

COSTING METHODS FOR MATERIALS
PROCESSING IN THE METALS SERVICE
CENTER INDUSTRY

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ABSTRACT

COSTING METHODS FOR MATERIALS PROCESSING IN THE METALS SERVICE CENTER INDUSTRY

By

Shirish B. Seth

Metals service centers are the wholesalers of the basic metal producing industries. Besides performing the normal storage and distribution functions, they also perform some pre-production processing (also referred to as processing) of metals in preparation for their use by customers. Such pre-production processing includes services such as slitting, shearing, flame cutting, etc. Pre-production processing has become an increasingly important activity in this five billion dollars a year industry, with corresponding increases in capital equipment outlays.

Despite rapid growth in sales for three decades, the industry's profit picture has actually deteriorated in the 1960's as compared to 1956 and 1957. A major cause of this decline in profits appears to be the failure of the

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industry to control its costs--particularly its pre-production processing costs.

The purpose of this study has been to make an empirical investigation of pre-production processing cost control practices and to determine the feasibility of a profit planning and control system for controlling these costs.

Much of the data for this study was obtained through the cooperation of the Steel Service Center Institute, a trade association representing 500 North American companies. The data was obtained through a mail questionnaire and through personal visits to thirty companies. Completed questionnaires were returned by 117 of the approximately 380 member firms in the association. This sample represents a wide range of sizes and types of companies.

Part of the study involved finding out why a 1956 Institute-sponsored "Distribution Cost Analysis" functional costing system failed to obtain wide acceptance. A critical evaluation of that system indicated some major drawbacks, including a failure to incorporate cost behavior patterns and the arbitrary allocation of many fixed costs.

The analysis of data obtained in the study also revealed that a majority of the service centers (especially the smaller ones) lack sophistication in pre-production processing cost control practices. Most of these companies

seem to rely on intuition and some past cost records for estimating the cost of special pre-production processing orders. The number of companies with well developed cost control programs is relatively small. Little direct relationship is evident between company size and the degree of sophistication in cost control practices. But it is encouraging to note that many companies are aware of the need for better cost information and are planning changes in their cost systems.

Those metals service centers which desire to become more sophisticated in the area of pre-production processing cost control can do so by adapting and using the profit planning and control system suggested in this study. The system is feasible for use by service centers as demonstrated by its present successful use by a very small number of companies. It stresses cost behavior patterns and requires the identification of variable and fixed costs both at the operation level and at higher organization levels. The system incorporates the contribution approach to cost control, segment profit contribution analysis, and pricing. It is presented in four phases, namely, the organization phase, the planning phase, the control phase, and the decision-making phase. Its use would enable service centers to improve their planning and control of costs and revenues, and would provide more relevant information

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Shirish B. Seth

for making decisions in such areas as pricing, performance evaluation of product line and processing segments, and the acceptance of special orders.

**COSTING METHODS FOR MATERIALS PROCESSING
IN THE METALS SERVICE CENTER INDUSTRY**

By
Shirish B. Seth

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CHAPTER I

INTRODUCTION

Purpose

The purpose of this study is to make an empirical investigation of pre-production processing cost control practices in the metals service center industry and to determine the feasibility of a profit planning and control system for isolating and controlling these pre-production processing costs. This system is developed and explained in Chapter VI of the study.

Definitions

Metals Service Centers

Metals service centers are the wholesalers of the basic metal producing industries. They perform the storage and distribution function between the manufacturers of steel and other metals and the users of those metals. In addition to their warehousing function, such service centers also perform some processing of metals in preparation for their use by customers. Items distributed through service centers consist of industrial steel products which include structurals, bars, plates, strip, sheets, tubing, etc., in

various grades of steel; merchant steel products, and semi-finished steel products. Other important materials distributed through service centers include aluminum, copper, brass, bronze, magnesium, and plastics.

Pre-Production Processing

Pre-production processing (also referred to as processing hereafter) includes various types of special services rendered by service centers such as slitting, shearing, flame cutting, grinding, etc., to meet customers' needs. This is discussed in greater detail in Chapter II of this study.

Significance of the Study

The last three decades have seen the phenomenal growth and development of the metals service center industry. Some recent statistics indicate that the sales of the industry are in excess of five billion dollars per year and it distributes about 18% of the steel used for industrial steel products in this country.¹

Although the sales of the metals service center industry have shown a steady rise, the profit picture has actually deteriorated in the period since 1956. In 1967,

¹"New Marketing, Processing Muscle from Metals Service Centers," Iron Age, volume 197, February 17, 1966, page 98.

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the average after-tax profits were 9.6% on stockholders' equity. They are not only lower than the after-tax profits in 1966 when they averaged 11.7%, but they are also well below the level of 13.9% achieved in 1956. They also compare rather poorly with the after-tax earnings in some manufacturing industries such as drugs and medicine--21.1%; and soaps, cosmetics, etc.--19.3%.² The table below shows the per cent return on book net assets after taxes for steel service centers.

Table 1-1.--Steel service centers (reporting S.S.C.I. members). Per cent return on book net assets after taxes

Year	Per Cent
1956	13.9
1957	9.9
1958	7.2
1959	8.1
1960	5.1
1961	4.8
1962	6.0
1963	5.6
1964	7.8
1965	10.2
1966	11.7
1967	9.6

Source: Steel Service Center Institute, Company Operations and Operating Ratios in 1967 (Cleveland: Steel Service Center Institute, 1967).

²Steel Service Center Institute, Company Operations and Operating Ratios in 1967, (Cleveland: Steel Service Center Institute, 1967), p. 1.

One of the possible reasons for the decline in the level of profits (relative to 1956) could well be that the industry has not made a conscious and determined effort to recognize and control the costs associated with pre-production processing in particular and with operations in general. Many service centers have often used pre-production processing services as a competitive tool to sell steel and other metals. As a result, it is possible that the pricing policies of the firms in the industry do not properly reflect the rising trend of pre-production processing costs.

It should also be noted that with the increasing importance of pre-production processing, it has now become necessary to install new and modern processing equipment. Consequently, the capital expenditures by service centers to acquire such equipment have increased substantially. Since the cost of such equipment can run into several thousand dollars, the decision of any service center to install such equipment will have to be carefully analyzed in terms of the probable returns that can be obtained by its use.

There are some other factors also which could have adversely affected the level of profits in the period since 1956. While the industry, in recent years, has experienced rising labor costs and property taxes, its selling prices have generally remained at the 1958 level.³ Furthermore,

³"Better Management Begins to Pay Off: Service Centers," Steel, volume 158, May 16, 1966, p. 56.

the service centers have also begun to offer a number of other services such as free delivery, extended credit terms, special packing, etc., without compensating revenue.

The Problem

It was in 1956 that the Steel Service Center Institute first moved to make its members aware of the importance and usefulness of a functional cost system by publishing a study on Distribution Cost Analysis. Although, initially, many firms in the industry were enthusiastic about using such a system, it appears that very few firms are currently using this system. The details of this system as well as some of the underlying reasons as to why it is not widely used today are discussed in Chapter III of this study.

Professors Edwards and Konstans, in their study of the profitability planning practices of some selected steel service centers, also state

Field interviews found only one firm with an adequate knowledge of the costs of processing, from an accountants' point of view, but it apparently made no concerted effort to control them.⁴

¹James Don Edwards and Constantine Konstans, "Planning for Future Profitability," Business Topics, volume 14, Summer 1966, p. 19.

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Hypotheses

One hypothesis of this study, therefore, is that many firms in the metals service center industry do not have an adequate system for isolating and controlling pre-production processing costs. A corollary, then, is the hypothesis that the lack of an adequate accounting system has resulted in poor cost control and underpricing of their pre-production processing services.

Another hypothesis of this study is that it is possible to develop a profit planning and control system which would be feasible and would result in improved cost control and a more realistic pricing for cost recovery.

Data-Gathering Methodology

The data for this study was obtained through personal visits and a questionnaire. The researcher visited thirty companies and mailed questionnaires (see Appendix A) to all member firms of the Steel Service Center Institute. Completed questionnaires were returned by 117 of the approximately 380 member firms in the association, representing a 30% response. Almost all the companies in this sample are involved in at least one or more types of pre-production processing operations and the sample also includes some of the largest companies in the industry.

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The Questionnaire

A five page questionnaire was developed and copies of this were sent to each member firm of the Steel Service Center Institute. The first three items in the questionnaire dealt with the type of company, number of branch plants, and total annual sales. This information was sought to serve as "control" variables against which the remaining questions in the survey can be related. These remaining questions pertained to the Distribution Cost Analysis program, type of cost system used, type of techniques used to control costs, etc.

Company Visitation Data- Collection Procedure

Through the Steel Service Center Institute, arrangements were made to visit personally about thirty companies. This sample included companies from coast to coast and very large companies with many branch plants as well as small independently owned service centers with no branch plants. Also included in the sample were general line service centers and specialty service centers.

In each of these visits, the researcher interviewed the top executive or a senior executive with the object of seeking his views on the problem of pre-production processing costs and the type of information and reports that would be useful to him. This discussion was then followed by an interview with the accounting personnel and the basic

format of the questionnaire was used to obtain their views on many of these questions in considerable depth and detail.

Organization

This chapter has served to discuss the purpose and the significance of the study. It also defines the problem and the hypotheses and indicates the data-gathering methodology that has been used.

Chapter II is devoted to a description of the metals service center industry. The latter part of this chapter emphasizes the growing importance of pre-production processing in the metals service center industry and leads into the need for isolating and controlling pre-production processing costs.

Chapter III deals with the study on Distribution Cost Analysis. The main features of this functional cost system are examined and an attempt is made to determine some of the reasons for the lack of general acceptance of this system in the industry. This is done by means of an analysis of the responses to questions pertaining to Distribution Cost Analysis in the questionnaire and company visitations.

Chapter IV summarizes the questionnaire responses concerning the existing practices for isolating and

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controlling pre-production processing costs. The data accumulated during company visitations is also summarized.

A review of applicable cost concepts and classifications is given in Chapter V.

In Chapter VI a profit planning and control system is developed and explained. In the latter part of this chapter, the feasibility of this system is also discussed.

A brief summary of the study and some over-all conclusions are stated in the last chapter which also indicates some areas which need further research.

CHAPTER II

THE METALS SERVICE CENTER INDUSTRY

Industry Description

The history of metals service centers in the United States can be traced back to early Colonial days when "blacksmiths, wagonmakers, and other craftsmen could obtain a few bars of iron, or hammered sheets, or a gross of cut nails from 'iron mongers' who stocked the products of English and Swedish mills."¹ However, it is only in the last three decades that the metals service centers have come to be identified as a full fledged industry which serves as the distribution arm of the metal producing industries.

The sales volume of the metals service center industry has been estimated at over five billion dollars. The industry accounts for about 18% of the steel used for industrial steel products in this country and the sales in this category alone amount to nearly three billion dollars. Other allied metal products such as aluminum,

¹"Steel Service Centers for Industry," 1967-1968 Roster (Cleveland, Ohio: Steel Service Center Institute, 1965) p. 4.

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copper, brass, bronze, magnesium, and plastics account for the remaining sales volume of over two billion dollars.²

It is difficult to determine just how many companies comprise the metals service center industry. A 1962 survey of the industry estimated that there are approximately 800 companies operating a total of about 1400 service centers or locations.³ A more recent survey conducted by the Iron Age magazine indicates that there are 1862 service centers in this country but the number of companies which operate them is not given.⁴ However, the Iron Age magazine survey also includes companies which specialize only in nonferrous metals and those which are in the architectural shape business.⁵

Most service centers are small and independently owned although several large chains are owned and operated by the metal producers. The latter include companies such

²"New Marketing, Processing Muscle from Metals Service Centers," Iron Age, volume 197, February 17, 1966, p. 98.

³"All About Steel Distribution and Steel Service Centers," Kaiser Aluminum News, volume 19, No. 5, p. 11.

⁴"New Marketing, Processing Muscle from Metals Service Centers," Iron Age, volume 197, February 17, 1966, p. 97.

⁵Letter from Robert G. Welch, President, Steel Service Center Institute, Cleveland, Ohio, November 30, 1967.

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as U.S. Steel Supply Division, with 24 branches; Jones and Laughlin Steel Warehouse Division, with 11 branches; Joseph T. Ryerson, Inc., a subsidiary of the Inland Steel Company, with 22 branches. There are also some large independently owned companies such as A. M. Castle and Company, Central Steel and Wire Company, Earle M. Jorgensen Company, Edgcomb Steel Company, and Peter A. Frasse and Company, Inc. Many of these independently owned companies have a large number of branches although the number of branches is not always a true indicator of company size. There are some large independently owned companies which do not have many branch plants.

The Steel Service Center Institute (also referred to as the SSCI hereafter) is a trade association representing 500 North American companies in the steel industry. The 400 active member companies operate 900 service centers in industrial areas and they distribute "85% of all the industrial steel products that reach the market through distributors."⁶ Since many steel service centers also stock and supply nonferrous metals such as aluminum, brass, bronze, and copper, they could be classified as metals service centers. The National Association of Aluminum Distributors and the Copper and Brass Warehouse

⁶"All About Steel Distribution and Steel Service Centers," Kaiser Aluminum News, volume 19, No. 5, p. 15.

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Association are two other trade associations which are also active in the metals service center industry.

The SSCI tries to promote the welfare of its members and the industry by compiling statistical reports and sponsoring programs in education and advertising. It also sponsors programs in the field of public relations, industrial relations, and industry research. Much of the data for this study was obtained through the cooperation of the Institute and its member firms.

The total number of metal users in the United States is estimated at about 200,000. Of these, 40,000 are large users of metal whose needs are such that they can deal directly with the producing mills. The remaining 160,000 are small users who require metals in smaller quantities and/or at irregular intervals. The needs of these small users can best be met by the metals service centers. However, the needs of these small users of metal account for only 20% of the sales volume of the metals service center industry. The remaining 80% of the industry's sales volume is accounted for by the large users of metal who also buy from the mills.⁷ One reason why the large users prefer to buy a significant portion of their needs from metals service centers is because they often require some pre-production processing which only the

⁷Ibid., p. 10.

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service centers can provide. Another contributing factor has been the active promotion of the "Cost of Possession" concept by the SSCI and individual service centers. Metal users have been urged to study the direct and indirect costs of maintaining large inventories and it has been suggested that the apparent savings from volume purchase can be more than offset by the "Cost of Possession." Consequently, the metals service centers emphasize that it would be more economical for the users to buy virtually all of their requirements from them as needed rather than from the mills in quantity. Some steel producers have also assisted in this effort.

In the past today's metals service centers were more appropriately termed warehouses since their main role was one of selling metals--with little pre-production processing. Today, however, pre-production processing is an increasingly important part of service center operations and will be discussed at length in the later part of this chapter. Fast delivery is a characteristic of the metals service center industry and routine orders are filled in one day or less. The metals service centers also offer technical advice and assistance to their customers. In filling a customer's order a service center may find that, for some reason, it does not have a particular item. In such a case, the service center will generally "pickup" this item from a competitor so as to

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completely fill the customer's order. This practice of "pickups" is helpful to the customer as it saves him the time and effort to procure the item elsewhere. Thus, these different services that are performed by the metals service centers firmly establish the service aspect of the metals service center industry.

Growing Importance of Pre-Production Processing

As indicated before, pre-production processing is becoming an increasingly important part of metals service center operations and equipment such as saws, slitters, shears, levellers, coiling equipment, grinding and finishing equipment, and flame cutting equipment is used to provide these services.

This growing trend toward pre-production processing by service centers has enabled the mills to become more and more automated and concentrate on long production runs of standard products.⁸ For example, sheet steel now is typically rolled in 30,000 to 40,000 pound coils as compared to 8,000 to 10,000 pound coils ten years ago. The efficient use of high speed, mass production, automated mill equipment has also enabled the mills to lower their costs of operation.

⁸Ibid., p. 17.

On the other hand, the manufacturers who use the various metals require increasingly diverse shapes and forms of metal to compete successfully in today's market. The metals service centers with their capacity to perform different types of pre-production processing services help to bridge the gap between the standardized output of the mills and the special requirements of the manufacturer.⁹

Thus the metals service center has become not only a reservoir of material but also a reservoir of pre-production processing capacity. This means that the manufacturer can also draw upon the service center for his pre-production processing requirements and eliminate the need for maintaining expensive pre-production processing equipment that would be used only sporadically. When the role of pre-production processing is viewed in this light, the economic justification as well as the service nature of the metals service center industry assumes even greater importance.

Some metals service centers have already recognized the tremendous potential that pre-production processing offers to generate new business. One service center has even launched a marketing campaign aimed at making metal users think first of the final shape and form in which

⁹ Ibid., p. 20.

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they want the metal instead of trying to adapt the basic mill shapes to their own requirements.¹⁰

The importance of pre-production processing in the metals service center industry can be gauged from the fact that in the early 1950's only 30% of the orders shipped from service centers were processed in one way or another. Currently, it is estimated that about 70% of the orders shipped from service centers involve some pre-production processing and Robert G. Welch, president of the SSCI, forecasts that this percentage will be in the range of 78% to 80% by 1975.¹¹ The following table indicates the range and variety of the pre-production processing operations performed by metals service centers.¹²

The rapid growth in pre-production processing has had a big impact on the capital expenditures by metals service centers. It is estimated that service centers are now spending at the rate of 100 million dollars a year for new plant and equipment and this represents an increase of nearly 500% over the rate of capital spending

¹⁰Virginia Starke, "'STAMSTAFF'--or, How to Sell Processing," Metal/Center News, volume 7, February 1967, p. 19.

¹¹Personal interview with Robert A. Welch, President, Steel Service Center Institute. September 20, 1967.

¹²"Census of Metals Service Centers," Iron Age (Philadelphia, Pa.: Chilton Company, 1966)

Table 2-1.--Pre-production processing operations performed.

