlined under Facilities.

Type of Data

Manufacturing plants, sales offices, research facilities, warehouses, and distribution facilities are itemized. Information on area of buildings, whether the facilities are leased or owned, and plans for new construction are useful types of data in support of this list. Major items of machinery or other equipment involved in the activities under study should also be classified and listed, with capacity figures added, if meaningful. Equipment listings are often supplemented by layout diagrams of plants and offices. Data processing equipment is noted when physically located within the enterprise.

In certain types of businesses, the communication network (e.g., the Teletype for a brokerage house with multi-locations) is a most essential facility, and its performance should be covered in some depth. A map is a good visual to show the several locations (as it is to show dispersion of sales offices and manufacturing plants) with connecting lines to point out interoffice connections and switching centers. Costs (operating and original), current and projected volumes and capacities, and response speeds are important. Later, in the Operational Section, the time and length of queues, periodic fluctuations (rather than cyclic), and volume trends are recorded on the grid section of an Activity Sheet.

Messages and file records can be analyzed on a Message Sheet, and file loads analyzed on a File

Sheet. These forms, along with Resource Usage Sheets and Operation Sheets, are described in IBM Reference Manual C20-8075, "Study Organization Plan — Documentation Techniques".

Example

Building -- 130,000 square feet -- expandable to 250,000 square feet.

Office Area -- (55' x 80') ground floor, no floor loading problem, 20' x 40' area available for new system. Adequate 110 and 208 volt single and three-phase AC available near possible system site.

Fire protection -- Overhead sprinkler system with 100,000 gallon underground water tank.

Air-conditioning -- Two systems; front office area (55' x 80') has central compressor and chiller. Plant area has 50 individual units, each rated at 7 1/2 tons. Water is circulated through a water tower to exchange the heat before it is returned to individual systems. Each unit is individually controlled to maintain a temperature of 10° below outside air, with 50%-60% relative humidity.

Communication -- Teletypewriter Exchange (TWX) service between plant (office area) to Chicago and Fort Worth sales office.

Equipment -- Printer and keyboard in each location; circuits rated at 60 wmp, half duplex.

Other Office Equipment

	Owned	Rented	Total
Typewriters	47	57	104
Adding Machine and Calculators	23	10	33
Bookkeeping machines	3	--	3
Dictating machine	5	--	5
Cars	10	7	17
Trucks	5	--	5

IBM Equipment

	Owned	Rented	Total
Card punches	3	3	6
Verifier	2	2	4

	Owned	Rented	Total
Collator	1	1	2
Sorter	1	1	2
Accounting Machine	2	2	4
Reproducer	1	1	2
Calculating punch	1	1	2
Interpreter	1	1	2

Sources of Information

Facilities are generally well documented. Information may be extracted from plant accounting records or from details maintained in the manufacturing or engineering facilities unit. Communications network data is obtained from equipment vendors (AT&T and Western Union) or user personnel. Rental equipment costs are located in rental, rather than facilities accounts.

CHAPTER 5 - ACTIVITY FORMULATION

Determination of business goals and formulation of activities is the most important Phase I task, for analysis and new systems design are based primarily on activities. Activity formulation goes far beyond conventional data organization; it requires substantial thinking into the business in terms of goals, objectives, and purpose, as contrasted to the existing organizational structure. This analysis calls for sound judgment and insight from the analyst to listen to and interpret established views, analyze them, then reslice the business into basic activities.

Initial definition of activities may be modified later as the analyst becomes more familiar with the business, but early definitions and boundaries usually don't change much, even with hindsight. Activities are not structured out of a few interviews or selected readings on the enterprise. They evolve from intensive examination of the nature and practical requirements of the business. Consequently, this chapter will discuss several ways to close in on activity definitions through a series of approximations and successive refinements.

ACTIVITY FORMULATION METHODS

No one best method exists for defining business goals and formulating activities to carry out these goals. However, there are three general approaches the study team selects from to close in on a definition: deductive, inductive and composite. All three presume the team has completed investigations for general and structural information, has prepared a functional organization chart, and has distributed total business costs across the top band of a Resource Usage Sheet, by organization component, for personnel, equipment, materials, and miscellaneous items.

In the deductive method of activity formulation, management is asked for opinions or direct statements on goals of the business. Then the study team defines activities as it interprets these statements, and confirms or revises them by reinterviewing management. In reaching a final goal statement and the resulting statement of goal directed activities, lively discussions with management are usually generated. Once an agreement has been reached on goal definition, then individual activities are investigated and documented on Resource Usage, Activity, Operation, Message, and File Sheets as necessary.

The inductive method works almost in reverse. After an allocation of total business costs is entered on the Resource Usage Sheet, the team starts to document operations as they are encountered and identified, department by department. When Operation Sheets are completed, individual operations are sorted into logically related groups. Next, a rough flow chart is drawn for each group, and studied for content and completeness. It requires considerable insight and many regroupings of operations to achieve an effective activity, and, of course, interviews at this point are necessary to verify results. When the activities are arranged to management's and the team's satisfaction, they are recorded on appropriate documentation forms.

The composite method contains features of the first two. Using the goals stated by management as a guide, activities are formulated by the team, and one or two major activities selected for examination. At the conclusion of the investigation, the team prepares a goal statement and compares results to the original definition supplied by management.

Method choice is determined largely by how well true goals are understood and can be stated early in the study, how much freedom the team has, and how far activity definition and scope departs from existing organization patterns. The deductive method is normally followed when restraints have been placed on the study team by management, or when goals and activities are well defined in the beginning; the inductive method is used where relatively few constraints are placed on the team, and there is considerable freedom of action, or where considerable data gathering is desirable before arriving at a definition. As a result, the deductive method is closely associated with studies leading to the mechanization of an existing system, while the inductive method is more appropriate when a completely creative solution is required. The composite method is frequently applied when one or two activities of the business predominate.

ACTIVITY BOUNDARIES

In a discussion of activities, the question might well be asked: "Why is an activity defined, and what is its usefulness in systems studies?" An activity, as explained in The Approach manual, is a set of related operations, usually self-contained and with few ties to the surrounding environment, and directed toward the fulfillment of one or more goals of the business. The principal reason for having activities is to separate a business into manageable and relatively independent elements which can be easily understood, analyzed, and evaluated. A small business may be treated as an entity, but in larger concerns, size works against the analyst. In a big company, he can quickly lose sight of the forest because of the trees. Recognition of functional patterns (e.g., marketing, engineering, manufacturing, administration, etc.)

does not always resolve the problem; vertical structuring sometimes conceals the true goals of a business.

The Study Organization Plan unified systems approach, based on goal-directed activities, directs the attention of management and the study team toward true goals of a business. Activities position a business for study, but do not necessarily realign organization into new or permanent patterns. Activity structure must be logical and understandable to management, who will make systems judgments and decisions in terms of activity alignments. Also, activities should not depart so far from conventional practice that management cannot easily relate activity costs back to established accounting practices.

In some cases, the business may already be organized into functions which closely parallel suitable activity groupings, and the team needs to make only minor realignments to produce a workable activity formulation. This recently occurred in a bank study where management had already recognized the need for better controls, and was planning cost centers for functions like commercial checking, special checking, installment loans, commercial loans, mortgage loans, savings, personal trusts, etc. Since the cost centers related to functions which serviced individual markets and could be identified with special goals of the business, they provided a basic activity definition for the study team. Better yet, management had become used to thinking in terms of the cost centers, and required little reorientation to consider and appraise costs in terms of activities. Though the cost center plan was not yet fully implemented, bank personnel were able to compile much of the activity cost data for the study team. As a result, Phase I of the study was completed well ahead of schedule.

Although activity formulation is performed in Phase I, the study team will have an opportunity at the beginning of Phase II to modify the preliminary results. For example, in Butodale Electronics, the first pass at activity definition produced these results:

- Prepare Quotations and Accept Orders
- Procure Material
- Manufacture General Purpose Analog Computers
- Provide Other End Items
- Sell Spare Parts
- Develop Engineered Products

Later, the team made some adjustments to this list and settled on this statement:

- Provide and Communicate Demand
- Provide Materials and Components
- Provide End Items
- Provide Spare Parts
- Provide Engineered Products
- Provide Research and Development
- Provide Personnel, Facilities, and Management

The scope of the first activity was increased to cover all demand up through communicating demand to the shop, rather than just the acceptance of orders and preparation of quotations. In others, a distinction was made between products which are essentially custom-designed and ones which are considered "standard". The revised definition also resulted in a better balance in size among the various activities.

There will always be an element of cut-and-try in achieving activity balance, identity, and boundary; approximations are usually required before proper results are obtained.

Example in a Large Company

While the following example is not truly representative because of the company's size, the various steps taken in activity formulation are indicative of the kind of thinking and interpretation which is involved in this process.

The purpose of the study was to resolve duplications in function and organization, and provide more effective overall control of operations. Quite briefly, the company looks like Figure 11.

Initially, parent and subsidiary organizations were analyzed to see what could be set apart as self-contained activities, not closely interrelated with other activities. Exploration qualified because its responsibility ended when crude oil was supplied to

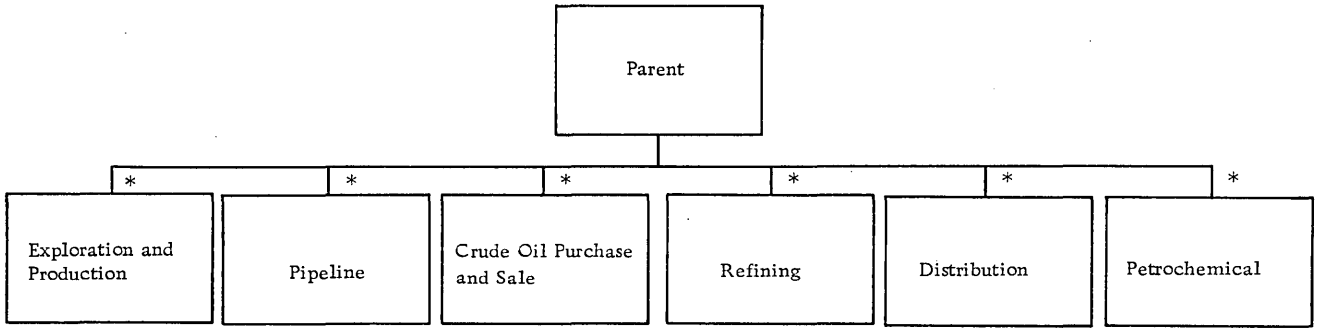


Figure 11.

* Individual operating companies described by functions.

Pipeline. However, its operation was interrelated with both Pipeline and Crude Oil Purchase and Sale. Pipeline exerted too great an influence on the company information system, since it served as the linkage between Exploration, Crude Oil, and Refining. In contrast to these, Petrochemical turned out to be a highly integrated business. Its only interrelationship with other organizations was the "purchase" of material from Refinery (which it supplemented through its own purchasing department), so Petrochemical, with its own manufacturing and distribution departments, was set aside as a preliminary activity.

Formulation of activities from the standpoint of organization, then, yielded only one (Petrochemicals). The next step was to consider several other points of view:

- Did any of the companies have self-contained functions?
- Was the key in product lines, markets, or services?
- How about activities by types of raw materials, or kinds of resources?
- Was there a clue in corporate goals?

Function and product seemed to be reasonable approaches for this company, since every concern that manufactures products uses materials and processes them through a facility to produce the products.

Exploration, Pipelines, and Crude Oil were all concerned with providing material to the company; Refining is basically the manufacturing function which uses the materials. Consequently, two more preliminary activities were established: Provide Materials and Manufacture Products.

Next, Distribution was studied and found to serve three different types of markets:

- Internal Combustion Engine Fuels (gasoline)
- Accessories (tires, etc.)
- Heating Fuels

Each market had decidedly different characteristics and required different marketing practices and organization, so three activities were established for Distribution to parallel these markets.

Finally, management and control functions of the parent company were assigned to an activity called Provide Management.

From this recasting of the business, the results showed an activity formulation reflecting organization (Petrochemicals), functions (materials, manufacture), products (engine fuels, accessories, and heating fuels) and control (management) as shown in Figure 12.

Because this was a very large company, the initial activity definition was in effect an identification of separate businesses. As a final step, activities were formulated for each newly defined business.

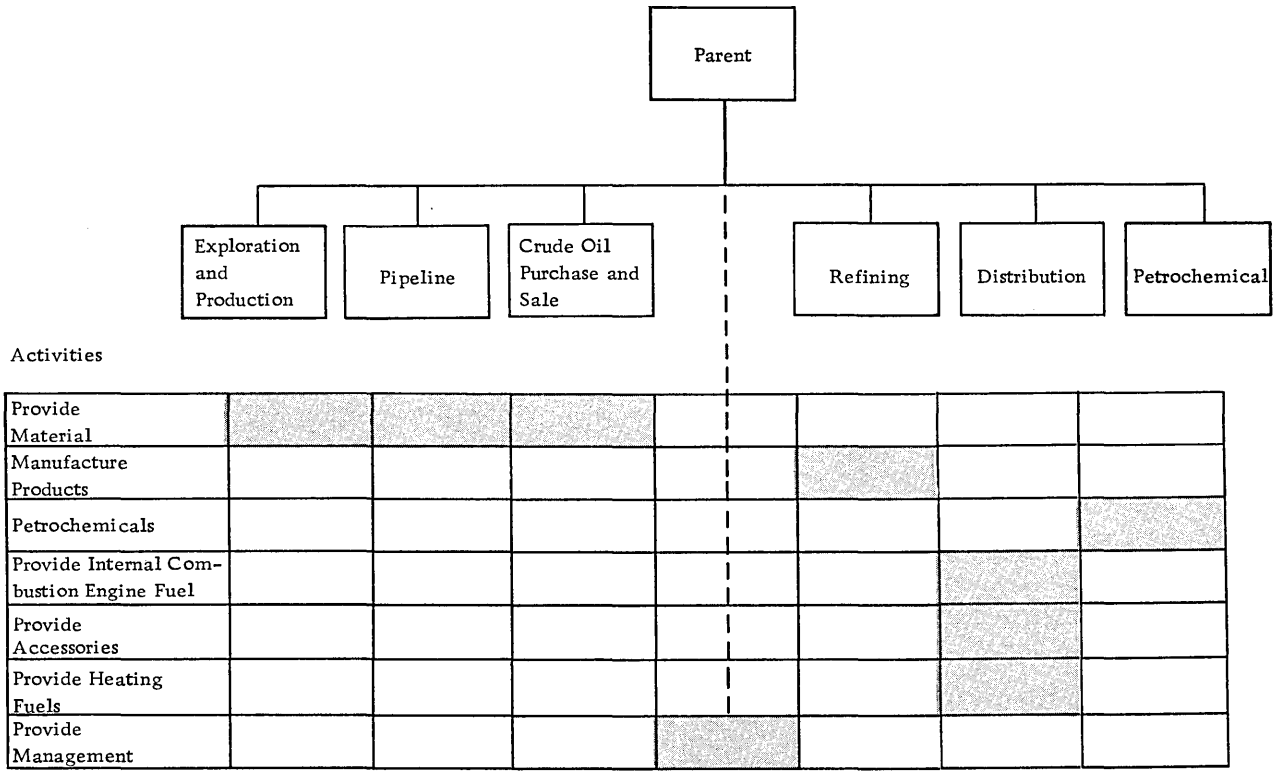


Figure 12.