	Centers Performing		Warehouse Size (Thousands of Square Feet)					Size Not Reported
	No.	%	Under 20	20-49	50-99	100-249	250 and Over	
Centers Listing Operations	1,766	100	585	583	293	164	37	104
Operations Performed:								
Sawing, Hack	1,028	58	282	326	189	128	26	77
Shearing	1,006	57	223	362	213	128	29	51
Flame Cutting	787	45	196	240	151	123	26	51
Sawing, Friction	481	27	97	130	100	85	24	45
Slitting	423	24	79	144	94	68	23	15
Abrasive Wheel Cutting	397	22	99	119	77	72	18	12
Welding, Electric	324	18	107	92	50	44	15	16
Bending	297	17	79	89	50	43	16	20
Punching	274	16	74	76	50	46	15	13
Drilling	271	15	93	78	44	28	12	16
Threading	263	15	65	85	44	41	14	14
Deburring	244	14	51	60	52	52	14	15
Leveling	244	14	27	64	65	62	18	8
Forming	243	14	57	79	41	35	15	16
Rolling	230	13	50	66	49	36	17	12

Welding, Gas	212	12	61	58	31	36	11	15
Painting	209	12	76	60	31	21	7	14
Straightening	190	11	39	47	33	42	17	12
Edging	167	9	24	41	39	42	15	6
Testing	108	6	21	26	21	24	9	7
Plasma Cutting	95	5	13	13	19	39	7	4
Milling	89	5	25	20	17	14	6	7
Corrugating	55	3	2	11	11	22	5	4
Stamping	51	3	12	15	10	6	5	3
Special Coatings	47	3	15	13	10	4	3	2
Heat Treating	46	3	7	18	9	6	3	3
Stretching	41	2	5	7	5	19	4	1
Extruding	29	2	1	4	3	15	4	2
Drawing	19	1	4	6	4	2	2	1
Galvanizing	19	1	4	6	5	3	1	--
Electroplating	5	*	2	2	1	--	--	--

*Less than .5%

Source: Iron Age, Census of Metals Service Centers (Philadelphia: The Chilton Company, 1966).

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in the early 1950's.¹³ Much of this new equipment is geared for pre-production processing and includes giant saws, improved flame cutting equipment, bigger and more powerful shears, slitters, and coil handling equipment.

The growing role of pre-production processing together with the sharp increases in capital expenditures by metals service centers also raises some important questions concerning the cost and revenue relationship for pre-production processing services. In the past much of the pre-production processing involved simple operations such as the traditional cutting-to-length and the service center operator often absorbed at least some of this cost, depending on his gross margin being sufficient to cover this practice. But more recently, metals service centers have begun to acquire modern and expensive pre-production processing equipment and the cost of such equipment often runs into several thousand dollars. The estimated cost of a modern shear, fully installed, would be about \$50,000 and the cost of a leveling and slitting line may well exceed \$100,000. Therefore, when pre-production processing service involves the use of such expensive equipment, the pricing as well as the cost of providing these services should demand careful consideration.

¹³"New Marketing, Processing Muscle from Metals Service Centers," Iron Age, volume 197, February 17, 1966, p. 98.

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Another important consideration should also be the efficient utilization of such equipment so as to keep costs at a reasonable level.

In the previous chapter it was noted that the metals service center industry, in recent years, had been experiencing a profit squeeze. Since the present day metals service center operator also provides pre-production processing services, he must think of profitability in a product-service context. He must be concerned with a more realistic pricing of pre-production processing services based on the costs of these services so as to be able to improve his profit picture. That this has not been done so far is evident from the following comment made by Robert A. Welch, president of the SSSCI:

All too often, the industry uses processing services as a competitive tool rather than striving to base the price for these services on processing costs.¹⁴

¹⁴El Hoeffler, "Service Center Institute Sponsors Inventory Control Study," American Metal Market, Section 2, May 2, 1966, p. 23.

CHAPTER III

THE DISTRIBUTION COST ANALYSIS PROGRAM

Introduction

This chapter deals with the Distribution Cost Analysis study (hereafter referred to as the DCA) and examines the study in great detail. The latter part of the chapter contains a critical evaluation of the DCA as well as the results of the survey pertaining to the DCA.

The DCA Study¹

Objectives

The DCA program was undertaken with defined objectives. They were: (1) prepare a manual containing suggested techniques and common definitions to assist member companies in applying Distribution Cost Analysis to their businesses, (2) assist in the widespread adoption of this accounting technique throughout the metals distributing industry, and (3) collect and publish comparative percentage reports enabling participating companies to judge

¹Steel Service Center Institute, Distribution Cost Analysis for Metals Distributors--Manual of Instruction (Cleveland: Steel Service Center Institute, 1960).

their efficiency against other firms handling identical products.

The natural classification of expense ("object of expenditure") does not reflect the purpose or function for which an individual expense is incurred. Consequently, the basic premise of the DCA is that all expenses are to be related to the several functions that are performed. The functional costs are grouped into three broad categories: product costs, customer costs, and general (supporting) costs. The general outline of the plan is shown in Appendix B (see Chart A).

When the costs of all these functions are known, they can be allocated to the various products which are sold. The summation of allocated costs, by product, would lead to the preparation of a statement showing the relative profitability of each of the products. The technique of DCA would not only provide reports on Product-line Profitability (see Appendix B--Chart D) but could easily be adapted to the preparation of other reports and analyses of significance to company managers such as a Statement of Territorial Profitability (see Appendix B--Chart E) and a Statement of Customer Profitability (see Appendix B--Chart F).

The purpose of such analyses would be to reveal and differentiate between those products, territories, class of customers, salesmen, or quantity brackets, which are

relatively more profitable as opposed to those which are relatively less profitable. The conventional profit and loss statement, on the other hand, shows only one net profit figure for the entire company and fails to reveal which products, territories, class of customers, etc., are contributing to this net profit and to what extent. Therefore, the DCA would attempt to provide the type of information which would enable management to make sound decisions pertaining to product lines, territories, customers, etc. For example, if a particular product line is found to be incurring a loss, management is in a position to evaluate it and decide whether to correct the deficiencies or to eliminate the product completely. If the Statement of Territorial Profitability reveals that a particular territory has had a poor performance in terms of overall profitability, the need for a strong promotional effort to increase the sales volume may be indicated.

The DCA Technique

The DCA program is based on the accumulation of functional costs and their subsequent allocation to products, territories, and customers, so that the "net profit" of these segments may be determined. The DCA program has two basic requirements: (1) the functions performed in a company must be determined and (2) costs must be assembled accurately according to functions.

The DCA Manual gives a list of functions applicable to metals service centers. The list is broad enough to include all service centers regardless of volume; a company will use only such functions as apply to it. The functions are divided into two categories: supporting and prime. They are listed on page 26.

The Manual then goes on to define and explain each of these supporting and prime functions in detail. The natural expenses that would normally be identified with each one of these functions are indicated and the importance of maintaining sufficient records is also stressed so that the cost of supporting functions can be properly transferred to other functions. For example the following explanation is given for Maintenance and Repair:

Maintenance and repair refers to the keeping of building and equipment in suitable condition for use. Costs include payroll, supplies, outside contractor services, watchmen services.

If a company wants to keep a record of maintenance and repair cost as such, all such costs should be included in this function. Sufficient statistics should also be kept so that this supporting function can be properly transferred to other functions.

If the dollar cost of maintenance and repair is not as important to a company as the end-purpose for which the cost was incurred, then this support cost should be kept to a minimum. Wherever possible, maintenance and repair expense vouchers would be charged directly to the functions which were serviced. Repairs to crane by outside repairmen would be assessed to Materials Handling. Outside contractor repairs to the shear would be assigned directly to Shearing; repairs to office building, to Space Charges-Office; repairs to accounting machines, to Accounting. Watchmen services would be charged directly to Space Charges--Warehouse and

Supporting Functions

Maintenance and repair	Teletype	Employee benefits--sales
Space charge--warehouse	Western Union	Supervision--warehouse
Space charge--office	Office service	Supervision--office
Telephone switchboard	Employee benefits--warehouse	Supervision--sales
	Employee benefits--office	

Prime Functions

Purchasing	Levelling	Outside selling
Inventory records	Annealing	Inside selling
Order--processing	Miking & Sorting	Administrative selling
Slitting	Outside fabricating	Credit authorization & Collection
Shearing	Materials handling	Bad debts
Sawing	Packaging	General administration
Edge-rolling	Delivery	Accounting
Flame-cutting	Inventory space cost	Inventory carrying cost
Burning	Advertising	Sales discounts

Space Charges--Office on a square footage basis. All outside contractor services can be thus assigned directly to the functions which received the benefits of the services. The only costs which would appear in the function of Maintenance and Repair would be the payroll and supplies used by the company's maintenance crew. Records should be kept of their work so that the cost of this function can be properly transferred to other functions.

As another example, the function of Order-processing is explained as follows:

Order-processing is the paper-work of converting a customer's order into a sales invoice. In general, the function begins when the inside salesman passes his sales order papers to the next person and ends when the sales order papers are filed. It thus includes preparation of warehouse work order, assignment or work orders to warehouse work stations, calling in common carrier to deliver the order, pricing, extending, re-checking prices and extensions which may appear on original sales order documents, preparing invoice, mailing invoice, and filing sales order documents. The costs include payroll, supplies, invoice forms, postage, depreciation.

The Manual recognizes that some natural expenses present problems in their conversion to functional costs and it suggests some methods to overcome these problems--(see Appendix B--Chart B). The following procedure is suggested for converting payroll costs to functional costs:

This is the most important single cost in metals distribution and amounts to approximately 60% of total operating cost.

The office and sales payroll can be functionalized through the use of an Employee Time Estimate Sheet (Exhibit E). A sheet should be prepared for each person by immediate supervisors and then reviewed by financial officers. The data should be recorded on worksheets in percentage form by individuals, so that the total number of people in any one function may be calculated. The individual percentages should be applied against the individual payroll, so that the

functional amounts may be determined. A system of follow-up should be established, so that terminations, new employees, and changes in functional ratios of current employees can be properly recorded functionally.

The Employee Time Estimate Sheet may also be used for the warehouse functions by the use of the same type of form shown in Exhibit E which contains the functions performed in the warehouse. However, unless a warehouse employee spends all his time in one function only, then the use of this form for functionalizing warehouse payroll will require constant review and perhaps frequent adjustment in order to obtain reflective functional costs.

Usually the warehousemen perform different functions during the day and spend varying amounts of time in the functions. Since warehouse labor costs are generally quite sizeable, it is desirable to use a time card. A properly-administered warehouse time card will establish full confidence in the warehouse functional costs. In addition, its results can be extended to the allocation of these functional costs to products, territories, and customers, thereby helping to establish confidence in the figures of net profit of these statements. A sample time card is shown in Exhibit F, this can be varied to meet the needs of a particular company.

The suggested procedure for converting depreciation cost is:

Assets should be scheduled by type and annual depreciation amount. Then each asset's depreciation can be set up functionally according to the use made of the asset. The office assets should be first assigned to people. Then the depreciation amount can be assigned functionally according to the person's functional ratio.

Other natural expenses which present problems in conversion and for which procedures are suggested are: postage; telephone; light, heat and power; mechanical accounting equipment; stationery and supplies; realty and personal property taxes; insurance; interest; profit-sharing costs.

After all the natural expenses have been converted to functional costs, the Manual then discusses in detail the transfer of supporting functions to the various prime functions. The procedures set forth are very elaborate as can be seen by the following example of Space-charge--office:

This cost will be transferred on the basis of gross square footage. The office will be measured and space assigned to people. Ample room should be included for each person, to allow for easy movement. Then each person's square footage will be divided into functional ration. The cost of the function will then be distributed according to the functional square footage ratio. The usual functions accepting this transfer are Telephone switchboard, Teletype, Western Union, Office Service, Employee benefits--office, Supervision--office, Supervision--sales, Purchasing, Inventory Records, Order--processing, Advertising, Outside Selling, Inside Selling, Administrative Selling, Credit Administration, and Accounting.

The transfer of telephone switchboard costs to prime functions is shown as follows:

This cost will be transferred on the basis of the number of phones. A list of the phones should be prepared by individuals. Then the number of phones per person should be set up in functional ratio according to the person's functional ratio. This phone functional ratio then becomes the base for transfer of this cost. The common functions to which this cost is transferred are Supervision--warehouse, Supervision--office, Supervision--sales, purchasing, Inventory records, Order--processing, Advertising, Outside Selling, Inside Selling, Administrative Selling, Credit authorization and collection, General Administration, and Accounting.

Thus, after the above detailed procedures of converting natural expenses into supporting and prime functions and transferring the costs of the former to the latter have been properly followed, the end result would be a

classification of all costs by prime functions (see Appendix B--Chart C).

The next step would be to prepare a Statement of Product-line Profitability (see Appendix B--Chart D) and, in order to do this, the prime functional costs must be allocated to the various products. It will be recalled that one of the objectives of the DCA program was to collect and publish comparative percentage reports enabling participating companies to judge their efficiency against other firms handling identical products. For the achievement of uniform reporting, a list of metal products and code numbers (see Appendix B) was also prepared and distributed along with the Manual on DCA. For each functional cost a base of allocation is suggested so that each of the prime functional costs can be allocated to the products. In some cases more than one base has been suggested as can be seen from the following examples:

Purchasing

Purchasing can be distributed to commodities in one of three ways, as follows:

1. If Purchasing is the responsibility of one person, he can prepare an estimate of time devoted to individual commodities. The cost of Purchasing can then be divided among commodities on this ratio.
2. If several people do the buying, but the responsibility of each person is limited to specific commodities, then the cost of Purchasing for each person should be established and distributed among commodities on a time-spent estimate furnished by each person.

3. The total cost of Purchasing may be divided among commodities on a Cost of Goods Sold ratio. If stainless and aluminum products are sold, then their figures of Cost of Goods Sold should be reduced for this computation. Stainless and aluminum have much higher costs per ton than carbon; yet the time required to buy a ton of these products may not be as significantly greater than carbon as their ton cost differences indicate. For this computation, it is suggested that the Cost of Goods Sold for stainless and aluminum be taken at 30% and 40% respectively, and a ratio should be established which contains all carbon products with their Cost of Goods Sold amounts and stainless and aluminum at the adjusted Cost of Goods Sold amounts.

Inventory Records

This cost may be divided among commodities on a line-item or invoice count basis. A line item is taken to mean the description of commodity, with its quantity and price. If delivery or cutting charges are also shown on the invoice, this is considered as part of the line item and not as a separate line item.

If a company uses mechanical accounting equipment (such as IBM), the number of line items sold by commodity is usually developed in normal routine.

If a company does not use mechanical accounting equipment, it should count its invoices by commodity. If two commodities are listed on an invoice, this is recorded as 1/2 invoice for each commodity. If three commodities are shown, this is recorded as 1/3 invoice for each commodity. Since perhaps 80% of the metals distributing company invoices contain only one commodity, this type of computation in effect is a line-item count, and the results are very comparable to the results of the company using mechanical accounting equipment.

Slitting, Shearing, Sawing, Edge-rolling, Flame-cutting, Burning, Levelling, Annealing, Miking and Sorting

These fabricating costs will be distributed among commodities on a job ticket or time card basis.

If a job ticket is used, the information should show the labor hours, machine hours, commodity, and name of fabricating function. The payroll and fringe of each function should be assigned to the commodities processed under the function on the basis of labor hours. The Other Costs in the function can be allotted to the commodities on the basis of machine hours.

If a time card is used, the labor hours by commodity furnish the base for distributing the payroll and fringe costs of each function. The other costs in a function can be allocated to commodities on a machine time-estimate basis taken from the labor hours and the number of man hours usually required by one machine hour.

Delivery

One-third of total delivery cost can be assigned to commodities on the basis of tonnage shipped, aluminum tonnage being weighted by 3. Two-thirds of total cost can be allocated on the basis of commodity line count or invoice count.

If common carrier costs are recorded in the function of Delivery--Common Carrier, it may be possible to relate each common carrier charge to a commodity. If so, assessment of this cost should be made on a direct-charge basis. If the function of Delivery--Common Carrier is used, the company will also use the function of Delivery--Our Trucks; the cost of this function will be divided among commodities on the one-third weighted ton, two-thirds line item or invoice count ratio given above.

Outside Selling

This cost may be assigned to commodities on a product-mentioned basis or on a time-spent basis.

If a product-mentioned base is used, the call reports are reviewed to get the number of mentions by commodity. A ratio of product mentions is then established. The total of Outside Selling is assigned to commodities on this ratio. In some companies this is considered to be an equitable way of distributing this cost.

Other companies have considered that a time-spent basis is more applicable in their case as a base for distributing the cost of Outside Selling. Under this plan, a time study is conducted for one month, showing

actual time spent before the buyer and divided into time spent on each commodity. All salesmen participate in the study. The total cost of Outside Selling is then broken down into the cost of each salesman. Each salesman's cost is then assigned to products according to his product-time ratio. This ratio may be used for some period of time. But the study should be repeated periodically, and commodity assessments should be adjusted accordingly. This type of study, in addition to furnishing a sound base for charging this functional cost to products, has the advantage of making the salesman aware of the great value of time and is thus a motivating force.

General Administration

This cost will be divided among commodities on the basis of product sum total of cost. Sum total of cost will include Cost of Goods Sold, Product Cost, and Customer Cost. Cost of Goods Sold for stainless and aluminum will be adjusted to 30% and 40% respectively of their amounts shown on the Cost of Goods Sold line, as was discussed in the allocation of Purchasing Cost. Product Cost and Customer Cost are taken to mean the total cost of these classifications, as shown on the Statement of Product-line Profitability.

By commodity, the Cost of Goods Sold (adjusted as indicated above), Product Cost, and Customer Cost will be listed. This list will then be percentaged. The ratio thus established will be applied to the total cost of General Administration to derive product charges.

The above discussion covers the main allocation bases suggested and some of them are also used to allocate other functional costs. The remaining bases which are not covered in the above discussion are:

Equivalent ton basis--for allocating material handling costs if time cards are not used.

Square footage occupied--for allocating inventory space cost.

Percent of sales--for allocating advertising and bad debts costs.

Ratio of gross profit dollars--for allocating administrative selling costs.

Ratio of average inventory value per product--for allocating inventory carrying cost.

The Manual also discusses in detail the preparation of the Statement of Territorial Profitability (see Appendix B--Chart E) and the Statement of Customer Profitability (see Appendix B--Chart F).

The form of the Statement of Territorial Profitability corresponds to that of the Statement of Product-line Profitability except that territories take the place of products for columnar headings. The same functional costs and allocation bases used in preparing the Statement of Product-line Profitability are also used in the preparation of the Statement of Territorial Profitability and the general procedures are also very similar.

The basic sources of data for preparing the Statement of Customer Profitability are the individual customer ledger cards and the Statement of Territorial Profitability. The Manual suggests the following approach for preparing this statement:

1. The Sales and Cost of Goods Sold data are collected by customers within a territory.
2. Then the territorial functional costs are grouped by bases of allocation (see Appendix B--Chart G).
3. Finally, the grouped functional costs are assigned to customers according to the base.

For example, advertising and bad debts costs of the territory are first grouped together under the Sales

base. Then the total sales are divided into total Sales base cost and a rate per dollar of sale is determined. When this rate is multiplied by the sales made to each customer, the amount of Sales base cost assessable to each customer is developed.

This concludes the discussion of the general outline and the main features of the DCA study. A critical evaluation of the study is undertaken in the next section of this chapter.

A Critical Evaluation of the DCA

It should be noted that the DCA as outlined above represents a total or full costing approach since it includes all the costs incurred to determine the net profitability by product line, territory, and customer. Such an approach has been strongly criticized by the advocates of another approach, namely, the contribution approach.²

The contribution approach is based on the segregation of costs into fixed and variable categories. Such a segregation is considered useful for the major managerial functions of planning, control, and decision making.

²The contribution approach is also referred to as the direct costing approach and a good discussion of this approach will be found in any good text on Cost Accounting such as Charles T. Horngren's Cost Accounting: A Managerial Emphasis (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1967), pp. 299-315.

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While the total costing approach emphasizes a functional cost classification and allocation of all costs, the contribution approach emphasizes cost behavior patterns. This latter approach attempts to allocate only the revenue and variable costs to a given segment of activity such as a product line, a territory or a customer. Such an allocation is usually straightforward because each item is directly and specifically identifiable with a given segment of activity. In the contribution approach no attempt is made to allocate fixed costs except those which can be identified with the activity segment. The approach stresses fixed costs as a lump-sum amount which have to be recouped before net profit is determined. It emphasizes the contribution margin which is the excess of sales over variable costs of each activity segment and thus spotlights the cost-volume-profit relationships which are essential for profit planning.

However, the proponents of total costing argue that it is not easy to separate costs into fixed and variable categories and that this separation is often a matter of management policy.³ While this argument does have some merit, the problem of separating costs into fixed and variable is not unmanageable. Even the advocates of total

³Robert Beyer, "Is Direct Costing the Answer?" The Journal of Accountancy, Volume 99, No. 4, April 1955, p. 45.

costing recognize the utility of the type of information provided by the contribution approach and use it in the form of supplementary reports such as the break-even analysis and flexible budgets.

The proponents of the contribution approach are strongly critical of total costing as embodied in the DCA because of the arbitrary and sometimes confusing allocation of all fixed costs to individual products. They contend that this process of allocation is not only arbitrary but time consuming and costly and that it generates information which is not meaningful and useful for certain decisions.

This criticism is certainly applicable to the DCA since it involves the use of very elaborate and detailed procedures for converting natural expenses to functional costs and the allocation of these functional costs to products, territories, and customers. Moreover, the allocation of some functional costs such as delivery, general administration, and accounting seems to be quite arbitrary. That the allocation of fixed costs presents serious problems is acknowledged even by the DCA Manual when it states:

Bases of allocation constitute the most controversial aspect of any program of Distribution Cost Analysis. Every effort, however, has been made to present allocation bases which give sufficient accuracy for the

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primary purpose of judging relative product-line profitability.⁴

The contribution approach makes it possible to compute contribution margins by products, territories, and customers. The knowledge of these contribution margins would be highly essential and helpful to management in making proper evaluation of the performance of different activity segments. It would also enable management to make better decisions concerning promotion or elimination of products, territories, or customers, efficient utilization of a given set of resources, and pricing.

In the entire DCA Manual including the Product-line, Territorial, and Customer Profitability Statements, no attempt is made to distinguish between fixed and variable costs. By its failure to make this vital distinction which emphasizes cost behavior patterns and by somewhat arbitrary assignment of the fixed costs to different products, territories, and customers, the DCA fails to accomplish its goal of trying to provide meaningful information which would differentiate those products, territories, and customers that are relatively more profitable as opposed to those that are relatively less profitable. Conceivably, the DCA could even provide misleading information which

⁴Steel Service Center Institute, Distribution Cost Analysis for Metals Distributors--Manual of Instruction (Cleveland: Steel Service Center Institute, 1960), Section II, p. 10.

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may well lead to erroneous decisions. For example, the Statement of Product-line Profitability may indicate that Product B is making a very small profit as compared to Product A. This could lead management to give serious consideration to eliminating or de-emphasizing Product B. But it is possible that the contribution margin of Product B may be higher than Product A which appears to be four times as profitable as Product B according to the Statement of Product-line Profitability. In such a case, it is possible that a decision to drop or de-emphasize Product B could lead to a reduction in total profits. This point is illustrated in Exhibits 3-1 and 3-2.

Also, from the standpoint of control, the DCA makes no distinction between controllable and uncontrollable costs at any given level of management.

It should be noted that the DCA includes the costs of pre-production processing services such as shearing, slitting, etc. in "Product Costs" (see Appendix B--Chart C). Therefore, the existing design of the DCA cannot provide reports on the profitability of pre-production processing operations. However, in view of the growing importance of pre-production processing operations as discussed in the previous chapter, it would be important to have information which would show the profitability of different pre-production processing operations. But even if the DCA

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EXHIBIT 3-1

Statement of Product-line Profitability

The DCA Approach

(in thousands of dollars)

	<u>Total</u>	<u>Product A</u>	<u>Product B</u>
Net sales	\$1,000	\$600	\$400
Cost of goods sold	<u>750</u>	<u>450</u>	<u>300</u>
Gross profit	\$ 250	\$150	\$100
Total product costs	<u>100</u>	<u>55</u>	<u>45</u>
Profit after product costs	\$ 150	\$ 95	\$ 55
Total customer costs	<u>70</u>	<u>38</u>	<u>32</u>
Profit after customer costs	\$ 80	\$ 57	\$ 23
Total general costs	<u>40</u>	<u>24</u>	<u>16</u>
Net profit before taxes	<u><u>\$ 40</u></u>	<u><u>\$ 33</u></u>	<u><u>\$ 7</u></u>

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EXHIBIT 3-2

Statement of Product-line Profitability

The Contribution Approach

(in thousands of dollars)

	<u>Total</u>	<u>Product A</u>	<u>Product B</u>
Net sales	\$1,000	\$600	\$400
Variable costs of plant, sales and adm.	<u>850</u>	<u>526</u>	<u>324</u>
Contribution margin	\$ 150	\$ 74	\$ 76
^a Identifiable fixed costs	<u>30</u>	<u>16</u>	<u>14</u>
Segment margin	\$ 120	<u>\$ 58</u>	<u>\$ 62</u>
^b Joint fixed costs	<u>80</u>		
Net profit before taxes	<u>\$ 40</u>		

^aThese could consist of programmed fixed costs and other fixed costs. Programmed fixed costs arise from policy decisions of management and are controllable at least when they are planned. Fixed costs are also referred to as capacity costs.

^bThese cannot be properly allocated to the products except by some questionable allocation base.

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were modified to provide such information, it would still suffer from the weaknesses cited above.

The DCA Survey

As indicated in Chapter I, the data for this study was collected by means of a questionnaire and personal visits to about 30 companies. In the questionnaire, there were four questions (Nos. 4-7) which related to the DCA. These four questions were intended to determine the extent to which the DCA was being used in the industry as well as the reasons for its use or lack of use.

Sample Size and Distribution

Replies were received from about 117 companies and this represents slightly over 30% of the active member firms in the Steel Service Center Institute.

In terms of the type of service center, the largest number of replies was from centers which had industrial steel products as the major product, but these products accounted for less than 90% of the sales volume. A total of 52 replies fell in this category. The next largest number of replies was from service centers described as "Industrial Steel Products 90% to 100%," with 43 replies. The remaining 22 replies had fabricating (16), aluminum (3), wholesale hardware and merchant products (2), and brass, copper, and miscellaneous (1) as their most important source of revenue.

The distribution of companies according to the number of branch plants per company was as follows:

Table 3-1.--Number of branch plants per company.

Number of Branch Plants	Number of Companies
0	55
1-4	41
5-9	11
10 or more	10
Total	<u>117</u>

It would be normal to expect the number of branch plants to be closely related to the total annual sales of the company with the larger companies frequently having a number of branch plants. Consequently, only one company--of the twenty-one compnaies which reported sales in excess of twenty-five million dollars per year--reported "no branch plants." In the sales category of ten to twenty-five million dollars per year, only six of the twenty-six companies reported "no branch plants."

In terms of the total annual sales per company, the replies were distributed as follows:

Table 3-2.--Total annual sales distribution.

Total sales (in dollars)	Number of Companies
Less than one million	4
One to five million	47
Five to ten million	19
Ten to twenty-five million	26
Over twenty-five million	21
Total	117

As mentioned in Chapter I, the type of company, number of branch plants, and total sales are the three control variables against which the remaining questions in the survey can be related. An attempt was made to determine which control variable would best explain the differences in pre-production processing cost practices. As the results of the survey are presented, it will become evident that company size as indicated by total sales serves as the best control variable for explaining the differences in approach to pre-production processing cost practices. However, even this variable is not quite adequate as a general predictor of practice in the industry.

Familiarity with the DCA

The first question relating to the DCA simply asked: "Are you familiar with the suggested Steel Service Center Institute Distribution Cost Analysis System?" The replies were distributed as shown in Table 3-3.

Table 3-3.--Companies familiar with the DCA.

Total Sales (in Millions of Dollars)	Number of Yes Answers	Percent- age of Yes Answers	Total Companies in Sales Category
Less than 1	2	50	4
1 to 5	33	70	47
5 to 10	13	68	19
10 to 25	19	73	26
Over 25	17	81	21
Total	84	72	117

Of the total number of 117 companies in the sample, 84 companies indicated that they were familiar with the DCA. It is somewhat surprising that about 28% of the responding companies--33 out of 117--are not familiar with the DCA. It should be noted that the DCA was first published by the Steel Service Center Institute in 1956 and was actively promoted till, perhaps, 1961. Therefore, it

is possible that the executives or the accounting personnel who completed the questionnaires on behalf of their companies could have joined their companies after 1961 and hence may not have heard about the DCA.

The Use of the DCA

The next question which consisted of two parts was aimed at the companies that were familiar with the DCA. The question was: "If your answer to 4 is 'Yes' then:

- (a) Have you used it in the past?
- (b) Are you using it now?"

The distribution of the replies to part (a) of the question was as follows:

Table 3-4.--The use of DCA in the past.

Total Sales (in millions of dollars)	Number of Yes Answers	Percentage of Yes Answers	Total Companies in Sales Category
Less than 1	1	50	2
1 to 5	12	36	33
5 to 10	6	46	13
10 to 25	10	53	19
Over 25	6	35	17
Total	35	42	84

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Thus, we find that only 35 of the 84 companies--about 42%--that are familiar with the DCA have used it in the past. The replies to part (b) of the question were distributed as follows:

Table 3-5.--The present use of DCA.

Total Sales (in millions of dollars)	Number of Yes Answers	Percentage of Yes Answers	Total Companies in Sales Category
Less than 1	1	50	2
1 to 5	3	9	33
5 to 10	2	15	13
10 to 25	1	5	19
Over 25	--	--	17
Total	7	8	84

While thirty-five companies used the DCA in the past, only seven companies are still using it as revealed by Table 3-5.

Some of the underlying reasons as to why the DCA did not gain wide acceptance and is used by very few firms today could lie in the explanations given by companies for not using the system. The question asked was: "If your answer to 5 (b) is 'No' (implying that it does not use the

DCA) please give reasons why you do not use it." Representative comments made in response to the above question were:

Gave it up long ago as being too costly, too much detail in relation to benefits obtained.

We tried to use the DCA but found it ineffective because:

1. It required too many arbitrary allocations.
2. It required too much clerical labor for value received.
3. It did not recognize multi-corporate cost distribution.
4. It was so voluminous that it presented past history instead of useful and timely data.

Lack of management interest to support DCA and unwillingness to accept results as shown through use of DCA. We were unable to eliminate nonprofitable products and work areas.

We changed to what we feel is a more flexible system using variable and fixed costs within a responsibility framework.

Present management does not consider the total system sound. Excessive allocation of natural expenses leads to improper conclusions. Best results occur when one considers a series of alternatives and selects the best total combination.

After we began to produce reports with the DCA system, we were not basing decisions on the reports. This was primarily because we had serious doubts as to the validity (as well as accuracy) of the distribution of functional costs to products. Since we were not using the reports we abandoned the system because it was too costly to maintain.

On the other hand, the companies that are still using the DCA were asked if they had found the system helpful in giving them accurate and meaningful cost information

for isolating and controlling pre-production processing costs. They were also asked to indicate any problems that may have been encountered when they first set up the system. Some of the comments in response to this question were as follows:

Helpful in knowing costs and relating to revenue. No particular problems in setting it up.

The only difficulty at the beginning was to make sure the shop people knew what information we needed. The cost system has been very helpful to us and proven our investment in equipment is paying off.

No--too generalized. Helpful in determining whether total operation of work center operates at profit or loss, but not meaningful in detail.

A few companies which had indicated that they are not currently using the DCA also commented that they were using the DCA "partially" or in a "modified" form. Consequently, it is possible that some of these seven companies may be using modified versions of the DCA instead of the original system as such.

The experience of one company that has successfully used the DCA for the past ten years is discussed in some detail in the next section.

Company Visitations

As stated previously, the researcher personally visited thirty companies which included companies from coast to coast and very large companies with many branch plants as well as small independently owned service centers.

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In these interviews, the basic format of the questionnaire was used to obtain the views of senior executives and accounting personnel on many of these questions in considerable detail. It should be noted that these thirty companies are also included in the survey sample of 117 companies.

The companies visited can be divided into three categories on the basis of total sales. In the first category are eleven companies whose total annual sales volume is between one to ten million dollars. These would be considered as smaller metals service centers. The second group consists of nine companies with total sales of ten to twenty-five million dollars and these can be termed as medium size metals service centers. The third group includes ten companies whose total annual sales exceed twenty-five million dollars. These would be called the large metals service centers.

Smaller Metals Service Centers

The eleven companies visited whose total sales were from one to ten million dollars were all single-service-center operations except two companies which had one branch plant. Eight of these companies had total sales in the range of one to five million dollars.

At least three of these eleven companies were not familiar with the DCA and of the remaining eight companies,

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six had never used the DCA. When the executives in these six companies were asked why they had never used the DCA, almost all of them indicated that their size of operation was too small to justify the costs involved in setting it up. One top executive felt that the system had a lot of merit but the costs would outweigh the benefits as far as his company was concerned.

One company did use the DCA in the past but is no longer using it. Apparently, it encountered some problems in the allocation of costs and the interpretation and use of the reports developed.

There was one company in this group, however, that has successfully used the DCA for the past ten years. The president of this company indicated that they did no natural accounting and that everything was on a functional basis. He further stated that the DCA had been extremely helpful in improving profits in his company and that no major problems were encountered when they installed the system. The information generated includes product and customer profitability reports as well as sales by county, by territory, and by salesman. The top management of this company has also recognized the importance of pre-production processing and processing profitability reports are also prepared.

The Accounting executive of this company was told about the problems that other firms had encountered such as arbitrary allocation and that the system required too much

detail and was costly to maintain. He felt that the DCA was basically sound and in their case, the data processing equipment which they used generated much of the detailed information that was needed.

It was also pointed out to him that the DCA made no distinction between fixed and variable costs and hence the product profitability reports could not be very meaningful for certain decisions. He agreed that the type of information provided by the contribution approach was useful and indicated that such information along with all the other pertinent factors would be carefully evaluated before a decision to eliminate a product was made. Thus, while he was generally pleased with the results obtained from the DCA, he was also aware of the usefulness of the contribution approach for certain decisions.

This company is a fine example of the progressive attitude as displayed by its top management. The principal reason for the installation of data processing equipment was the need for more information by top management. As the President of the company put it: "Today's competitive conditions require an ever increasing awareness of the cost of doing business. More importantly it is necessary to know where the profit is being made." It is interesting to note that top management has made effective use of the information generated by focusing on products, customers, processing services, and quantity brackets which

are more profitable and taking corrective measures where necessary. A system of budgets is also used as a means for better profit planning and as a control device.

Medium-Size Metals Service Centers

Eight of the nine companies visited in this category were familiar with the DCA. However, four of these eight companies had never used the DCA and the remaining four companies used it initially but are not using it at present.

Again, the reasons given by most of these companies were about the same--very time-consuming and costly in relation to the benefits received. A senior executive of one company said that his company had been doing "quite well" and he did not feel the need for any cost system. One company also indicated that lack of participation on the part of most firms in the industry was one of the reasons why they discontinued its use. Another reason cited was that the information generated by the DCA "was too much average oriented."

However, there were two companies which felt that they had a more sophisticated cost system than the DCA and this was the reason given for not using the DCA.

Large Metals Service Centers

Ten companies in this category were visited and it was found that none of them are currently using the DCA.

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But six companies indicated that they were using some other cost system which, in their opinion, was better and provided the type of information they needed. There were two companies which attempted to use the DCA but gave it up for the reasons which have been mentioned.