ACTIVITY DATA

Even after activities are defined, the study team faces certain problems in data gathering. Although an analyst still relies on interviews, file searches, and sampling or estimating to secure data, he may no longer have benchmarks to test against.

Consider, for example, the team which has been asked to study one or two activities with very high affectable costs, and concentrate on these areas to the exclusion of others. As the analyst moves through a department, he will find some department costs apply to the activity he is investigating but others do not. He must, therefore, exercise great caution to insure the accuracy of his results. He finds himself in much the same situation as the accounts payable clerk who has lost the control tape for invoice payments, and therefore does not know what total figure he must prove to.

The problem is further compounded by the fact that in operational data, elapsed time is more significant to the study than process time; flow and sequence of events is more meaningful than occurrence of events; and operations costs are more revealing than costs by general ledger accounts.

The special problems involved in gathering operational data are explored in Chapter 6.

In this section, operating dynamics of a business are described in the framework of activity classifications. Time, cost, and flow and sequence of events are important factors identified in this part of the study. To assist in organizing the analysis and displaying results, SOP provides five special forms which are discussed in IBM Reference Manual C20-8075, "SOP Documentation Techniques". The interrelationship of the five forms is shown in Figure 13.

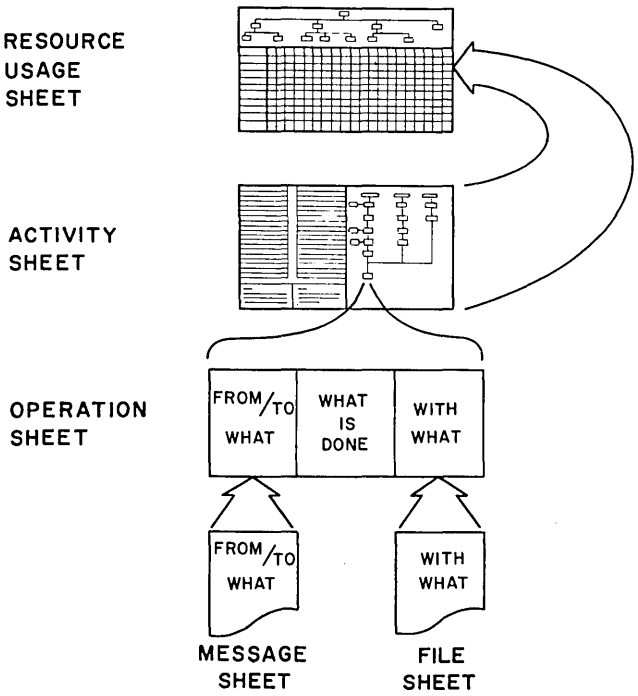


Figure 13. Documentation Structure of the Operational Section

COURSES OF ACTION

The study team has two principal alternatives in data gathering for the Operational Section, and they relate closely to previous methods followed in activity formulation.

Under either alternative, a functional organization chart is first prepared and laid out on a Resource Usage Sheet (or two, if the number of departments or groups of departments exceeds 20). Then costs are compiled by department in categories of personnel, machines and equipment, material, and miscellaneous, and recorded on the top band of the Resource Usage Sheet.

Where few study restrictions have been specified, the team turns to examination of operations throughout the business (or in one or two major-impact activities, as the case may be) before activity definitions and boundaries are made final. After activities have been formulated, they are flow charted, and operational documentation is completed (the bottom-up approach, or inductive method of data collection).

On the other hand, in studies with more restrained objectives, such as in improvement or mechanization studies, or where management has stipulated what areas are to be investigated and what steps to follow, individual activity bands of the Resource Usage Sheet can be filled out first, then activities flow-charted for sequence, and finally, operations documented as necessary to support study objectives (the top-down approach, or deductive method of data gathering).

The problems which arise in relation to analyzing costs, time, and sequence of events are much the same for both methods, and therefore are treated together over the remainder of the chapter.

COSTS

Several types of cost summaries are useful in a Phase I study, in addition to the exhibits in the Financial section:

- Department or product line costs by personnel, equipment, and other categories.
- Activity costs by these same categories.
- Resource costs by operational usage.

Inasmuch as activity costs generally cut across conventional accounting classifications, a study team often runs into difficulties preparing cost analyses.

Cost Systems

Each industry or field of endeavor (manufacturing, insurance, banking, government, etc.) has evolved its own accounting practices; there is considerable variation among businesses even within an industry. Before conducting cost studies, an analyst can save time and effort by sitting down with qualified financial personnel and learning about special characteristics of the accounting system.

Figure 14 is a typical manufacturing cost classification scheme.

Such a classification is suitable for making departmental cost distributions on the top band of the Resource Usage Sheet, but data normally must be reclassified to produce costs by activities or product lines. Unit costs (the cost of a unit of production within a department) are relatively easy to compile under a direct costing system where all expenses are separated between fixed and variable costs. With the more prevalent allocation or burden cost systems, however, an analyst is faced with the need to allocate expenses and overhead (or burden) to arrive at unit costs.

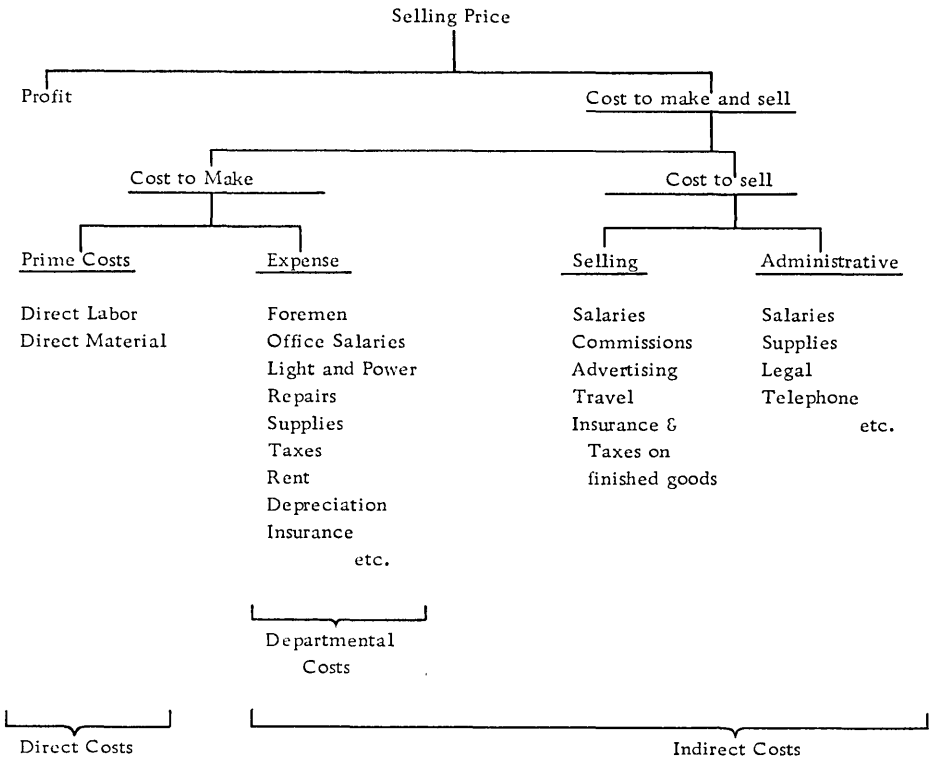


Figure 14. Cost Classifications

Compiling Activity Costs

Activity costs are compiled by indirect methods. During interviews, some department heads and supervisors respond to a direct question such as: "How much of your budget (or your effort, as the case may be) is involved in this specific activity?" If this cannot be answered with a fairly precise estimate, the question is rephrased to furnish further guidance in making an estimate: "How much effort or money would you save by eliminating this activity from your department?" Still another approach is to ask: "How much money or effort would it take for you to set up this activity as an independent operation?" Sometimes none of these approaches work, and the analyst and management must estimate from their knowledge of the business.

In a complete business study where estimates can be checked to total department costs, and in partial studies where only one or two activities are being investigated, estimating or sampling reliability should always be checked with the cost supervisor, or other managers.

At Butodale Electronics, the team initiated the activity cost allocation from a consolidated overhead statement. With labor and expense totals for each account (supplies, freight, taxes, wages, etc.) by department, they successively interviewed department heads to determine what share of these accounts applied to each of the several activities. When interviews were completed, they distributed results on the Resource Usage Sheet by activity and department (Figure 15). The total distribution was then reconciled to the consolidated overhead statement.

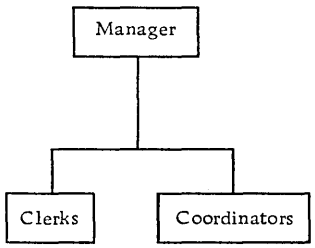
Product or Unit Costs

Many companies do not set up product cost accounts and publish reports by product lines. Such information is frequently confidential, and in any case requires increased accounting expense to prepare and maintain.

The experience of one study team illustrates how product costs may be developed where records by this category do not exist. Working in a manufacturing business ($56 million annual sales), a four-man team was investigating marketing and engineering functions for several selected product lines representing roughly 15% of the total sales volume. Since management was very specific in stating project objectives and scope, the team employed the top-down, deductive method of study. Little reliable information existed on costs by product lines. Instead of just making an educated guess across the board, the team carefully

Notes:

Organization Chart



Total Business Costs		
Personnel	$xxxxx	$xxxx
Machine and Equipment	xxx	xxx
Material	xxx	xxx
Miscellaneous	xxx	xxx
Total, by department	$xxxxx	$xxxxx
"Provide Demand" Activity Costs	$	$
Personnel	xxx	xxx
Equipment	xx	xx
Material	xxx	xxx
Miscellaneous	xx	xx
Total, by department, for costs in "Provide Demand" activity	$xxxxx	$xxxx
"Provide Material" activity costs	$	$
.	xxx	xxx
.	.	.
.	.	.

Figure 15. Schematic Resource Usage Sheet

selected a representative month and studied the flow of all orders and inquiries from the time they were received in sales offices until they reached a manufacturing schedule. This entailed searches of order files in engineering, marketing, and cost departments. Average unit costs were supplied by the accountants; then the team assigned overhead to these direct engineering and labor costs. After extending the sample to an annual basis, they checked the sample against total sales figures in marketing for reasonableness.

Resource Costs

Dividing resource costs (files, machine tools, data processing and communications equipment, personnel, etc.) among operations and activities is made difficult by characteristics of most cost accounting systems. Data processing facilities can be allocated by usage (% of total cost); personnel expense can be distributed by multiplying head count times % of hours worked on the activity, times an average wage for the labor class; files expense can be apportioned roughly by assigning first-cost and upkeep charges to the section requiring their maintenance. In general, the method must be tempered by comparing compilation costs against desired levels of accuracy. Results are always checked with supervisors for reasonableness.

TIME

Time data is collected by sampling and analysis rather than by interviews; people are not as accurate with time estimates as they are with costs. When recalling time in relation to events, most people remember the difficult, time-consuming situations or the exceptionally easy and fast ones, but rarely can identify the average.

Elapsed Time

Elapsed time is recorded within operations and also summarized for the entire activity on Activity Sheets. Within operations, it is defined as the time between the occurrence of successive inputs, or the time between the arrival of the first input and the availability of an output. Elapsed time is influenced by many factors: volume of transactions, day of the month (banking), month of the year (retailing), and the like. Therefore, data is always gathered for the peak as well as the average situation.

Where good data is not available, sampling produces results quickly. For example, a batch of papers can be time-stamped at successive processing stations as they are being sent out (stamping documents after people have worked on them avoids the implication the person is being studied by time-and-motion methods. This is important in sampling; people must not feel they are being studied, rather than the work). Time relationships can also be reconstructed from file data, correspondence, memos, and other information which fixes time directly or indirectly. Mailroom personnel can also be used to record time. In sampling, peaks can be determined by conducting tests during periods when the peak is most likely to occur.

An example of recording elapsed time on documentation forms is demonstrated in Figures 16, 17 and 18. The operation "Assign to Design Group" (Figure 17) from the Butodale report refers to Engineering Administration assigning customer inquiries among the engineering design groups for technical review and reply to the customer. As the operation sheet (Figure 16) shows, a volume of 40 orders per month is involved, with elapsed time established as one to three days (the time between receipt of the quote folder in engineering administration and release of the quote order to the appropriate design group). The operation is also exhibited as it appears on the activity flow diagram (Figure 17), and as its elapsed time is summarized in the grid area of the Activity Sheet (Figure 18).

FUNCTION: QUOTATIONS					
INPUTS: 2000 2010					
KEYS	AVG	PEAK	NOTE		
1-2	1H	1D			
3-4	2H	6D	1200		
4-6	1D	2D			
7-8	1H	4H			
8-11	1D	6D	1200		
12-13	2D	5D			
13-14	1D	2D			
14-15	1D	3D			
15-16	12D	30D	1210		
16-17	3D	10D	1200		
17-18	2D	5D			
20-23	2D	5D			
7-11	2D	5D			
14-16	14D	30D			