Summary of the Chapter

The first part of this chapter examined the DCA study in detail. The DCA was then critically evaluated by comparing it with the contribution approach. This comparison was helpful in revealing some of the main drawbacks of the DCA, namely,

1. failure to incorporate cost behavior patterns.
2. arbitrary allocation of many fixed costs.
3. the system involves detailed record-keeping which is time-consuming and costly.
4. although the information generated has some utility, it does not highlight the cost-volume-profit relationships and hence is not very meaningful and useful to management for planning, control, and decision-making.

The latter part of the chapter dealt with the results of the survey and company visitations. A brief summary of the survey results is provided.

1. Replies were recieved from a total of 117 companies which represents slightly over 30% of the

active member firms of the SSCI. This sample of 117 companies includes the 30 companies which were personally visited by the researcher.

2. Ninety-five companies, or about 81% of the responding companies, had industrial steel products as their major source of revenue.
3. Fifty-five compnaies were single-service-center companies.
4. Seventy companies, or about 60% of the sample, had sales of less than ten million dollars.
5. At least 33 companies indicated that they were not familiar with the DCA.
6. While 84 companies were familiar with the DCA, only 35 companies had used it in the past.
7. Only seven companies are still using the DCA. Even here it is possible that some of these firms may be using modified versions of the DCA instead of the original system.
8. Interestingly, the drawbacks of the DCA as indicated above were the main reasons given by most companies for not using the DCA. In a few cases, however, the companies were not using the DCA because they were using some other cost system which they felt was better than the DCA.

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Company visitations found one company which has used the DCA with success and the experience of this company was discussed in some detail.

It can therefore be concluded that the DCA failed to gain wide acceptance in the metals service center industry mainly because of the drawbacks mentioned above.

The next chapter deals with the survey of existing practices of the firms in the sample for isolating and controlling pre-production processing costs.

CHAPTER IV

PRE-PRODUCTION PROCESSING COST SURVEY

Introduction

In the previous chapter a beginning was made in the presentation and analysis of the "pre-production processing cost survey" replies which were received from 117 companies, representing slightly over 30% of the active member firms in the Steel Service Center Institute. These replies were analyzed in terms of the type of service center, the number of branch plants, and total annual sales. An analysis was also made of the four questions relating to the DCA. One of the conclusions of this analysis was that only seven companies are using the DCA at present.

This chapter is devoted to the presentation and analysis of the remaining questions in the survey. These questions pertain mainly to the existing practices used by these companies for isolating and controlling pre-production processing costs and to such matters as cost estimation and cost recovery on orders which involve pre-production processing. In the latter part of this chapter

the data accumulated during company visitations is summarized.

Analysis of Questionnaire Responses

Type of Cost System Used

The 110 companies which do not use the DCA were asked to indicate the cost system they used, if any. The replies are summarized in Table 4-1 below.

It is interesting to note that 47 or about 43% of the 110 companies do not use any cost system at all. Also, 33 of these 47 companies have sales of less than ten million dollars. These companies which can be classified as smaller metals service centers probably feel that the scale of their operation does not warrant the maintenance of a cost system on a regular basis. However, it is surprising to find that there are eight companies with an annual sales volume of over 25 million dollars that do not use a cost system. It would seem that the operation of a cost system on a regular basis would be justified in their case because of their size.

Twenty-six companies or about 24% of the 110 companies indicated that they use an absorption cost system. But during company visits it was found that some companies which indicated that they used an absorption cost system actually did not have such a system in operation. Instead, they used the absorption cost approach in gathering cost

Table 4-1.--Type of cost system used.

Total Sales (Millions of Dollars)	Absorption Costing		Direct Costing Prime Costs Only		Direct Costing Variable Costs		Relevant Costing		Other		None		Total Number of Companies
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Less than 1	-	-	-	-	-	-	-	-	-	-	3	100	3
1 to 5	6	14	13	30	1	2	2	4	3	7	19	43	44
5 to 10	2	12	4	24	-	-	-	-	-	-	11	64	17
10 to 25	9	36	7	28	-	-	-	-	3	12	6	24	25
Over 25	9	43	2	10	2	10	-	-	-	-	8	37	21
Total	26	24	26	24	3	2	2	2	6	5	47	43	110

information for some special situations. Thus, it is likely that not all of the 26 companies use the absorption cost system on a continuing basis.

The use of "Direct Costing--Prime Costs only" was indicated by some 26 companies. Here again, during company visits it was found that some of these companies only determined the cost of materials processed for each order and very seldom an attempt was made to determine the labor cost. Processing cost as such was not identified.

The remaining eleven companies cited the use of some other cost system such as relevant costing, etc.

It can be concluded, therefore, that a large majority of the 110 companies that do not use the DCA also do not use any other cost system on a continuing basis.

Isolating the Pre-Production Processing Cost Elements of a Given Order

Material.--Table 4-2 below indicates that about 80 companies out of 117 do try to isolate the material cost of a given order.

However, it should be noted that most of these companies attempt to determine only the approximate cost of the metal involved; and, in general, no attempt is made to identify the cost of any supplies that may be used in the pre-production processing operation. It is true that in the more simple operations such as shearing, sawing, and slitting, the cost of supplies used is negligible.

Table 4-2.--Isolation of material cost.

Total Sales (Millions of Dollars)	Number of Yes Answers	Percentage of Yes Answers	Total Companies in Sales Category
Less than 1	1	25	4
1 to 5	31	66	47
5 to 10	9	47	19
10 to 25	23	88	26
Over 25	16	76	21
Total	80	68	117

But there are certain other operations such as flame-cutting where the cost of gas used may be significant.

Labor.--As shown in Table 4-3, a total of about 66 companies or about 56% of the 117 companies attempted to estimate the direct labor cost for a given order.

Table 4-3.--Isolation of direct labor cost.

Total Sales (Millions of Dollars)	Number of Yes Answers	Percentage of Yes Answers	Total Companies in Sales Category
Less than 1	2	50	4
1 to 5	25	53	47
5 to 10	6	32	19
10 to 25	18	70	26
Over 25	15	71	21
Total	66	56	117

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Many of these 66 companies indicated that this was done only for orders which involve somewhat complex pre-production processing operations. The most common technique used for isolating direct labor cost was to have the worker or workers involved keep a record of their time spent on the order. In some instances an "average" hourly rate was used whereas some companies used some sort of a "rough estimate" to compute these costs. It should also be noted that in most cases the estimate for direct labor cost probably includes the material handling cost along with the direct labor cost for the pre-production processing operation.

Cost Center and General Overhead.--It was the area of overhead cost estimation that presented a serious problem for most companies. Table 4-4 shows that only 48 companies or about 41% of the 117 companies in the sample made any attempt to make some estimate of the overhead cost of a given pre-production processing order.

It should be pointed out that only 19 companies of these 48 companies tried to break down their total overhead costs by cost centers. This is revealed in Table 4-5.

Consequently, in most cases, the estimation of overhead costs for a given order amounted to a certain percentage of direct labor costs or some dollar amount per direct labor hour. However, during company visitations it was found that the method of estimating the percentage or

Table 4-4.--Isolation of overhead cost.

Total Sales (Millions of Dollars)	Number of Yes Answers	Percentage of Yes Answers	Total Companies in Sales Category
Less than 1	1	25	4
1 to 5	15	32	47
5 to 10	4	21	19
10 to 25	16	62	26
Over 25	12	57	21
Total	48	41	117

Table 4-5.--Breakdown of overhead cost by cost centers.

Total Sales (Millions of Dollars)	Number of Yes Answers	Percentage of Yes Answers	Total Companies in Sales Category
Less than 1	0	0	1
1 to 5	4	27	15
5 to 10	2	50	4
10 to 25	6	38	16
Over 25	7	58	12
Total	19	40	48

the dollar amount per hour ranged from a "rough guess" on the part of a senior executive to some detailed computations based on past experience.

Techniques Used for Controlling Pre-Production Processing Costs

The next question in the survey pertained to the techniques used to control the three elements of pre-production processing costs. The replies are summarized in Table 4-6. It should be noted that the breakdown is given in "per cent" only and that some row totals add up to more than 100% because more than one answer was specified by a few companies.

Nearly 50 companies or about 43% indicated that they did not use any formal technique for controlling their pre-production processing costs. This is not surprising in view of the large number of companies--47 to be exact-- which indicated that they do not use any formal cost system at all. There were about 12 companies or 11% which specified the use of some "other" techniques. However, their replies seemed to indicate the use of some informal techniques of control such as close supervision, comparison with past records, periodic review of some sort, etc.

The use of plant-wide budgets was cited by 37% of the companies. Here again, during company visits, it was found that in some cases annual budgets in rather broad

Table 4-6.--Techniques used for controlling pre-production processing costs.

Total Sales (Millions of Dollars)	Cost Center or Dept. Budgets	Plant-Wide Budgets	Product Unit Standards	Other	None	Total Number of Companies
-----Per Cent-----						
Less than 1	-	25	-	-	75	4
1 to 5	4	36	2	13	45	47
5 to 10	11	32	5	16	57	19
10 to 25	15	42	8	8	38	26
Over 25	14	52	10	10	29	21
Total	9	37	5	11	43	117

categories such as "salaries and wages" were developed instead of quarterly or monthly budgets in a more detailed classification of expenses. Only 9% of the companies indicated the use of departmental or cost center budgets and another 5% mentioned some use of standards as a means for controlling pre-production processing costs.

Cost Estimation for a Routine
Pre-Production Processing Order

The companies were asked to indicate how they estimated the cost of a routine pre-production processing order. Such an order would usually involve a very simple pre-production processing operation such as cutting to length or slitting to proper size and, therefore, it would not require much labor or machine time. The responses are tabulated in Table 4-7. Again, the breakdown is given in "per cent" only and the row totals add up to more than 100 per cent because more than one answer could be specified.

As can be expected, nearly 73% of the companies indicated that they made no cost estimate at all. Because of the inherent nature of such orders it would probably not be worthwhile to estimate the cost of each routine order. Further, the pricing of such routine orders tends to be quite competitive and consequently the price to be charged for such orders generally would not depend on the actual cost of such orders.

Table 4-7.--Cost estimation for a routine pre-production processing order.

Total Sales (Millions of Dollars)	Standard Cost Elements	Current Cost Records	Past Cost Records	Intuition	Other	No Cost Estimate Made	Total Number of Companies
-----Per Cent-----							
Less than 1	0	0	0	25	0	100	4
1 to 5	0	11	25	17	4	70	47
5 to 10	10	10	16	21	10	79	19
10 to 25	11	11	23	8	0	62	26
Over 25	5	10	14	5	0	81	21
Total	5	10	20	14	3	73	117

About 14% of the companies reported that they "intuitively" estimated the cost of such orders whereas 20% of the responses indicated the use of past cost records. Some use of current cost records and standard cost elements was also cited by a few companies.

Cost Estimation for a Special
Pre-Production Processing Order

The companies were also asked to indicate how they estimated the cost of a special pre-production processing order. A special pre-production processing order is a complex operation which would involve significant machine and/or labor time. In some cases it would also involve preliminary work and preparation of blueprints by the engineering department. Such an order may also require more than one pre-production processing operation. One example of a special pre-production processing order would be the cutting of several intricate shapes from a plate by means of a flame cutter. The replies are summarized in Table 4-8 which shows the breakdown in "per cent" only and here also the row totals add up to more than 100 per cent because more than one answer could be specified.

In the case of special orders, however, we find that only 10% of the companies reported that they do not attempt to make a cost estimate. Surprisingly, however, as many as 50% or 58 companies reported using "intuition"

Table 4-8.--Cost estimation for a special pre-production processing order.

Total Sales (Millions of Dollars)	Standard Cost Elements	Current Cost Records	Past Cost Records	Intuition	Other	No Cost Estimate Made	Total Number of Companies
-----Per Cent-----							
Less than 1	0	25	25	50	0	50	4
1 to 5	0	17	47	57	13	8	47
5 to 10	16	10	58	63	0	10	19
10 to 25	11	19	54	31	8	11	26
Over 25	20	33	38	43	14	5	21
Total	8	20	48	50	9	10	117

at some time in estimating the cost of special orders. Nearly 48% also indicated the use of past cost records on similar or related jobs and 20% or about 23 companies cited the use of current cost records.

Thus we find that most of the companies in the sample recognize the need for estimating the cost of special orders. But it appears that the majority of these companies seem to rely on intuition and past cost records instead of using more refined techniques of cost estimating and basing them on current cost conditions.

Recovery of Full Cost on the Bulk of Pre-Production Processing Orders

The question was asked: "In your opinion, do you feel that you recover the full cost (materials, labor, mfg. overhead, and applicable selling and administrative expense) on the bulk of your pre-production processing orders?"

The breakdown of answers is shown in Table 4-9.

Eighty-five companies or nearly 73% of those responding indicated that they felt that full cost was being recovered on the bulk of pre-production processing orders. On the other hand, there were 24 companies that felt that full cost was not being recovered and the remaining 7 companies were not sure.

It will be recalled that an analysis of the question pertaining to the type of cost system used revealed that a large majority of the 117 companies in the survey

Table 4-9.--Recovery of full cost on bulk of pre-production processing orders.

Total Sales (Millions of Dollars)	Number of "Yes" Answers	Percentage of "Yes" Answers	Number of "No" Answers	Percentage of "No" Answers	Number of "Not Sure" Answers	Percentage of "Not Sure" Answers	Total Number of Companies
Less than 1	2	50	1	25	1	25	4
1 to 5	36	77	9	19	2	4	47
5 to 10	13	68	4	21	2	11	19
10 to 25	20	77	6	23	0	0	26
Over 25	14	67	4	19	3	14	21
Total	85	73	24	20	8	7	117

do not use a cost system on a continuing basis. Hence it is surprising that almost 73% of these companies would feel that full cost was being recovered on the bulk of pre-production processing orders when there is apparently no substantive evidence to support such a claim. At least some of the companies which indicated that they did recover the full cost recognized that their premise was not supported by adequate cost information as can be seen from the following comments that they made:

Obviously, we don't know for lack of elaborate cost data; but we are confident that we are in good shape.

We really don't know as the application of overhead and expenses, other than material and labor, is not detailed in our records.

This is merely an assumption since cost analysis and accounting is not performed.

Intuitively based on special studies of revenue received and the overall profitability of our operations compared with others.

Effect on Order-Acceptance Decision
if Less Than Full Cost is Recovered
on a Particular Order

The companies were asked: "If you found that, on any particular order, less than full cost was being recovered through selling price, would your order-acceptance decision be affected? (In other words, would you still accept the same order for service or other reasons, hoping to make it up elsewhere?)."

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As can be expected, the responses of almost all the companies indicated that such an order would have to be carefully evaluated and that the decision to accept or reject it would depend on several factors such as the customer involved, the type and size of the order, future potential for profitable orders from the customer, the extent of the workload at the time, etc.

Evidence of Contribution to
Recovery of Fixed Costs and
Profit

The companies were also asked to indicate if they had any evidence (e.g. in the form of a report) of the contribution being made to the recovery of fixed costs and profit over and above directly applicable (i.e. variable) costs of servicing an order. The replies are summarized in Table 4-10. The data in Table 4-10 show that only 33 companies or about 28% of the sample indicated that they had some evidence of the contribution being made to the recovery of fixed costs and profit over and above directly applicable costs of servicing an order.

This question presumes the use of direct costing techniques by the companies on a continuing or periodic basis for analysis and control purposes. Again, it will be recalled that an analysis of the question pertaining to the type of cost system used revealed that only 3 companies made use of direct costing (variable costs).

Table 4-10.--Evidence of contribution to recovery of fixed costs and profit.

Total Sales (Millions of Dollars)	Number of Yes Answers	Percentage of Yes Answers	Total Companies in Sales Category
Less than 1	1	25	4
1 to 5	13	28	47
5 to 10	6	32	19
10 to 25	8	31	26
Over 25	5	24	21
Total	33	28	117

However, in Table 4-10 we find that as many as 33 companies report that they have some evidence of the contribution being made to the recovery of fixed costs and profit.

Some companies commented that only material cost and sometimes direct labor cost were the only variable costs considered. And two other companies reported that their evidence was not based on a careful and systematic analysis but on rough estimates and intuition. Thus it is probable that a substantial number of the 33 companies do not consider all the variable costs in estimating the contribution to fixed costs and profit or that their evidence is based on rough estimates and/or intuition.

Planned Changes in Cost System

The companies were asked to indicate if they were planning any changes in their cost system and also to

give the reasons for such planned changes. The responses are summarized in Table 4-11 which shows that 53 companies or about 45% of the sample indicated that they were planning changes in their cost system.

Table 4-11.--Planned changes in cost system.

Total Sales (Millions of Dollars)	Number of Yes Answers	Percentage of Yes Answers	Total Companies in Sales Category
Less than 1	2	50	4
1 to 5	16	34	47
5 to 10	7	37	19
10 to 25	14	54	26
Over 25	14	67	21
Total	53	45	117

Interestingly, more than 50% of the companies with sales of more than 10 million dollars indicated that they planned some changes in their cost system. It should be noted that some of these 53 companies did not have any cost system to begin with and, therefore, the changes in their case actually amount to the installation of some cost system.

The companies were also asked to indicate the principal reasons for planned changes and some of the comments were as follows:

We plan to institute some cost system as processing has grown to such an extent that we must have cost information to guide us in management decisions.

We have recognized the importance of better information for some time but a combination of personnel circumstances has postponed our plans.

We are constantly improving our cost system and associated financial data. Each new process or machine added and each new product affects our costing system.

We feel we should have better cost knowledge on processed orders to increase gross margin of profit.

Our present knowledge of costs is totally inadequate. Also, we are now well along with data processing which will give us better tools.

We feel a necessity for more accurate costing of pre-production processing orders but have not developed a system. Expect to do so in the next year.

Due to the low profit margins in our industry, it has become imperative that we know profit margins on every job, every customer, and every salesman.

We plan to isolate our direct costs of processing, by type of processing, by the establishment of cost centers and development of standard costs.

It is clearly evident from the data in Table 4-11 and the foregoing comments that many companies and especially those with sales of over 10 million dollars have realized the growing importance of pre-production processing operations and the need for better cost information concerning these operations.

Use of Punched Card or Tape

The last two questions in the survey pertained to the use of punched cards or tape and the manner of their processing. In Table 4-12 below, we find that 48 companies or nearly 41% of the sample make use of punched cards or tape for some phases of their operation. From company visits and the comments made by some companies it appears that punched cards or tape are mainly used for sales analysis and, at this time, very little use is made for pre-production processing cost analysis. This is also borne out by a Computer Use Survey conducted by the Steel Service Center Institute in 1967. The results of that survey also indicated a widespread use of computers in the metals service center industry and the most common types of computer applications were payroll, billing, and sales analysis.

Table 4-12.--Use of punched cards or tape.

Total Sales (Millions of Dollars)	Number of Yes Answers	Percentage of Yes Answers	Total Companies in Sales Category
Less than 1	2	50	4
1 to 5	11	23	47
5 to 10	7	37	19
10 to 25	13	50	26
Over 25	15	71	21
Total	48	41	117

In Table 4-13 we find that 34 of the 48 companies which use punched cards or tape have their own equipment to process these cards or tape. The remaining 14 companies cited the use of service bureaus for processing their cards or tape.

Table 4-13.--Processing of punched cards or tape.

Total Sales (Millions of Dollars)	Processed Through Own Equipment		Processed Through Service Bureau		Total Companies Using Cards or Tape
	No.	%	No.	%	
Less than 1	-	-	2	100	2
1 to 5	5	45	6	55	11
5 to 10	5	71	2	29	7
10 to 25	10	77	3	23	13
Over 25	14	93	1	7	15
Total	34	71	14	29	48

It is of interest to note that there is a direct relationship between company size and the use of punched cards or tape as well as their processing through own equipment. As can be seen from Table 4-13, the use of punched cards or tape and their processing through own equipment was cited by more than 70% of the companies with sales in excess of 10 million dollars.

Summary of Questionnaire Response Analysis

This chapter has so far summarized and analyzed the pre-production processing cost survey responses to questions other than those pertaining to the DCA. The analysis of the questions pertaining to the DCA has already been presented in the previous chapter.

The answers to the questions were analyzed primarily by company size as indicated by total sales as this seemed to be the best control variable for explaining the differences in pre-production processing cost practices. But, as mentioned before, even this variable is not quite adequate as a general predictor of practice in the industry.

A brief summary of the survey results follows:

1. Replies were received from a total of 117 companies which represents slightly over 30% of the active member firms of the SSCI. This sample of 117 companies includes the 30 companies which were personally visited by the researcher.
2. Ninety-five companies or about 81% of the responding companies, had industrial steel products as their major source of revenue.
3. Fifty-five companies were single service center companies.
4. Seventy companies, or about 60% of the sample, had sales of less than ten million dollars.

5. Of the 117 companies which responded, 110 companies did not use the DCA.
6. Forty-seven companies or about 43% of these 110 companies also do not use any other cost system.
7. With respect to a given pre-production processing order:
 - (a) 80 companies try to isolate the material cost
 - (b) 66 companies attempt to estimate the direct labor cost
 - (c) 48 companies try to estimate the overhead cost
8. Nearly 50 companies, or about 43%, indicated that they did not use any formal technique for controlling their pre-production processing costs.
9. Almost 73% of the companies said that they made no cost estimate for a routine pre-production processing order whereas only 10% reported not making a cost estimate for special pre-production processing orders. However, most of these companies seem to rely on intuition and some past cost records for estimating the cost of special orders.
10. Eighty-five companies felt that full cost was being recovered on the bulk of pre-production processing orders. However, it seems that in

many cases this premise was not supported by adequate cost information.

11. Fifty-three companies or about 45% of the sample indicated that they were planning changes in their cost system.
12. The use of punched cards or tape for some phase of their operation--mainly payroll, billing, and sales analysis--was indicated by 48 companies or nearly 41% of the sample.
13. The processing of these punched cards or tape through their own equipment was indicated by 34 of these 48 companies.

Company Visitations

In the previous chapter it was stated that the researcher had personally visited thirty companies which included companies from coast to coast and very large companies with many branch plants as well as small independently owned service centers. All of these thirty companies are also included in the survey sample of 117 companies.

It will also be recalled that these thirty companies were divided into three categories on the basis of total sales. In the first category were 11 companies whose total annual sales volume was between one to ten million dollars. These were considered to be smaller

metals service centers. The second group which was termed as medium size metals service centers consisted of nine companies with total annual sales of 10 to 25 million dollars. The third group included 10 companies whose total annual sales exceeded 25 million dollars and they were classified as the large metals service centers.

The primary object of these visits was to obtain information in greater detail on many of the questions in the questionnaire from senior executives and the accounting staff.

The summary results of the survey indicate that very few companies use a cost system on a continuing basis. However, many companies have recognized the need for better cost information and are planning changes to that effect.

With the answers to the questionnaire as a foundation, the data accumulated during company visitations is now presented.

Smaller Metals Service Centers

The eleven companies visited whose sales were from one to ten million dollars were all single service center operations except two companies which had one branch plant. Eight of these companies had total sales in the range of one to five million dollars.

Of these eleven companies, only one company was using a cost system on a continuing basis. The experience of this company which has successfully used the DCA for the past ten years has already been discussed in Chapter III.

Three of the remaining ten companies recognized the need for more cost information and planned to make some changes in their existing accounting system. However, the remaining seven companies felt that an "elaborate" cost system was not justified in view of their small size and hence had no plans to make any changes in their present system.

The lack of sophistication in the matter of cost accumulation and cost control was quite evident in all of these ten companies. In general, processing costs were not broken down by cost centers and in most cases only material costs were properly identified. Labor and overhead costs were often based on guesses or past experience.

In six of the ten companies visited, the researcher did not find any evidence of the use of budgets or standards as a device for controlling costs. The executive of one such company noted that "close supervision" worked quite well and hence there was no need to have a system of budgets. The president of another company indicated that he used the preceding year's results as a basis for

comparing the current year's performance. He also mentioned the use of some industry statistics published by the SSCI on the rate of return as a measure of the overall success of his company in relation to some of the other companies in the industry.

The remaining four companies did use plant-wide budgets but these budgets were prepared in broad functional categories and were not broken down in sufficient detail to provide an effective means of cost control.

Most of these ten companies relied on intuition and some past cost records as far as the acceptance of special pre-production processing orders was concerned. However, there were two companies which were moving in the direction of assembling detailed cost information for certain operations. One of these two companies kept a complete record of all costs on all major orders and these were properly filed for future reference in the event a similar order was received again.

The second company had two relatively expensive machines and the president of this company felt that detailed records of costs and revenues should be maintained for each of these two machines. Consequently, a monthly report on the operating costs and revenues is prepared to include:

1. Total number of direct labor hours for the machine including overtime hours. The total direct labor

cost is also determined and an average rate per hour is computed.

2. Indirect labor cost plus an allocation of supervisory and quoting and billing cost. Again, the total indirect cost is divided by the total direct labor hours for the month to compute an average rate of indirect costs per hour.
3. Total cost of supplies used for each machine for the month. The average rate per direct labor hour for supplies is also computed.
4. An allocation of fixed costs such as depreciation, interest, rent, state taxes, and insurance is made and the average rate of fixed cost per direct labor hour is computed.
5. By adding up the costs per hour as computed in 1 through 4, a total cost per hour for each machine is developed.
6. Finally, the total costs for the month for each machine are subtracted from the related revenues to determine the profit for each machine.

Thus, we have here an example of a small company which felt the need to determine the profitability of its processing operations and equipment and decided to accumulate the necessary cost and revenue data for this purpose. Also, the company makes very good use of the cost information in developing its pricing policies for the services

rendered by these machines. This is both interesting and encouraging especially when we consider that most of the small companies do not keep such detailed records of their processing operations and so have no real basis of judging to what extent they are profitable.

Although the efforts of this company to develop detailed cost records are commendable, the approach taken is not without some drawbacks. For example, the monthly report does not distinguish between variable and fixed costs and, therefore, the contribution margin concept is not used. The usefulness of this report could be enhanced by separating the costs into variable and fixed and by clearly identifying and segregating all the allocated fixed costs.

It should also be noted that this company does not use a system of budgets to control expenses. Instead, "direct control" is exercised by top management.

Medium Size Metals Service Centers

Five of the nine companies whose sales were from ten to twenty-five million dollars had branch plants ranging from one to six. The remaining four companies were single service center operations. As one would expect, in comparing this group to the group of smaller companies, the degree of sophistication in cost accumulation and cost control practices would be higher. However,

only two companies in this category had well developed programs in this area.

One of these two companies uses a computer to produce a variety of reports pertaining to sales, costs, and inventory. Cost centers have been established and standards have been developed for various operations performed by the workers. A system of wage rates related to performance is used to provide incentive to the workers. The company has also developed a system of standards for applying overhead to each order.

With the aid of the computer, the material, labor, and factory overhead cost of each order is determined along with the computation of gross profit for each order. However, it should be noted that costs are not classified into variable and fixed components. In addition, information regarding the customer, the salesman, and the quantity bracket for each order is also generated. Detailed reports on labor hours and labor cost are also prepared.

The researcher was very impressed with the calibre of the accounting staff and the type of information that is generated in this company. It is obvious that top management, the marketing personnel, and the purchasing staff, have access to much useful information that would enable them to make better decisions concerning their operations. But, surprisingly, in the discussions with

the accounting staff, it was learned that this information was not being fully utilized by the people concerned.

The second company also made use of data processing equipment for cost analysis purposes. Here also the different processing operations were established as cost centers. Material and labor costs were isolated by cost centers and overhead cost was applied as a per cent of direct labor cost on the basis of past experience. Also, the quantity of the various metals that were processed through a processing cost center was also determined and a cost per pound of processing was developed.

This company's accounting system, however, did not provide for a segregation of pre-production processing revenues for each operation and the comparison of these revenues with the costs to determine the extent of profitability of any given pre-production processing operation. Also, no provision was made to classify costs into fixed and variable categories.

Of the remaining seven companies five had no cost system to speak of and had no future plans to develop more cost information.

The other two companies also did not have a cost system on a continuing basis but one of them kept detailed records on many past jobs and made use of these in developing cost estimates for similar jobs that were undertaken later. The other company developed an estimate of some

dollar amount of "profit" per hour for some of its processing equipment. This estimate was then used to determine whether a given order would be accepted or rejected. The estimate was compiled on the basis of intuition, past experience, and past records. Also, the orders were analyzed after the fact to determine whether the estimated profit was, in fact, realized.

Large Metals Service Centers

Visits were made to a total of ten companies with sales of twenty-five million dollars or more per year. Some of the largest companies in the industry were included in this group. Interestingly, only three of these ten companies did not make use of a computer in their operations.

It was found that, in this group, the degree of sophistication in cost accumulation and cost control techniques ranged all the way from quite unsophisticated to highly sophisticated.

Three Companies with No Cost System.--Three of these ten companies indicated that they used no cost system in their operation. A senior executive of one company expressed strong disbelief in such a program and felt that any cost information is not useful because it is arbitrary depending on how costs are allocated. As he put it: "You can make them come out as you want." When asked how control

was exercised in such a large company he related his philosophy as follows: If everybody in the organization operates at a high level of efficiency then the entire organization would be functioning at a high level of efficiency and, therefore, there would be little need for any type of control. A serious and somewhat questionable implication in this philosophy is that there are no problems of motivating employees to work efficiently.

The second company relied on intuition and past experience for estimating costs on special orders and on close supervision by middle and top management for exercising control.

The third company had plans to install a computer system and was in the process of establishing a cost system. The company had no formal system of budgetary control and the president indicated that they were currently working on this problem also.

Examples of Some Well Developed Programs.--While all of the remaining seven companies had cost control programs with varying degrees of sophistication, the experience of three companies is worthy of mention here.

The first company has many branch plants scattered over a wide geographical area. This company has a well developed EDP program and has also developed a very sophisticated cost system especially tailored to meet its particular needs. Profit and loss reports are prepared each

month for all departments and branch plants. These reports are prepared using the contribution approach as described in the previous chapter and costs are broken down into variable and fixed categories with the contribution margin being clearly identified. The company utilizes the concept of profit planning and has an excellent system of budgetary control in operation. The monthly profit and loss reports of each department and branch plant compare the actual performance with the budgeted performance.

The company has a rather large standards and methods department which is entrusted with the task of developing specifications and standards for various types of jobs and operations, particularly pre-production processing operations. As such the company has done some significant pioneering work in this area of developing cost information for various types of pre-production processing services and has generally been recognized as one of the leaders in the determination of pricing policies for such services.

The second company, in contrast to the first one, is a single service center operation and its pre-production processing operations chiefly consist of shearing and slitting. It was not too long ago that this company realized the need for more detailed cost information concerning its pre-production processing services especially because of the high cost of some of its processing

equipment. Consequently, a cost system was installed so as to provide detailed cost information regarding its processing operations.

Cost centers have been established in the warehouse and each machine is regarded as a cost center. All warehouse expenses are analyzed and are identified or allocated to each of the cost centers. Also, the quantity, in pounds, of metals processed through each machine is also recorded. Monthly cost reports are prepared which indicate the total costs pertaining to each machine and the quantity of metals processed. The cost of processing per pound is also computed.

While the above approach certainly represents a marked improvement over the previous procedures, some of the criticisms made before are also applicable here. First, the monthly cost reports do not break down the costs into variable and fixed components. Second, it would be very helpful if the processing revenues generated by each machine were also identified with the costs so as to indicate the extent of contribution being made by each processing cost center to the overall profits of the company.

The third company, like the first one discussed before, also has many branch plants. It, too, has developed a sound program of cost control which involves the use of standards for materials and labor and budgets for

other expense classifications. One interesting feature concerning this company is that it has developed an effective system of keeping track of "shorts" and other remnant pieces of metals so that incoming orders can be screened to see if any of the odd pieces could be utilized first before using standard mill shapes and sizes.

Summary of Company Visitations

The preceding descriptions of pre-production processing cost practices indicate a diversity of approaches. Some of these differences can be attributed to variations in company size and the extent of pre-production processing operations, while others must be attributed to differences in management philosophy with respect to this area.

The number of companies with well developed programs is still rather small and a direct relationship between company size and the degree of sophistication in pre-production processing cost practices is not quite evident. But it is encouraging to note an awareness on the part of most companies of the growing importance of pre-production processing and the need for better cost information. A likely possibility is that many of the companies which use a computer for billing and sales analysis will, in time, seriously consider its use for pre-production processing cost analysis.

CHAPTER V

REVIEW OF APPLICABLE COST CONCEPTS AND CLASSIFICATIONS

The purpose of this chapter is to provide a brief review of some applicable cost concepts and classifications so as to gain a better understanding of the techniques for analyzing and controlling costs. In the next chapter, the profit planning and control system will be presented.

For the present purpose, the words "cost" and "expense" may be considered to be synonymous although from an accounting standpoint they are not treated as such.¹ The accounting data which are routinely accumulated became the basis of a wide variety of managerial decisions. The general meaning of cost is sacrifice or foregoing, but "there is no unique 'correct' classification of cost that is applicable to all situations, that is pertinent for all

¹In accounting costs are often referred to as unexpired costs and expired costs. Unexpired costs are carried forward to future periods as assets. Expired costs are those which should be released to the current period as expenses or losses. This point is discussed by Charles T. Horngren in Cost Accounting: A Managerial Emphasis (2d ed. rev.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967) p. 24.

purposes."² In other words, different cost classifications are needed to serve different purposes. For example, the long-run efficiency of the operations of the firm can best be evaluated by considering the total production cost per unit. On the other hand, the relevant cost which should be considered for accepting a special order would be the estimated incremental cost that would result from such acceptance. The concept of "controllable" cost is more pertinent for evaluating the control of current operations.³

In order to guide his day-to-day decisions, the manager is concerned with cost classification by various segments of the firm. A segment may be defined as "any line of activity or part of an organization for which a separate determination of costs and/or sales is wanted."⁴ A segment is also referred to as a cost center when only a separate determination of costs is wanted; and it is referred to as a profit center when a separate determination of both costs and sales is desired. A product, a plant,

²Charles T. Horngren, Cost Accounting: A Managerial Emphasis (2d ed. rev.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967) p. 17.

³Nicholas Dopuch and Jacob G. Birnberg, Cost Accounting: Accounting Data for Management's Decisions (New York: Harcourt, Brace and World, Inc., 1969) p. 11.

⁴Charles T. Horngren, Accounting for Management Control: An Introduction (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965) p. 237.

a territory, a machine, a customer, a job, and a department may all be treated as segments.

It should be noted that there are numerous ways of classifying costs and it is the purpose here to examine only some of the major cost classification concepts which will be useful in developing the profit planning and control model.

Functional Costs

One approach with respect to cost classification would be to classify costs by functions such as plant, sales, and administration. The DCA program attempted to relate all costs to the several functions that are performed. It also provided a list of functions applicable to metals service centers and the functions are divided into two categories: supporting and prime. The functional costs are then grouped into three broad categories: product costs, customer costs, and general costs. Then an allocation procedure enabled the preparation of product line, territorial, and customer profitability reports (see Appendix B--charts D, E, and F). The limitations of the DCA program have already been discussed at length in Chapter III. One of the major defects was the failure to distinguish between variable and fixed cost behavior patterns.

Variable, Fixed, and Mixed Costs

One of the most fundamental classification of costs is according to their degree of variability in relation to changes in volume. The short-range planning and budgeting cycle for a business organization is typically one year. Thus for purposes of cost analysis covering a time span of one year, most accountants assume that all costs can be categorized as either fixed or variable.