Figure 18.
Elapsed time summary
on Activity Sheet

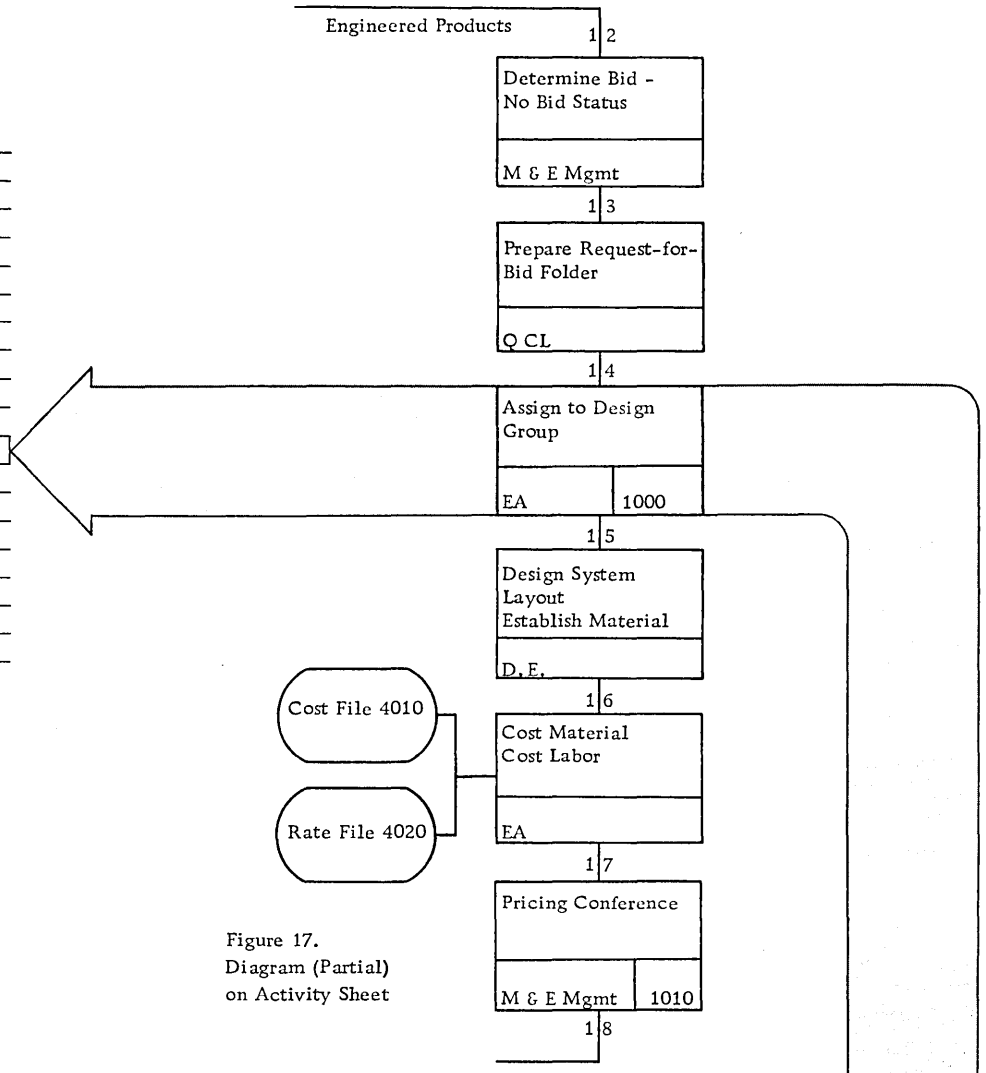


Figure 17.
Diagram (Partial)
on Activity Sheet

IBM — **Operation Sheet**

OPERATION NO.	PERFORMED BY	ID. NO.	TRIGGERS, INPUTS AND OUTPUTS: NAME AND QUALIFICATIONS	RECEIVED FROM OR SENT TO	VOLUME AVG.	VOLUME PER	ELAPSED TIME	RESOURCES: FREQ.	ID. NO.	TYPE	UNIT TIME	TOTAL TIME AVG.	TOTAL TIME PER
010-001	ENG ADM.	T1	RECEIPT OF I1										
KEY NOS. 14-15		I1	QUOTE FOLDER (SPEC., REQUEST FOR BID FOLDER, IDENT. CARD)	QUOTE SEC.	40	M	0						
		R1	QUOTE FOLDER (WITH ALL PAPERS)	DESIGN ENG.	40	M	1-3D	1/I1	X1	ADM. ENG. (1)		31H	W
			BIDDING										
		P2	DETERMINE WHICH GROUP OR GROUPS IN ENG.					1/I1					
			DESIGN WILL COMPLETE BID										
		P3	DETERMINE WITH PROPER GROUP THAT THEY					1/I1					
			UNDERSTAND REQUEST AND SPEC.										

Figure 16.
An Operation

Resource Time

Unit and total resource usage times recorded on the Operation Sheets are used as a basis for determining resource costs. Estimates of personnel time by operation are compiled from supervisory interviews, and verified by comparing to total man-hours available for the selected period. Resource usage is more easily calculated by sampling or estimating. One method is to find the length of time a resource is actually used in the operation, then extend it by operation volume and frequency over a time period. For example, in the process of selecting a vendor from a stock record file, an average look-up and selection may require ten minutes. At 100 orders a week, the resource usage time of the file becomes 1000 minutes/week, or 16 1/2 H/W.

SEQUENCE AND FLOW

Operations within an activity are plotted in a flow diagram (along with inputs, outputs, and file resources) to demonstrate the flow and sequence of events in a business. The completed flow chart is placed on the right side of an Activity Sheet. Elapsed and resource times are summarized in the grid area of an Activity Sheet to furnish a composite picture of time (and also to pick up time between operations), and volume data is introduced to the grid area (Figure 19) for easy comparison with time information.

Activity Name

FUNCTION: QUOTATIONS

INPUTS: 2000, 2010

KEYS	AVG	PEAK	NOTE
1-2	1H	1D	
3-4	2H	6D	1200
4-6	1D	2D	
7-8	1H	4H	
8-11	1D	6D	1200
12-13	2D	5D	
13-14	1D	2D	
14-15	1D	2D	
15-16	12D	30D	1210
16-17	3D	10D	1200
17-18	2D	5D	
20-23	2D	5D	
7-11	2D	5D	
14-16	14D	30D	
23-25	14D	90-D	-MAX
		20-D	-MIN

FUNCTION: ORDERS

INPUTS: 2020

KEYS	AVG	PEAK	NOTE
25-28	4D	10D	
28-29	2D	4D	
29-31	1D	3D	
25-31	7D	20D	1220

INPUTS

KEY	NAME	SOURCE	AVG VOLUME	PEAK VOLUME	NOTE
2000	QUOTE REQUEST	CUST	50/W	70/W	1020
	FREQUENCY		46 W/YR	4 W/YR	1030
2010	BID REQUEST	CUST	10/W	12/W	
	FREQUENCY		42 W/YR	10 W/YR	1040
2020	ORDER	CUST	16/W	20/W	1030
	FREQUENCY		44 W/YR	6 W/YR	

OUTPUTS

KEY	NAME	DEST	AVG VOLUME	PEAK VOLUME	NOTE
3000	QUOTATN	CUST	15/W	20/W	1030
	FREQUENCY		40 W/YR	10 W/YR	
3050	ACKNOW	CUST	16/W	—	1050

FILE USAGE

KEY	NAME	MSGS AVG	MSGS PEAK	ACCESS	USAGE TIME	NOTE
4000	PRICING	240K	300K	RANDM	8H/D	1100
4010	COST	1,000K	—	RANDM	—	1110
4020	RATE	2500	2800	RANDM	8H/D	
4030	INSTALLED SYSTEMS	400K	—	RANDM	4H/D	1120
4050	CONTRACT REGISTER	1500	2100	SEQ	8H/D	1130
4060	CUSTOMER INDEX	4000	5500	SEQ	2H/D	
4070	PROJECT INDEX	1500	2100	SEQ	1H/D	
4080	ASSIGN'T SHEET	20	80	RANDM	10H/D	1140

IBM Activity Sheet

NOTES
1100 - PRICING FILE IS USED IN BOTH END ITEM AND SYSTEMS QUOTATIONS.
1110 - COST FILE IS PRESENTLY MAINTAINED IN 3 DIFFERENT AREAS. NO CARDS HAVE YET BEEN DISCARDED.
1120 - INSTALLED SYSTEMS FILE HAS NOT YET BEEN PURGED.
1130 - CONTRACT REGISTER IS MASTER OPEN CUSTOMER ORDER FILE. WHEN ORDERS ARE COMPLETED, THE RECORDS ARE MOVED TO THE INSTALLED SYSTEMS FILE.
1140 - MUST BE AVAILABLE FOR SECOND SHIFT.
1200 - WIDE VARIATION DUE TO SYSTEM VARIATION. THERE IS NO SUCH THING, STRICTLY, AS "STD SYSTEM"
1210 - MULTIPLE DESIGN "PASSES" (SEE NOTE 1000)
1220 - TIME ALLOWED BY CUSTOMERS TO ACKNOWLEDGE ORDER VARIES FROM 1D TO MAX. OF 30D.