According to Shillinglaw, "Variable costs are those that change as a necessary response to small changes in volume. These are the costs incurred by utilizing the available capacity to produce or sell goods or services. They may or may not average the same amount per unit as volume increases or decreases, but they are by definition variable in total, depending on the rate of activity."⁵ Direct labor and raw materials are examples of variable costs. Variable costs are also referred to as activity costs because the total amount for a given period tends to vary proportionately with the volume of activity.⁶

⁵Gordon Shillinglaw, Cost Accounting: Analysis and Control (2d ed. rev.; Homewood, Illinois: Richard D. Irwin, Inc., 1967) p. 61.

⁶Walter B. McFarland, Concepts for Management Accounting (New York: National Association of Accountants, 1966) p. 51.

Fixed costs are those that will not change in total over wide ranges of volume. They are also called capacity costs because they are incurred to provide the capacity to produce and sell a product or a service. However, a fixed cost is fixed only in relationship to a given time period and a given, though wide, range of activity called the "relevant range."⁷ Also, as the time span becomes longer, more costs tend to become variable so that in the very long run all costs can be considered to be variable.

For planning purposes, it is useful to subdivide fixed costs into committed and programmed costs. Committed costs arise as a result of long lived commitments for physical facilities and services. Depreciation and property taxes are good examples of committed costs. These costs are the least responsive of the fixed costs and need to be planned and controlled on a long range basis.

Programmed costs--also called discretionary costs--are those fixed costs which arise from periodic appropriation decisions that directly reflect top management policies. They are determined by organizational objectives and constitute outlays in manufacturing, selling, and administrative areas. The costs incurred for training

⁷Charles T. Horngren, Cost Accounting: A Managerial Emphasis (2d ed. rev.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967) p. 20.

programs, advertising, and research and development are all examples of programmed costs. Unlike committed costs, programmed costs are subject to a greater degree of control and can be influenced more easily from period to period.⁸

Not all costs, however, can be neatly categorized as variable and fixed. Some costs contain elements of both and are termed semivariable or semifixed or mixed costs. The cost of electric power is one example of a mixed cost. A certain minimum cost is incurred for some power consumption which is independent of operating volume, while another component is likely to vary directly with volume.

Since mixed costs are a blend of two unlike cost behavior patterns, theoretically, these costs can be subdivided into two accounts, one for the variable portion and one for the fixed portion. A statistical technique known as the method of least squares is available for separating the mixed cost into its variable and fixed components.⁹ In practice, however, if the amount of a given mixed cost is not material it would not be worthwhile to undertake the

⁸Charles T. Horngren, Accounting for Management Control: An Introduction (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965), p. 237.

⁹Charles T. Horngren, Cost Accounting: A Managerial Emphasis (2d ed. rev.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967) pp. 218-19.

effort of separating the mixed cost into its variable and fixed components.

The concepts of variable and fixed costs are very important from the viewpoint of managerial planning and control. A knowledge of cost behavior patterns enables management to properly analyze the interrelationships of costs, volume, and profit and, therefore, is invaluable in guiding management decisions.

Controllable and Uncontrollable Costs

One of the principal uses of cost data is to facilitate the control of the operations of a firm. But in order to effectively analyze the performance of the various segments of a firm, it is necessary to develop reports which will indicate the costs that are controllable by the manager who is responsible for that segment.

Internal cost control is tied closely to the concept of responsibility and, whenever possible, costs should be recorded and traced to the manager who is responsible for them. Such reporting of costs by responsibility is often referred to as responsibility accounting.

Responsibility accounting attempts to distinguish between controllable and uncontrollable costs. Horngren defines controllable costs as follows: controllable costs

are those that are directly influenced by a manager within a given time period.¹⁰

A common misconception is to assume that all fixed costs are uncontrollable and all variable costs are controllable. Rent is a fixed cost and regardless of the time period, it is uncontrollable as far as the warehouse foreman is concerned. But it may be controllable by top management which has the responsibility of deciding whether to own or rent a given facility.

Although not all variable costs are controllable at a given managerial level, most variable costs are subject to control and hence the classification in terms of fixed and variable becomes suitable for this purpose also.

Controllability is a matter of degree and often the diffusion of control throughout the organization makes the problem of distinguishing controllable costs quite difficult. Also, as the time period becomes longer, more costs become controllable whereas in the short run fewer costs are controllable. Despite these difficulties, though, such a distinction is useful for cost control purposes.

Separable and Common Costs

All costs that can be directly traced to a given segment are called separable costs. Specific product

¹⁰Ibid., p. 273.

advertising or research costs are an example of separable costs when the product in question is a segment.

On the other hand, those costs which are common to all segments and cannot be identified with particular segments except by using arbitrary allocation procedures are called common costs. The salary of the president would be an excellent example of a common cost.

In general, all variable costs are separable whereas the separability of fixed costs (programmed and committed) would depend upon the segment in question. This notion of separable and common costs is very helpful in the proper evaluation of different segments of a company.

CHAPTER VI

THE PROFIT PLANNING AND CONTROL SYSTEM

In the chapter dealing with the survey of pre-production processing cost practices, it was found that a diversity of approaches exist with respect to pre-production processing costs and they range all the way from highly sophisticated to very unsophisticated. Also, the number of companies with well developed programs is still quite small although many companies are realizing the need for better cost information especially regarding their pre-production processing operations. A brief review of applicable cost concepts and classifications was provided in the preceding chapter.

With this as a background, this chapter will develop and present a profit planning and control system. It is not the purpose here to present a very sophisticated and complex system of cost control but rather a relatively simple and uncomplicated approach to cost control. Such an approach will not involve the use of detailed procedures concerning the classification of costs as was the case with the DCA. It will be recalled from Chapter III that one of the objectives of the DCA program was to collect and publish

comparative percentage reports enabling participating companies to judge their efficiency against other firms handling identical products. This will not be an objective of the profit planning and control system. Instead, the primary objective of this system will be to improve the profitability of metals service center operations in general and particularly their pre-production processing operations through the use of formal techniques of planning and control. The system will emphasize cost behavior patterns and will distinguish between variable and fixed costs. It is hoped that individual firms--especially the smaller service centers--will be able to adapt this approach to their own operations and that it will lay the foundation for the gradual development of a more sophisticated cost control system.

The development and presentation of the profit planning and control system will be done in four phases which are as follows:

1. The Organization Phase
2. The Planning Phase
3. The Control Phase
4. The Decision-making Phase

The Organization Phase

The profit planning and control system is primarily concerned with improving the profitability of metals

service center operations. Hence, as a first step, it is suggested that product line segments and processing segments be devised.

A product line segment would consist of a product or a group of homogeneous or similar products for which it would be desirable to obtain a separate determination of costs and revenues.

Processing segments would consist of various pre-production processing operations such as slitting, shearing, flame cutting, etc. In other words, the slitting operations would comprise one processing segment, the shearing operations would comprise another processing segment, and so on. It is also possible to have more than one processing segment for the same pre-production processing operation. For example, a company may want to treat two shears of different sizes as separate processing segments so as to be able to evaluate the operations of each shear. It is presumed here that most service centers would be in a position to segregate revenues derived from processing operations.¹ Field interviews indicated that processing revenues are segregated at least by some companies and, therefore, it is feasible to do this.

¹Letter from Mr. Thomas F. Leopard, Controller, O'Neal Steel, Inc., Birmingham Alabama, October 12, 1966.

The second step involves the ultimate identification of all separable costs and revenues to the individual product line and processing segments. This is shown in Exhibit 6-1. All costs would be first grouped into the three major functional categories: plant, sales, and administration. Each one of the cost items within these three functional classifications would then be analyzed into variable, programmed, and committed categories. Finally, each one of these cost components would be identified with individual product line or processing segments to the extent that it is feasible to do so without resorting to any arbitrary procedures. The remaining cost items would be classified as common costs. Similarly, all the revenue items would be traced to the individual product line or processing segments to the extent that they are separable and the remaining revenue items would be considered common. As far as service center operations are concerned, there will be some common costs but the possibility of common revenues is rather remote.

From the standpoint of planning and control, it would be desirable to establish responsibility segments within the three broad functional cost categories. A suggested plan for establishing such responsibility segments is shown in Exhibit 6-2. It should be noted that the number and type of responsibility segments will vary from company to company depending upon the size and

EXHIBIT 6-1

Classification and Identification of Costs and Revenues
with Product Line and Processing Segments

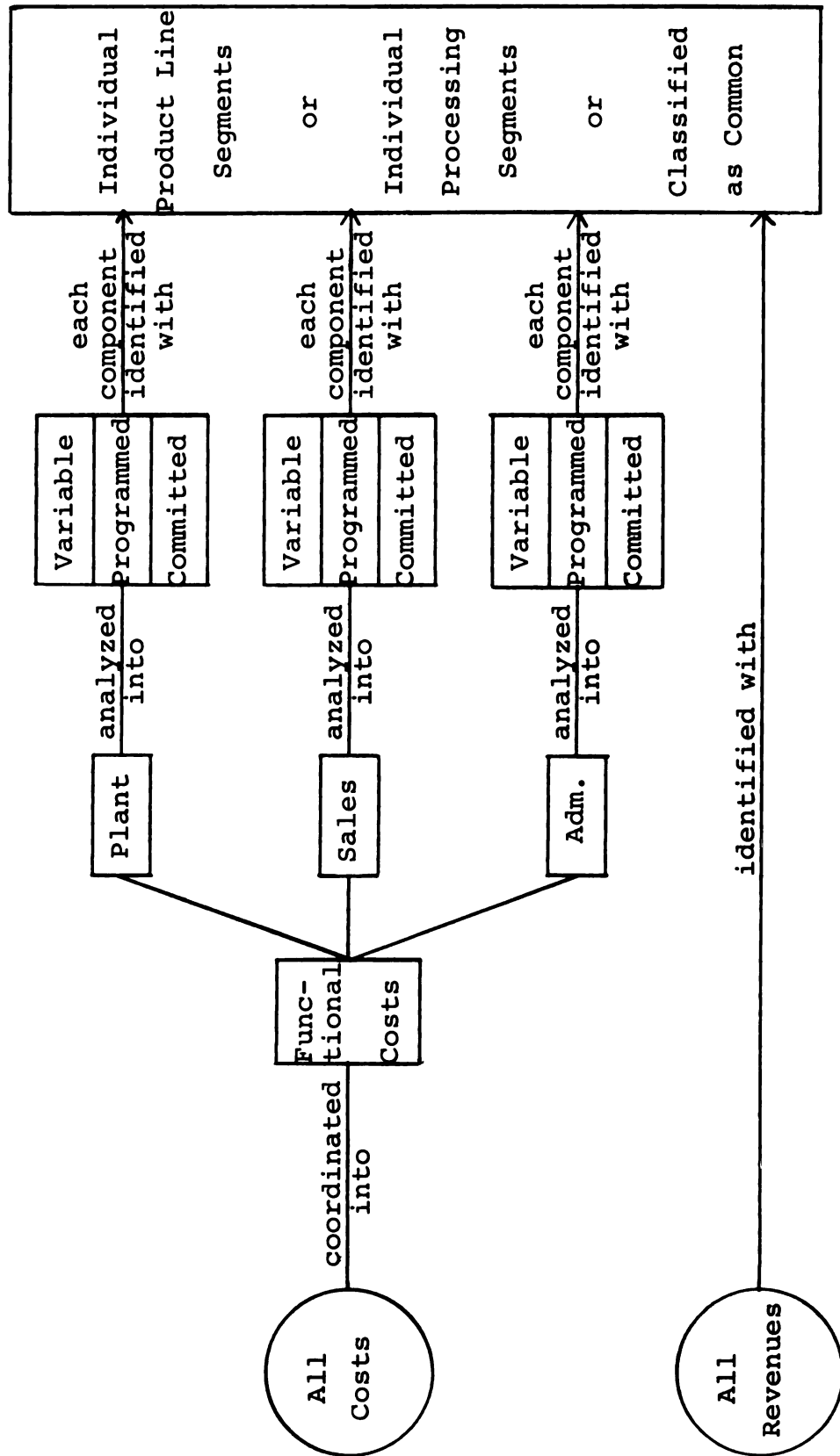


EXHIBIT 6-2

A Suggested List of Responsibility Segments
for a Single Plant Service Center

PLANT

Each Product Line Segment
Each Processing Segment
Material Handling
Repairs and Maintenance
Purchasing

SALES

Outside Selling
Inside Selling
Advertising
Order Processing
Delivery
Packaging and Shipping

ADMINISTRATION

Accounting
Credit and Collection
General

complexity of operations. The main point to be emphasized is that the establishment of appropriate responsibility segments would be useful in achieving more effective cost control. This is discussed in greater detail in the section dealing with the control phase of the system.

The third step would be to arrange the revenue and cost data for each segment in such a manner that it would aid in the managerial functions of planning, control, and decision-making. A suitable framework that would accomplish this would be the contribution approach which highlights cost behavior patterns and cost-volume-profit relationships. A sample of the contribution approach segmental income statement format is shown in Exhibit 6-3.

An examination of Exhibit 6-3 reveals that the main emphasis is on the classification of costs into variable, programmed, and committed categories. A functional classification is also made within these three categories. This is in sharp contrast to the traditional approach and the DCA which only emphasize functional costs and ignore a classification by cost behavior.

Exhibit 6-3 also reveals three margin concepts that need to be explained briefly. First, there is the contribution margin which is the difference between sales and total variable costs. The contribution margin is particularly useful in determining the impact of short run

EXHIBIT 6-3

A Segmental Income Statement

Based on the Contribution Approach

Company as a Whole	Product Line A	Product Line B	Product Line C	Processing Segment X
Net sales	xxx	xxx	xxx	xxx
Variable plant costs	xxx	xxx	xxx	xxx
Variable selling and adm. costs	xxx	xxx	xxx	xxx
Contribution margin	xxx	xxx	xxx	xxx
Programmed costs	xxx	xxx	xxx	xxx
Performance margin	xxx	xxx	xxx	xxx
Committed costs	xxx	xxx	xxx	xxx
Segment margin	xxx	xxx	xxx	xxx
Common fixed costs	xxx			
Net operating income (before income taxes)	xxx			

changes in volume on net income. Next, the difference between the contribution margin and total programmed costs is the short run performance margin which, along with the contribution margin, is a useful indicator of a segment's short run profitability.² Last, we have the segment margin which is the difference between sales and all identifiable variable and fixed costs. According to Horngren, the segment margin may be helpful as a crude indicator of long run segment profitability, but it should definitely not influence appraisals of current performance.³ The specific usefulness and application of the segmental income statement and these margin concepts will be discussed in the latter part of this chapter dealing with the decision-making phase of the system.

The preparation of segmental statements and other reports based on the contribution approach would be facilitated by a properly designed chart of accounts which is based on a system of numerical account coding.⁴ With the

²Charles T. Horngren, Cost Accounting: A Managerial Emphasis (2d ed. rev.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967) p. 303-304.

³Ibid.

⁴A detailed discussion regarding the development of a suitable chart of accounts can be found in Robert Beyer's Profitability Accounting for Planning and Control (New York: The Ronald Press Company, 1963) p. 72-99.

increasing use of some form of electronic data processing equipment by most companies, such a system would provide management with timely reports which would be very helpful in conducting the day-to-day operations of the firm. Most service centers will generally have a chart of accounts which reflects a natural cost classification. In such a case each one of the natural cost items can be first grouped into an appropriate functional classification. Then the functional costs can be analyzed to classify them into variable, programmed, and committed categories. Finally, these cost items would be traced to the individual segments provided, of course, that they are separable. This entire process can be accomplished through a worksheet procedure. It should be noted, however, that the analysis of natural cost items by means of a worksheet would be time-consuming and hence the preparation of segmental statements would be somewhat delayed. It is, therefore, suggested that service centers redesign their chart of accounts so as to comply with their specific needs for information and to facilitate the timely preparation of segmental statements.

The Planning Phase

The basic objectives of any business enterprise will not generally be attained without effective direction. Today's industrial organizations have become

increasingly large and complex and find themselves in an environment dominated by changing economic conditions, government regulations, customer needs, and technological advances. It is, therefore, essential that the management of a business enterprise should not only define its goals and objectives but should also develop plans for achieving them. As Davis states that "managerial functions involve the work of planning, organizing, and controlling the activities of others in accomplishing the organization's objectives."⁵ Thus these managerial functions include (1) formulation of plans, (2) coordination of activities dictated by the plans, and (3) control of operations. All of these three functions are complex and interrelated.

This whole process of planning, coordinating, and the control of operations has been referred to as the process of comprehensive budgeting. The Accountants' Cost Handbook states that there are numerous definitions of the word budget.⁶ Welsch defines a business budget as "a management plan covering all phases of operations for a

⁵Ralph C. Davis, The Fundamentals of Top Management (New York: Harper and Brothers, 1951) p. 22-23.

⁶Robert I Dickey (ed.), Accountants' Cost Handbook (2d ed. rev.; New York: The Ronald Press Company, 1960) p. 20-8.

definite period in the future. It is a formal expression of the policies, plans, objectives, and goals established by top management for the concern as a whole and for each subdivision thereof."⁷ He also refers to the business budget as a profit plan and prefers to use the phrase "profit planning and control" instead of the term "budgeting."⁸

It is helpful to distinguish between long-range planning and short-range planning. Long-range planning generally extends beyond one year and may involve time spans of five, ten, or even twenty years. Such planning would involve the establishment of broad objectives of the business in such areas as the addition of new products and marketing areas, equipment purchases, plant locations, profit objectives, return on investment objectives, and growth patterns. On the other hand, short-range planning involves the preparation of an annual budget or the annual profit plan. It is developed in considerable detail and consolidates the overall plans of management in quantitative terms.

Although the profit planning and control system will put primary emphasis on short-range planning, the

⁷Glenn A. Welsch, Budgeting: Profit Planning and Control (2d ed. rev.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1964) p. 5.