NOTES
1020 - BREAKDOWN OF REQUESTS FOR QUOTATION:

	STD SYSTEMS	807-817	OTHER	STD END ITM	PLOTTER	OTHER
AVG	36/W	32/W	4/W	14/W	10/W	4/W
PEAK	51/W	40/W	11/W	19/W	14/W	5/W

1030 - PLANT CLOSES DOWN FOR 2 WEEKS EACH YEAR, SO THERE ARE 50 WEEKS/YR FOR THIS INPUT. PEAKS OCCUR JUST BEFORE AND JUST AFTER THE 2-WEEK CLOSED PERIOD.
1040 - ENGINEERING DOES NOT CLOSE DOWN ALONG WITH THE PLANT, SO THIS INPUT OCCURS 52 WEEKS PER YEAR. PEAKS OCCUR AT BEGINNING OF EACH FISCAL QUARTER.
1050 - ESSENTIALLY NO PEAKS IN THIS OUTPUT.

Figure 19. Volume Data on the Grid Area of an Activity Sheet

Volume and Frequency Data

To obtain input and output volumes and fluctuations above and below averages, an analyst conducts record searches over representative periods. The historical approach has a disadvantage: it produces flat distributions when representative time periods are extended or annualized (e.g., average vouchers per week, shipments for August, 1961, orders received for one year), although this can be compensated for by pinpointing peaks and studying them individually (in a bank, for example, check processing peaks occur on the day factory and office payrolls are distributed). Where historical records are not productive, the analyst conducts running tests of incoming orders and outputs created by this input.

Volume information, of course, is not meaningful unless related to frequency of occurrence. Noting that average volume is 300 orders per day and peak volume 400 per day gives no idea of how significant the order peak is: if it occurs twice a week or lasts for three months, it obviously has greater impact than if it occurs but two days a year.

Clues on peaking times of cyclical data can be obtained through familiarity with the business. In various parts of a study, an analyst should be asking questions like: What are customer invoicing days in a billing routine? Are most withdrawals from stock or inventory made during certain hours of the day? In accounting, what is the cutoff day for monthly interdepartment transfers?, etc.

DATA RELATIONSHIPS

The completed Resource Usage Sheet shows costs from the larger background of the business allocated to activities (and functional organization components). Source and basis for allocation of costs is shown, in the Appendix, for each bottom-level block on the Resource Usage Sheet organization chart: source for the cost entry (an account on the overhead statement, a wages summary, etc.) and basis for cost allocation to activity (percent of people involved, amount of departmental time, section or job assignment, etc.). One or more Activity Sheets reveal not only the flow, sequence, and interaction of operations, but also peak and average volumes, elapsed and resource times, and frequency of occurrence. Volume, time, and frequency data is summarized from individual Operations Sheets, if they were used in the study, or is recorded directly on the Activity Sheet at the time the information is secured.

When Operation Sheets are used for data documentation, they show what is done (processes), with what resources, under what conditions, how often, to produce what specific results. A primary purpose is to show the time relationships and volumes among inputs, processes, resources, and outputs.

Where Operation Sheets are not used and the operations description in confined to the Activity Sheet, a simple (but clear) two- or three-word title is inserted in each flow chart block, along with a code, to identify the department (Figure 20).

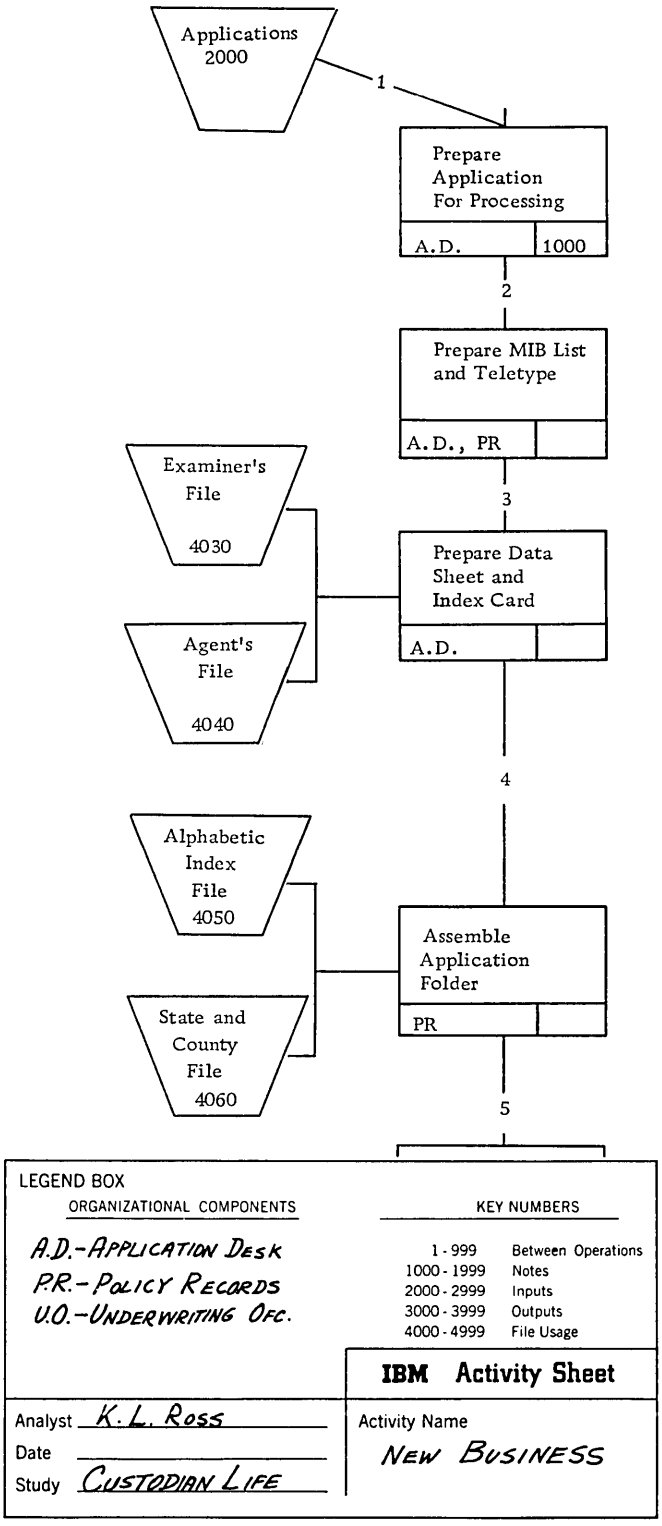


Figure 20. Operation Description

Message and File Sheets support the Operations Sheet. The Message Sheet describes, to the level of detail desired, from what source, or toward what result an operation is working. The File Sheet describes a collection of messages, and shows with what stored information an operation works.