⁸Ibid.

importance of long-range planning must be stressed. In this dynamic and highly competitive business environment, a business enterprise must concern itself with long-range plans if it hopes to maintain a position of leadership in the future. An important part of this long-range planning would be the capital budget which would be a formal expression of management's long-range plans for additions and improvements of physical facilities and equipment purchases. The portion of this capital budget which relates to the coming year would, therefore, affect certain subsidiary parts--such as the cash budget--of the annual profit plan.

The annual profit plan consists of the operating budget, the financial budget, and some special budget reports such as breakeven projections. The important elements of the operating budget are (1) the sales budget for different products and services and (2) the various expense budgets. As such, the components of the operating budget can be combined to prepare a forecasted or budgeted income statement for the coming year. Similarly, the financial budget consists of (1) the budgeted statement of cash receipts and disbursements, (2) the budgeted balance sheet, and (3) the budgeted statement of source and uses of working capital.

The Operating Budget

The Sales Budget.--The sales budget is the revenue side of the profit plan. Since the level of product purchases and various expenses depends upon the volume of sales activity, the sales budget becomes the cornerstone of the budgeting process.

As far as service center operations are concerned, the sales budget will consist of two main schedules: (1) the product sales budget and (2) the processing revenue budget.

The product sales budget will contain the annual quantities and the dollar revenue by product line and will generally be broken down by month and/or by quarter. It would also be broken down by sales territory, by customer, and by salesman.

The processing revenue budget should contain estimated dollar amounts of each type of processing service that is expected to be rendered and should also be broken down by month and/or by quarter. It could be detailed by sales territory, by customer, and by salesman if it is felt that such a breakdown may be useful.

The importance of an accurate sales forecast cannot be overstressed but the preparation of one is a most difficult task. While past sales volume may be a logical starting point in preparing the sales estimates for different product lines and processing services, several

other factors also need to be considered. These would include: general economic and industry conditions, seasonal variations, degree of competition, market research studies, advertising and other promotion plans, processing capacity, etc.

Although top management should be involved in the preparation of the sales budget, the primary responsibility for determining the sales goals should lie with the sales executives, supervisors, and salesmen who will be expected to achieve or exceed these goals.

A well developed sales budget not only provides the basis for preparing the product purchases and other expense budgets but it also sets forth sales goals and fixes responsibility for their attainment. In addition, the processing revenue schedule will provide an indication of possible scheduling problems that may arise as well as an insight into future equipment acquisition plans.

The Product Purchases Budget.--The product purchases budget contains the quantities of each product to be purchased as well as its cost. It is based primarily on the sales budget and planned changes in inventory levels for the coming year. Other factors which should be considered in preparing this budget will be the timing of actual deliveries, economic order quantities, storage costs, availability of warehouse facilities, risks of obsolescence and possible price changes, cash requirements, etc.

The head of the purchasing department would normally be responsible for preparing this budget and it should be broken down by month and/or by quarter. It is important that product purchases be carefully timed so as to avoid shortages and to efficiently use warehouse and financial resources.

The advance planning of product purchases will enable management to seek out alternative sources of supply and to utilize warehouse space more efficiently. It will also provide management with an indication of cash needs and financing requirements.

The Plant Expense Budget.--The plant expense budget is a summary of all the responsibility segment budgets in the plant. As such, it will be supported by subsidiary budget schedules prepared for segments such as:

- (1) Each product line segment
- (2) Each processing segment
- (3) The purchasing department or segment
- (4) The repairs and maintenance department or segment
- (5) The material handling segment

The sales budget indicates the dollar amounts of revenue associated with each product line and processing segment. Similarly, the expense budget for these segments would indicate the dollar amounts of expenses associated with such segments. The expenses would include separable costs such as plant rent, depreciation, insurance, and

property taxes as well as wages paid to the operators of processing equipment. The amount of such expenses would, of course, depend on the activity level as indicated by the sales budget. Past experience should be helpful in preparing estimates for these and other expenses.

The remaining three expense schedules, namely, purchasing, repairs and maintenance, and material handling would also contain the estimated amount of expenses which would be incurred in the coming year. Obviously, these estimates would depend on anticipated levels of activity for these segments. It should be noted that some of these subsidiary schedules such as material handling and processing would be affected by plans which call for improved or expanded warehouse facilities and equipment purchases in the coming year.

The preparation of expense schedules for each of the above segments would be most helpful to management in highlighting problem areas that may develop so that it may be better prepared to cope with them.

The Selling Expense Budget.--This schedule is a summary of all the responsibility segment budgets in the sales department. Hence this budget will be supported by subsidiary schedules which would include the following:

- (1) The outside selling segment
- (2) The inside selling segment
- (3) The advertising segment

- (4) The order processing segment
- (5) The delivery segment
- (6) The packaging and shipping segment

From a responsibility and control standpoint, it would be desirable to consider each salesman as a segment. As a result, the schedules for outside and inside selling expense, in turn, will be supported by the selling expense schedules of each salesman.

Again, each of the above schedules would contain estimates of expenses that are expected to be incurred given the volume of sales activity. The responsibility for their preparation would lie with the person in charge of each segment. The preparation of these estimates in advance would be helpful to management particularly in pinpointing areas of deficiency with respect to sales personnel.

The Administrative Expense Budget.--This budget, too, is a summary of the responsibility segment budgets in the area of administration. Specific subsidiary schedules that would support this summary budget include accounting, credit and collection, and general administration.

The administrative expense budget indicates the level of administrative expense which would be consistent with the projected sales volume. It would enable management to make adequate plans for the number and type of office personnel that would be needed.

The Budgeted Income Statement.--The sales, product purchases, and the expense budgets will provide the necessary information for preparing an estimated or budgeted income statement for the coming year. The budgeted income statement brings together the revenue and expense budgets and projects the final profit that is expected to be realized. Thus it enables management to compare this projected profit with the target return on investment or sales. Such a comparison may lead to a revision of revenue and expense estimates so that the revised plan is in harmony with management goals concerning the return on investment or sales.

The budgeted income statement is generally broken down by month and by quarter. It may also be broken down by product line and processing segments, by sales territories, and by customers. The latter breakdown would help management determine which particular product line or processing segments, sales territories, and customers are likely to be the most profitable.

The Financial Budget

No profit plan would be complete without the preparation of the financial budget which consists of the cash budget, the budgeted balance sheet, and the budgeted statement of sources and uses of working capital.

The Cash Budget.--The cash budget involves detailed estimates of anticipated cash receipts and disbursements

for the coming year. It is based on the sales, product purchases and the expense budgets. It would also be affected by plans for warehouse improvements or additions and equipment purchases during the coming year. It summarizes the impact of these budgets on the company's cash position.

The cash budget assists management in coordinating cash inflow and outflow and in synchronizing cash resources with needs. It is an invaluable management tool which facilitates financial planning and enables management to maintain a reasonable cash balance at all times, so as not to impair daily operations and provide for contingencies and possible miscalculations in planning.

The Budgeted Balance Sheet.--The budgeted balance sheet projects the financial position of the firm at the end of the coming year. It is a summary budget statement and is based on the other budgets which have been prepared.

A close examination of the projected balance sheet may reveal that borrowing may exceed safe limits or that certain financial ratios may turn out to be unfavorable. This could indicate a need for some revision of the plans.

The Budgeted Statement of Sources and Uses of Working Capital.--Just as the budgeted income statement provides information concerning the profitability of a firm, the cash budget and the budgeted statement of sources and uses of working capital provide information concerning

the solvency of the firm. This last budgeted statement is also a summary budget and is based on the other budgets which have been prepared. It indicates the anticipated change in working capital that will come about as a result of the profit plan adopted and lists the sources and uses of working capital during the coming year.

The projected statement of the sources and uses of working capital would be of much use to management. It would be helpful in guiding financing decisions and suggest how the working capital position can be improved. It would focus attention on the resources available for warehouse expansion and equipment acquisitions. Lastly, it could also be used in planning for the retirement of long-term debt and a sound dividend policy.⁹

The Advantages of Budgeting

The budgeting process offers some significant advantages to management. Since budgets represent a formal expression of managerial plans, the process of budgeting makes planning an explicit management responsibility and compels managers to anticipate and prepare for changing conditions.¹⁰

⁹Carl L. Moore and Robert K. Jaedicke, Managerial Accounting (2d ed. rev.; Cincinnati: South-Western Publishing Company, 1967) p. 191.

¹⁰Charles T. Horngren, Cost Accounting: A Managerial Emphasis (2d ed. rev.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967) p. 121-122.

Budgets provide management with a basis for judging actual results. Such a comparison is more meaningful than comparing actual results with past performance. The use of past performance as a basis for judging actual results is not recommended because it may not reflect the changes in economic conditions, technology, personnel, etc., and also because there may be inefficiencies buried in the past performance.¹¹

Budgeting helps management in coordinating and communicating the overall plans and objectives to the personnel in the organization. It forces the executives in charge of responsibility segments to see how their operations relate to other segments and to the company as a whole.¹²

General Comments Regarding the
Preparation of the Operating
and Financial Budgets

The process of budgeting is not merely an attempt to estimate or guess what sales and expenses will be in the coming year. Rather, it involves a serious and intelligent effort on the part of management to develop "a plan with clearly defined objectives toward which operational

¹¹Ibid.

¹²Ibid.

effort is directed."¹³ Consequently, the sales and expenses for each one of the responsibility segments must be carefully planned and estimated and such planning should be done primarily by the person who is in charge of the segment.

Since the profit planning and control model emphasizes classification of expenses into variable, programmed, and committed, it is only appropriate that such a classification be maintained in the preparation of expense budgets for responsibility segments.

As discussed above, the annual profit plan requires the preparation of separate budgets for sales, product purchases, expenses, and cash. However, it must be stressed that all of these budgets are interrelated to some degree. For example, selling expenses will generally depend on the sales budget. But certain items of selling expense such as advertising and travel also help to create more sales and thus affect the sales budget. Similarly, the expense for a given processing segment will generally depend on the projected processing revenue. But the latter will be affected by the acquisition of new processing equipment which, in turn, will affect the expense of that processing segment.

¹³Glenn A. Welsch, Budgeting: Profit Planning and Control (2d ed. rev.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1964) p. 82.

As management gains more experience in budgeting, it will become more sophisticated in this area and will be able to avoid past errors and make more accurate estimates. It will also begin to see more clearly the interrelationships of costs, volume, and profit.

Once the profit plan is finalized and adopted, it does not mean that it cannot be changed during the year. It is quite possible that certain external factors which are beyond management's control and on which some of the budget estimates were based have changed during the year. In such a case it would be necessary to make appropriate revisions in the plan so as to reflect the changed conditions that will prevail.

The success of the entire budgetary program will largely depend on the degree to which top management is "sold" on the program as well as the extent of participation by other personnel. It is extremely important that top management must enthusiastically support the program and that it should be understood and accepted by all the employees as a vehicle for improving company profits. If properly used, a budgetary program can become a "systematic tool for establishing standards of performance, for providing motivation, for gauging results, and for helping management advance towards its objectives."¹⁴

¹⁴ Charles T. Horngren, Cost Accounting: A Managerial Emphasis (2d ed. rev.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1964) p. 120.

In concluding this section on planning, it must be emphasized that it is, by no means, an exhaustive and complete coverage of this very important subject. Instead, it was the purpose here to stress the importance of planning and highlight some of the main aspects concerning the process of budgeting. There are many published works which contain a comprehensive and complete treatment of planning and budgeting and some of these have been referred to in this section.

The Control Phase

Meaning of Control

Much has been written about the word "control" and how it should be defined. Very simply, it may be defined as "the action necessary to assure that objectives, plans, policies, and standards are being achieved."¹⁵ Hence it would be presumed that objectives, plans, policies, and standards have been determined and communicated to those individuals having assigned responsibilities.

However, Dopuch and Birnberg feel that the above concept of control implies a purpose which is too narrow. It is their contention that performances should be made to conform to standards only if the standards continue to

¹⁵Glenn A. Welsch, Budgeting: Profit Planning and Control (2d ed. rev.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1964) p. 13.

reflect optimal action in light of operating conditions actually observed. Therefore, they define control as "a system or process consisting of comparisons between standards and actual performances, with the comparisons serving as a basis for determining the proper responses to actual operating results."¹⁶

A fundamental relationship exists between planning and control and without effective planning there can be no effective control. Horngren seems to feel that planning and control blur into one another in the real world and that they are basically indivisible.¹⁷

It must be emphasized that control must relate to the future and not to the past. This point is well made by Bedford when he states:

The essential nature of control involves not so much the correcting of past mistakes as the directing of the current and future activities in such a manner as to assure the realization of management plans. In a sense, control becomes methods of motivating various members of a business organization to assure actions on their part which are to the benefit of the firm. Normally,

¹⁶Nicholas Dopuch and Jacob G. Birnberg, Cost Accounting: Accounting Data for Management's Decisions (New York: Harcourt, Brace and World, Inc., 1969) p. 243-44.

¹⁷Charles T. Horngren, Cost Accounting: A Managerial Emphasis (2d ed. rev.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967) p. 279.

such action will involve the carrying out of the adopted plans of management.¹⁸

Moore and Jaedicke broadly view the entire process of budgeting and budgetary control as essential features of a total management system which they set forth in a diagram which is shown in Exhibit 6-4.¹⁹

Their explanation of this diagram follows:

If investigation reveals that the plan is satisfactory but that performance can be improved, steps will be taken to bring future performance into line with the plan. If investigation reveals that the plan is unsatisfactory, the plan will be corrected. These corrective actions are shown on the diagram as the feedback loops.²⁰

Techniques of Control

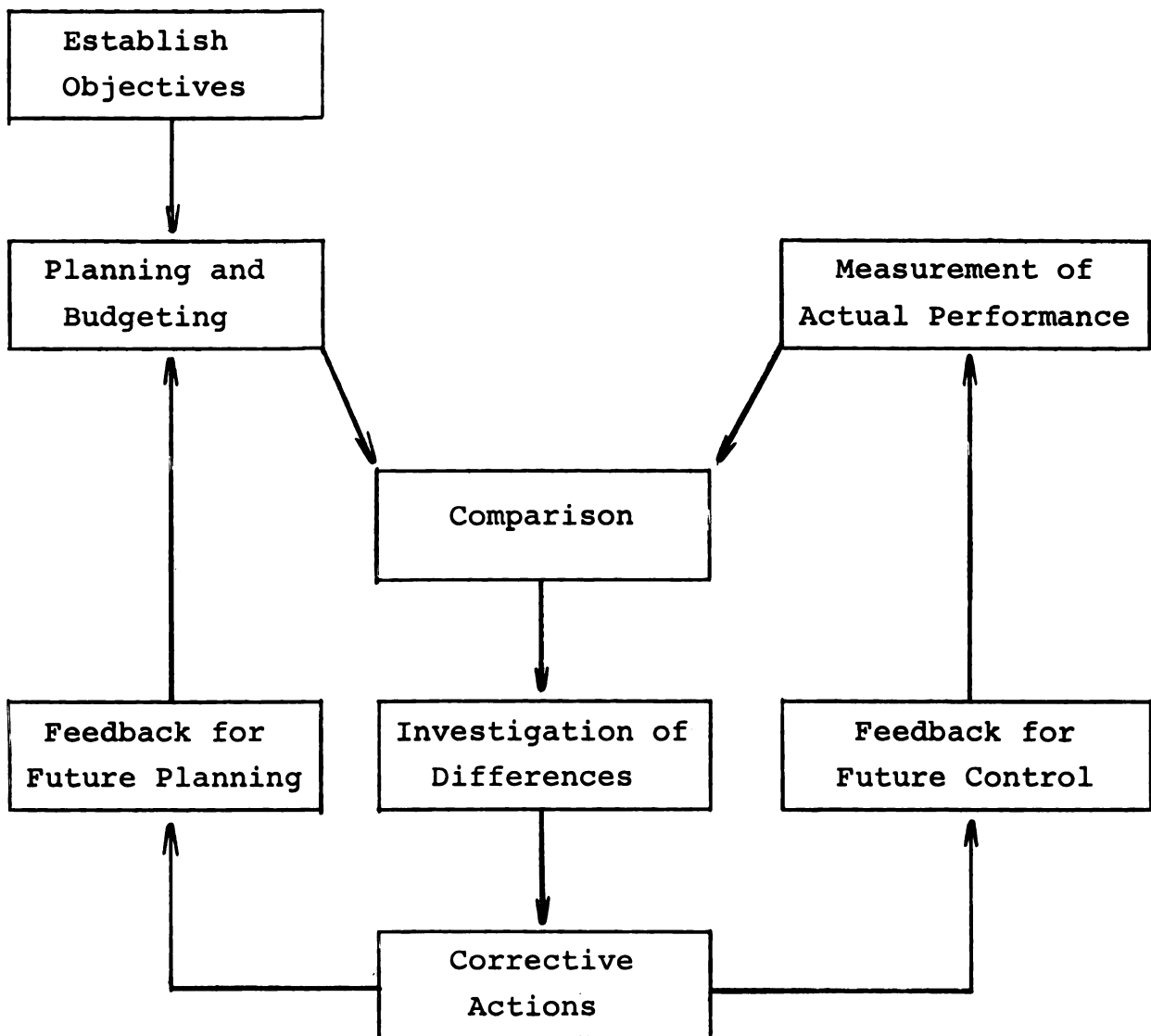
Control techniques may be informal or formal. Informal techniques require only the alert observation of physical conditions during daily operations. This was probably the only means of control in the past when business organizations were relatively small and daily operations were not complicated. However, as business organizations began to grow larger and daily operations

¹⁸Norton M. Bedford, "Cost Accounting as a Motivation Technique," N. A. C. A. Bulletin, volume 38, June 1957, p. 1251.

¹⁹Carl L. Moore and Robert K. Jaedicke, Managerial Accounting (2d ed. rev.; Cincinnati: South-Western Publishing Company, 1967) p. 459.

²⁰Ibid.