As operations are being grouped into activities, the analyst may find some operations are too large and need to be subdivided, or he may find that several operations are actually a series of processes, and could be efficiently combined. It is not unusual to find that initial documentation plans are modified in the light of subsequent appraisals and evaluation. It is also a temptation at this stage to consider questions on whether to merge processes or operations for reasons of economy, or to mechanize operations, or eliminate them because of their redundancy. The function of Phase I, though, is to understand, not to solve: the report is a descriptive document, not a proposal. Merging operations, eliminating them, or otherwise reorganizing the system may take the form of notes for subsequent phases of study and design, or as incidental recommendations to customer management in the report introduction. As the team sees opportunities for improvement, it must avoid getting involved in their implementation at this point, since this can only delay the study.

Experience has shown that if a team is diverted from its main objectives to carry out short range improvements, it rarely returns to complete the original study; if one analyst leaves for the same reason, he does not rejoin the team. Opportunities to improve the system should be brought to management's attention in the Introduction Section of the Phase I report, and suggestions advanced on how they may be implemented by persons other than those on the team. The study team should point out to management that these conditions may well be corrected with the introduction of the new system at a later date, or the condition may not even exist once the new system is in full operation. Since the impact of the new system cannot be predicted by the end of Phase I, effort spent on implementation of short range improvements may be totally wasted.

FLEXIBILITY OF FORMS USAGE

The five documentation forms have been applied to such a wide range of studies that no hard and fast rules can be stated on the depth and breadth of detail required for a particular Phase I study. Each has its own requirements, and the degree of documentation necessary must be decided upon by the study team. Generally, Phase I documentation must meet three tests:

- a thorough understanding of the present business is conveyed through the data.
- a solid base is provided for subsequent phases of study
- a logical sequence and relationship in description is provided, from the total view (Resource Usage Sheet) to the partial view (Activity, Operations, File and Message Sheets) and back again.

The Resource Usage Sheet remains fairly constant for all studies in content and arrangement, but there is some flexibility of application. For example, goal-directed activities can be covered one by one and everything then left over can be lumped into a "general" activity. This occurred in the Butodale study when six goal-directed activities were formulated and everything else was assigned to an "all other" activity (entitled "Provide Personnel, Facilities, and Management"). In working with large dollar figures, as on a Resource Usage Sheet, an analyst can often save time without compromising effectiveness by rounding off data to tens of dollars, or even, occasionally, to hundreds of dollars.

One source of documentation flexibility is choice of language level. For example, the overview language may be used on an Activity Sheet, with the result that operations are shown in a relatively few, precisely worded blocks, and in broad language terms. Then, if necessary, Operation Sheets are used for a more detailed analysis of peak and average volumes, and elapsed times. On the other hand, the Activity Sheet can be very detailed in content and language and eliminate the need for Operation Sheets.

Operations descriptions, too, may be quite detailed, as in Figure 16, or they may be restricted to a single, meaningful phrase (e.g., "Prepare Invoice"). Descriptive phrases for operations should be nonrestrictive, however, to permit freedom in design. For example, use "Arrange Data" rather than "Sequence Data", since the latter implies the nature of the arrangement.

Message Sheets can be filled out only for major input and output messages or for all significant messages encountered. When prepared, the form may include only a name and number and have a copy of the message attached; it may include name, title, and data on operations, media, and how the message is prepared; or it may contain complete data down through a description of individual fields in the message.

A similar approach applies to files. A File Sheet can be completed for every major file, or information can be recorded only for those files which affect more than one activity. On the other hand, merely a file number and location might be sufficient for the study.

These are only a few suggestions of documentation flexibility. Whatever the final documentation decision, results should meet the three conditions suggested earlier as a measurement standard.

CHAPTER 7 - PREPARING AND PRESENTING THE REPORT

The final task in a Phase I study is to organize and publish results in a report, to management, entitled the Present Business Description.

The written report includes a letter of transmittal, Introduction, General, Structural, and Operational sections, and an Appendix where necessary. In evaluating what should be included, and how much, a study team might well ask: "Why do we have a report?" and "What useful purpose does it serve?" Among other objectives, a Phase I report must:

- demonstrate understanding of the existing business.
- develop a new view of the business in terms of activities.
- establish benchmarks in time, cost, and accuracy.
- serve as an adequate base for conducting later phases of the study.
- present in one place a complete description of the business (many people know certain parts well, but few have the total picture in mind).
- provide a dictionary of terminology and language, which is unique to the business.
- communicate the description for proper interpretation by a diverse audience.

INTRODUCTION

The Introduction sets the climate for a Phase I report, and states ground rules for performing the study which were agreed to initially by management and the team.

The purpose of the study is stated, and study scope defined. Was the study to create a wholly new system, or was it conducted to improve the existing system? Was the objective to obtain dollar savings by improving operating efficiency, or was it to raise the technical competence of the business substantially? Whatever the purpose of the study, it should be explained here, even if it had been published widely in the beginning.

The principal points covered in scope are:

- area of the business included (and excluded) in the study.
- level of detail to be applied, and to what activities and departments.
- modifications of the original agreement or study plan.

Closely related to a discussion of scope are those special extensions of authority (or restrictions on authority) which apply to the conduct of a study. This includes rules on access to confidential information, restrictions on the release of operating data, contacts with employees and managers for interviews, permission to investigate special situations, use of processing facilities, and other matters which pertain to sound business practice and the maintenance of good relations.

Then the purpose of each major report section is briefly discussed. Purpose may be stated as:

Section	Purpose
General -	Describe the environment in which the business operates, and the position of that business in the environment.
Structural -	Amplify the description of the business in terms of inputs, outputs, and resources.
Operational -	Define activities and relate them to the established framework of the business.
Appendix -	Present the detail documentation on the activities of the business.

The final part of the Introduction is a summary of Phase I results and recommendations. What are the key facts on each of the activities in regard to size, volume, cost, and time? What suggestions does the team have on possible immediate improvements? What other insights of value to management were gained in the study? This last part of the Introduction is vital, and gives management some idea of study value, even though Phase I is devoted mainly to a description of the present system.

REPORT MECHANICS

At the conclusion of data gathering, the study team has a collection of notes, exhibits, flow charts, and miscellaneous documents representing the sum of their efforts over the past few weeks. Now the problem is to sort the wheat from the chaff, combine, condense, and edit the material, and convert it into a report which has subject-by-subject balance, continuity, and flow. Examples from Chapters 3, 4 and 6 can be used as guides for preparing individual parts of the three major report sections. Once this is accomplished, the total report is evaluated once more for completeness, sequence, and relationships among the several parts.

The General Section, with its emphasis on narrative, is directed mainly at the top management audience, as is the Structural Section. However, the presentation of structural information shifts from a concentration on narrative to a more highly inductive treatment where visuals are employed to achieve maximum data coverage with a minimum expenditure of reading time. Wherever possible, data is displayed with line charts, bar graphs, pictures,

layouts, floor plans, lists, and summaries. Some narrative is still required for transition, explanation, and interpretation, as well as for the maintenance of pace and flow.

The Operational Section is aimed principally at the systems engineer or analyst audience, and Resource Usage and Activity Sheets may be included here without annotation. However, a number of study teams have found considerable interest has been shown on these forms by managers (particularly the Resource Usage Sheets and summaries of volumes and elapsed times), and a nominal amount of explanation may be helpful to point up significant data and results.

When they are part of a study, Operation, Message and File Sheets and special detail exhibits are located in the Appendix without further notation.

Report length depends largely on the size and complexity of the business to be described. In Butodale, for example, the General section runs six pages, and the Structural section 27. Worthington Hardware has 12 and 23 pages, respectively; National Bank of Commerce contains 16 and 25 pages to cover these two sections. The inclusion of a great deal of data on manufacturing equipment lengthened Butodale's Facilities section, and added little to an understanding of the business. The same can be said for four pages of notes appended to the financial statements in the Worthington report.

AUDITING THE REPORT

As the study team assembles data into a final report, individual sections are tested for adequacy, coherence, unity, consistency, proportion, clarity, simplicity and accuracy. Considering the importance of time and economy, information content should be adequate for its immediate purpose, without being too detailed. Various parts of the report should demonstrate coherence and unity, so that each part evolves sequentially from the preceding parts. Consistency implies that events of the same importance will be treated generally in the same way, or to the same level of detail, so that the report audience need not switch frames of reference from subject to subject.

There are a few specific questions the study team can ask which help to appraise the report.

Are there any gaps? Are operations missing from the documentation of any activity? Do the activities traced out in the Operational Section adequately represent the business or business sector which is the scope of the study? If activities have been omitted, they should be noted to show the impact they have on the activities described in the study.

Do the descriptions at each of the various levels give roughly the same kinds of information, in the same detail, and in generally the same form? Coherence and consistency within each of the three sections is important for easy comprehension. Detailed descriptions of Products and Markets in the Structural section, for example, should be matched in tone, form, and detail by the descriptions of Materials and Suppliers — if both are equally important. Two equally important activities traced out in the Operational section should be documented to the same depth; if Message Sheets are prepared for one, they should be prepared for the other; if housekeeping operations are omitted from one, they should be omitted from the other. An audience is affected by the proportion and balance of a report, and if an unimportant process is omitted from the documentation of one activity and not from that of another, it will assume unwarranted importance in the second case.

Is the environment consistent across the entire present business description? Environment, by definition, includes the surroundings which are directly outside the scope of the study. In the study of a complete business, consistent environment is no problem: it is everything not in the XYZ Company. But if one part of a company has been staked off as "the business" (the subject of the study), then other departments of the company which influence the study become part of the environment.

Is the level of detail adequate for the phases to follow? A subsequent phase of requirements analysis follows, as does the phase in which a new system is designed and communicated. Before Phase I can be considered finished, then, the analyst should determine whether or not the information serves as a foundation for performing Phase II analysis and Phase III systems design. Note that iterations can be made to secure detail operational data.

Continuity, Cohesion, and Content

Phase I is referred to as describing and understanding the present business, but in a sense this is not completely true. The General and Structural Sections portray static elements of the business, but in the Operational Section the business is described by activities which contribute to goals and objectives, a recasting which slices through the enterprise from an entirely new angle. Starting from the broad base of organizations and costs on a Resource Usage Sheet, the description moves into a display of individual activities on Activity Sheets, supplemented where necessary by Operation, Message, and File Sheets. Thorough understanding of the business must be demonstrated in two directions: as the documentation descends progressively to more detail, and as it builds upwards from File, Message, and Operation Sheets to Activity and Resource Usage Sheets. Each

of the documentation forms contributes data to other forms. If Operation Sheets are weak in time and cost information and strong on the sequence of events, then flow charts of activities can be drawn up accurately but there will not be sufficient factual data for a cost allocation on the Resource Usage Sheets, or for the tabular section of the Activity Sheet. The team must be sensitive to the total data requirements and be continually thinking about the impact of the particular file they are studying in relationship to broad data requirements. Description of a communications network from the complete system to its elemental parts and back to its whole again, is a typical example of how description interacts from section to section. The capacity is set for the network in the Structural Section, while utilization and operations variability are covered in the Operational Section. Failure to inject flow and relationship among the several sections will produce a total description of the business, but a highly static (and erratic), rather than a dynamic one.

Example

To illustrate, consider this descriptive process in relation to a baseball team. Here, the General Section of a "Present Business Description" discusses the ball park, spring training site, minor league chain, owners, fans, and the fact that the team wound up second in the league last year. The Structural Section might discuss the areas from which fans are drawn, preference for box and bleacher seats, number of seats in the ball park, income when the stadium is completely filled, team record for the last ten years, etc. Working down into the Operational Section, the concern is now with bunts, grounders, balks, home runs, and double plays (processes) which make up an inning (operation) and game (activity). A fan tuning in a game has no real appreciation of the situation, when he watches the batter at the plate, unless he knows team names, league standings (General Section); ball players, batting and fielding averages (Structural Section); count on the batter, number of outs, and game score (Operational Section). Even in baseball, peak, average, and cyclic data are critical. Game events are influenced by the fact that, although the pitcher is 15 and 5 on the season, he has lost his last four games; and while the batter is hitting .272, he has gone 16 for 28 in the previous seven games. A ball game is far less meaningful if the lore of the pastime, league background, and lifetime averages are not drawn down into the dynamics of the hit-and-run play. By the same token, there is little significance in a squeeze play at home plate, unless it is known that the contending clubs are 1-2 in the standings, and half a game separates them in the final week of play. In business as in baseball, operational data is not meaningful if it is not related to the broad framework of general and structural information.

The Present Business Description of a real-life enterprise must demonstrate this same kind of communication from the top down and bottom up. The Activity Sheets should reveal queues, volumes, and time cycles in the grid area of the form. File Sheets should show growth, shrinkage, averages, peaks, and distribution. Message Sheets are more effective when they amplify the static data on size and content with facts on frequency and importance. Only when the analyst has checked and rechecked this kind of flow and interaction among the elements of activities, and the forms on which they are described, can he consider his first task complete.

PRESENTATION OF THE REPORT

When the report is finished, a letter of transmittal is prepared as a cover document (even though the recipient may be the analyst's own management). The principal function of the letter is to transmit the report formally; it need not be long or detailed. Since this is a well recognized document, it need not be expanded on here, except to mention that key officials are thanked for their interest and cooperation, and a request is made for an audience to review the findings in the near future.

The Phase I report should be presented to management far enough in advance of a formal review session to permit knowledgeable discussion when the analyst makes his oral summary.

An oral presentation can be made more effective with the use of enlarged exhibits to illustrate General and Structural data and the Resource Usage Sheet. Narrative from the General Section can be converted to flipchart sheets. Under no circumstances should the report be read nor should the presentation cover the data exactly as it is contained therein. The presentation will be far more effective if it is extemporaneous and well prepared charts are used for emphasis.

LOOKING AHEAD

After the Present Business Description has been prepared, audited, presented, and accepted by management, Phase I is complete. In actual practice, though, there is no abrupt demarcation among the three phases, since the transition is progressive and some of the work lap-phased. While studying the present business, an analyst is always looking ahead to the requirements of systems specifications and design, and in later phases he looks back to recall earlier results and conclusions.

Concurrently with Phase I report preparation,

some team members will be refining goal and activity definitions, and analyzing system requirements. In this work, many different analytical techniques will be applied to devise a system specification. The analysis surrounding a determination of systems requirements is the subject of "Study Organization Plan: The Method, Phase II".

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