EXHIBIT 6-4
A Total Management System



Source: Carl L. Moore and Robert K. Jaedicke, Managerial Accounting (2d ed. rev.; Cincinnati: South-Western Publishing Company, 1967) p. 459.

became more complex, observation could no longer be an effective means of control. Consequently, it became necessary to develop formal techniques of control. These formal techniques of control are based on careful accounting, statistical, and engineering study.²¹

Both formal and informal control devices are used today depending on the size and complexity of the organization and the nature of the control problem at hand. It is also possible that a combination of both types of techniques may be used in a business firm.

Visits to some smaller metals service centers indicated that the senior executives in these firms relied heavily on personal observation as an effective control device. In fact, this technique was also used in one large service center which did not have a formal cost system.

Formal Control Techniques.--The formal techniques of control generally involve the use of standards--particularly standard costs--and budgets.

The Accountants' Cost Handbook states that standard costs represent a carefully planned method of making a product or rendering a service. As such, standard costs are described as being "scientifically predetermined

²¹Robert I Dickey (ed.), Accountants' Cost Handbook (2d ed. rev.; New York: The Ronald Press Company, 1960) p. 20-4.

costs of materials, labor, and overhead chargeable to a product or service." The process of setting standard costs should include (1) a careful selection of materials (2) time and motion studies and (3) an engineering study of equipment and other manufacturing facilities.²²

Standard costs have been successfully used in manufacturing operations for many years. Although the concept of standard costs as used in manufacturing operations is not wholly applicable to metals service center operations, certain standard cost techniques may be useful especially in the area of pre-production processing operations. For certain types of repetitive processing operations it would be possible to develop standards which can be used as a control device. Also, the literature provided by manufacturers of processing equipment often contains information on time requirements, scrap loss, etc., and this would be most helpful in developing proper standards. The pre-production processing cost survey did reveal that a few companies--about 5 per cent of the sample--did use some standard costing techniques. However, since the type and size of pre-production processing orders received by most service centers are somewhat dissimilar, the usefulness of standard costing techniques would be limited.

²²Ibid., p. 15-1.

A more effective mechanism for control of metals service center operations can be found in responsibility accounting in which "costs are accumulated and reported by levels of responsibility within the organization."²³ In the prior discussion regarding controllable and uncontrollable costs it was noted that responsibility accounting attempted to distinguish between these two types of costs. The notion of responsibility segments as well as the preparation of budgets by responsibility segments has also been discussed. Thus responsibility accounting would require the preparation of periodic performance reports which would contain a detailed comparison of actual controllable costs with budgeted controllable costs of each responsibility segment for a specified time period such as one month. Such a report would supply the head of the responsibility segment with measurements of his performance on matters within his control. Those items which are not within his control should preferably be excluded from such reports so as to avoid confusion that might result from their inclusion in the report. An example of such a report is shown in Exhibit 6-5.

Dopuch and Birnberg illustrate the relationships between responsibility accounting reports from one level

²³John A. Higgins, "Responsibility Accounting," The Arthur Andersen Chronicle, volume 12, No. 2, April 1952, p. 2.

EXHIBIT 6-5

ABC Service Center

Flame Cutting Department

Supervisor's Monthly Responsibility Performance Report

	Budget		Variance	
	This Month	Year to Date	Favorable or (Unfavorable)	Year to Date
Payroll	\$5,000	\$16,000	\$ (500)	\$ (1,200)
Supplies	100	350	25	(50)
Gas	400	1,400	(40)	(80)
Rework	200	500	(85)	(140)
Other	250	600	(30)	20
Total	<u>\$5,950</u>	<u>\$18,850</u>	<u>\$ (630)</u>	<u>\$ (1,450)</u>

of responsibility to another.²⁴ This is shown in Exhibit 6-6.

Their comments concerning Exhibit 6-6 are as follows:

The number of costs considered controllable increases as we encounter higher levels of management. This reflects the pyramiding of responsibility from the lowest level of management to the highest. It also reflects the implicit assumption that the manager controlling the activities of one cost center is also indirectly responsible for all the controllable costs of the activities of all the subunits below his center.²⁵

It should be further noted that at higher levels of responsibility, the controllable costs would also include many items of programmed costs.

The system of responsibility accounting can be equally effective in the selling and administrative areas. A responsibility performance report for a salesman is shown in Exhibit 6-7.

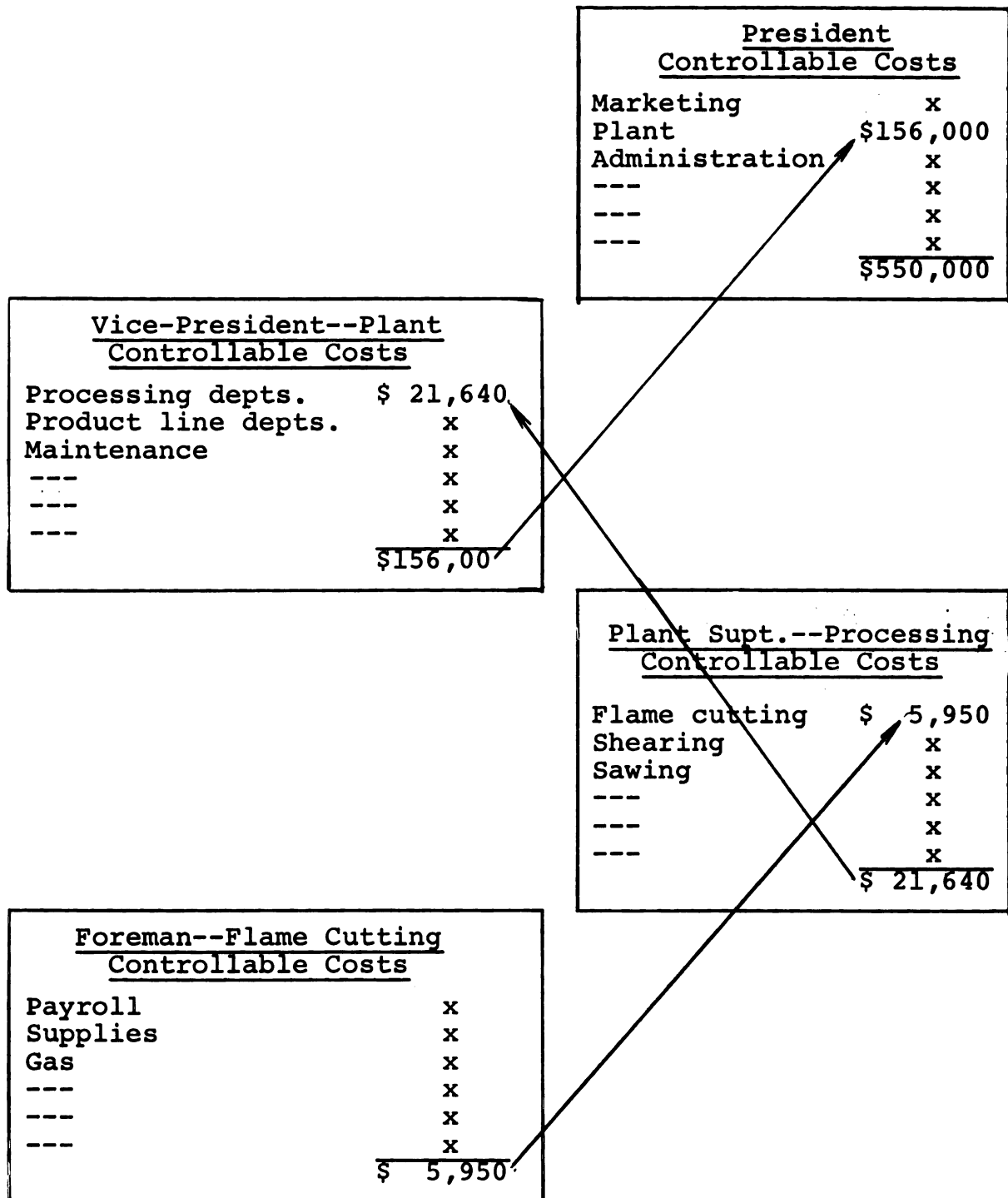
After the responsibility performance reports have been prepared and submitted to the heads of various responsibility segments, it is important that the variances be analyzed and action taken to correct the plans or to improve future performance as the case may be.

²⁴ Nicholas Dopuch and Jacob G. Birnberg, Cost Accounting: Accounting Data for Management's Decisions (New York: Harcourt, Brace and World, Inc., 1969) p. 248.

²⁵
Ibid., p. 249.

EXHIBIT 6-6

The Pyramid Effect of Controllability



Adapted from: Nicholas Dopuch and Jacob G. Birnberg, Cost Accounting: Accounting Data for Management's Decisions (New York: Harcourt, Brace and World, Inc., 1969) p. 248.

EXHIBIT 6-7

ABC Service Center

Salesman's Monthly Performance Report

	Budget		Variance Favorable or (Unfavorable)	
	This Month	Year to Date	This Month	Year to Date
Sales	<u>\$20,000</u>	<u>\$70,000</u>	<u>\$(2,000)</u>	<u>\$(3,500)</u>
Travel Expenses	\$ 300	\$ 1,000	\$ (50)	\$ (75)
Entertainment	100	300	(40)	(60)
Automobile	80	250	10	(20)
Special Handling	75	200	(15)	(25)
Total expenses	<u>\$ 555</u>	<u>\$ 1,750</u>	<u>\$(95)</u>	<u>\$(180)</u>

Responsibility accounting will not insure that effective control will exist but it does provide a framework within which control can be undertaken. The success of responsibility accounting will depend upon the extent to which responsibilities are clearly defined in the company. It also depends on the extent to which controllable costs can be distinguished from uncontrollable costs.

General Comments Regarding the use of Control Techniques

A management control system attempts to set standards of performance for individuals in the organization and it is presumed that they will strive to achieve these performance standards. Consequently, the effectiveness of such a control system will depend upon the acceptance of these standards by the individuals concerned. If an individual feels that the performance standard set for him is reasonable and consistent with his goals, he will be motivated to achieve this standard. But if he decides to ignore that standard for some reason and choose one of his own then he will have little motivation to strive for achieving the standard set by management for him. This problem of the motivational effects of control systems on individuals has attracted much attention from organization theorists and several studies have been undertaken to determine the effects of budgets and standards on individuals in an organization.

In a study undertaken by Argyris, it was noted that the use of budgets as a pressure device for increasing efficiency tended to generate forces which, in the long run, decrease efficiency. Budgets also had a divisive influence between line and staff personnel, especially the accounting staff. Hence Argyris recommends that management should try to seek genuine participation by supervisors in the process of budgeting so that the budgets will be more readily accepted by the supervisors. He also suggests a training program in human relations for the financial staff so that the latter may become more sensitive to the human relations problems that exist in organizations.²⁶

In a similar vein, Likert and Seashore also criticize the use of direct hierarchical pressure by management to cut costs and raise productivity in an organization. They are especially critical of crash programs to reduce costs and feel that such programs are likely to be self-defeating. In their opinion, low costs and high productivity can be achieved continuously by developing a system of management which uses existing control procedures in such a manner "that cooperating rather than hostile

²⁶Chris Argyris, "Human Problems with Budgets," Harvard Business Review, volume 31, No. 1, January-February 1953, p. 97-110.

motivations are created among both the supervisory and nonsupervisory members of the organization."²⁷

The Decision-Making Phase

The usefulness of the cost classification system that has been suggested in this system becomes evident in the area of decision-making. As stated earlier in Chapter III, the advocates of the contribution approach emphasize that a distinction between variable and fixed costs is crucial for certain decisions. It was also demonstrated that a functional approach such as the DCA which completely ignores cost behavior patterns could provide misleading information which may well lead to erroneous decisions.

The contribution approach presents revenue and cost data in such a manner that it is relevant for proper evaluation of the performance of different product line and processing segments. It enables management to make better decisions concerning pricing, acceptance of special orders, and the promotion or elimination of products, processing segments, territories, and customers. The approach also facilitates the preparation of cost-volume-profit

²⁷Rensis Likert and Stanley E. Seashore, "Making Cost Control Work," Harvard Business Review, volume 41, No. 6, November-December 1963, p. 96-108.

analyses and break-even charts. A discussion of some specific decision problems follows.

Performance Evaluation of Product
Line and Processing Segments

Exhibit 6-8 may be considered as a segmental income statement of a small company with three product line segments and one processing segment. The presentation of revenue and cost data as shown in Exhibit 6-8 provides a more meaningful and relevant basis for evaluating the performance of these segments. In evaluating the performance of each one of these segments, management would be particularly concerned about the performance of the flame cutting segment, which has a positive contribution margin but a negative segment margin. It would seriously want to consider the desirability of continuing this processing operation especially since the long run profitability of the segment appears to be doubtful.

Since the processing segment in question does have a positive contribution margin there would be no harm in continuing the operations at least in the short run. But as far as the long run is concerned, management will have to face up to the task of deciding whether this processing operation should be continued

EXHIBIT 6-8

ABC Service Center

Segmental Income Statement

	Company as a Whole	Cold Finished Bars	Plates	Sheets	Flame Cutting
Net sales	\$100,000	\$40,000	\$30,000	\$20,000	\$10,000
Variable plant costs (e.g. materials, wages, fuel, heat, power, supplies, etc.)	65,000	26,000	18,000	13,000	8,000
Variable selling and adm. costs (e.g. sales commissions, travel and entertainment, shipping, etc.)	8,900	4,000	3,000	1,400	500
Contribution margin	<u>\$ 26,100</u>	<u>\$10,000</u>	<u>\$ 9,000</u>	<u>\$ 5,600</u>	<u>\$ 1,500</u>
Programmed costs (e.g. all supervisory salaries, advertising, legal fees, etc.)	8,000	3,200	2,400	1,600	800
Performance margin	<u>\$ 18,100</u>	<u>\$ 6,800</u>	<u>\$ 6,600</u>	<u>\$ 4,000</u>	<u>\$ 700</u>
Committed costs (e.g. depreciation, property taxes, insurance, etc.)	12,000	4,800	3,600	2,400	1,200
Segment margin	<u>\$ 6,100</u>	<u>\$ 2,000</u>	<u>\$ 3,000</u>	<u>\$ 1,600</u>	<u>\$ (500)</u>
Common fixed costs (e.g. top executive salaries and other costs that cannot clearly be allocated)	4,000				
Net operating income (before income taxes)	<u>\$ 2,100</u>				

or not. In attempting to make such an important decision, management will have to consider several factors and seek answers to some key questions such as:

1. What is the future potential of this processing segment in terms of increased volume and profits? A history of the past performance of this processing segment should be prepared for evaluation by management. If management feels that this processing activity will continue to grow and will soon reach a point where it will have a positive segment margin then it should be continued.
2. Assuming that it has very little future potential, to what extent does it help in generating increased sales of other segments? This point needs to be carefully analyzed. If the discontinuance of this activity will have a very unfavorable impact on the sales of other segments, it is conceivable that total profits may be adversely affected by discontinuing this processing activity.
3. Is there a better alternative to this processing operation which would increase the total

profits and effectively utilize the space and other facilities that would be released as a result of discontinuing this operation? If so, a segmental income statement containing projected revenue and cost data for the proposed alternative should be prepared and compared with the above statement to decide the best course of action that should be taken.

4. To what extent will the programmed and committed costs assigned to this segment be eliminated as a result of discontinuing this operation? For example, certain committed costs such as building depreciation and property taxes which have been assigned to the segment would be unavoidable and would continue to exist even though the operation may be stopped. This factor would be quite pertinent if it is assumed that the processing operation does have a slight impact on the sales of other segments and that there is no better alternative to replace this operation.

In addition to the answers to the above questions, management will also want to evaluate other factors such as personnel and capital requirements, market research studies, possible modification of physical facilities,

etc. But the important point which should be noted is that, given the circumstances, a consideration of all these factors coupled with the analysis presented in Exhibit 6-8 would lead management to the best possible decision in this matter.

An analysis similar to the one presented in Exhibit 6-8 can also be prepared for evaluating customers and sales territories.

Pricing Decisions

The proponents of the contribution approach maintain that this approach offers distinct advantages over the traditional absorption costing approach in arriving at decisions on pricing. They feel that the contribution approach offers more detailed information because it distinguishes between variable and fixed costs. It is also sensitive to cost-volume-profit relationships and thus provides a better and easier basis for developing pricing formulas.

The selling price of a product or service is influenced by many factors and some of the major ones include the cost of the product or service and the reaction of customers and competitors. In certain short run pricing situations it is possible that a price may be set to recover only variable costs plus some contribution to the recovery of fixed costs. However, if a company is to

survive in the long run, it should follow a consistent pricing policy which recoups all costs.

There are instances in which a company has little or no influence in setting the selling price and it accepts the price set by competitive forces in the market place. In such a situation the company should decide on that level of production and sales which maximizes profit.

In those instances where a company does have some discretion in setting the price, the approach suggested by McFarland for presenting cost data would be more useful. This approach may be briefly described as follows:

1. The use of unit costs for a product or processing service should be restricted to variable costs which would include both manufacturing and selling. These unit costs should preferably be standard costs.
2. The programmed and committed costs which are assigned to the product line or processing segment should not be unitized. These costs should preferably be the budgeted costs for the current year.
3. The budgeted common fixed costs should be allocated to product line and processing segments on bases which reflect management policy with respect to the proportions in which the various segments should contribute to these common costs.

Again, these allocated amounts should not be unitized.²⁸

The above approach is illustrated in Exhibit 6-9.²⁹

In McFarland's view, such a presentation of cost data would enable management to focus its attention on determining the largest markup on variable costs. It would also facilitate the testing of alternative prices and volumes as well as the calculation of selling prices which should correspond to desired rates of return on sales or capital employed.³⁰

With the establishment of appropriate markup ratios, it is easy to use this procedure in situations where it is necessary to quote prices frequently. Also, the procedure is flexible enough to accommodate any modification of costs or deviations from normal profit margins. It is also flexible and usable for both short and long run pricing decisions.

The above approach to pricing has often been criticized because it is felt that the approach will result in underpricing and eventually lead to disastrous

²⁸Walter B. McFarland, Concepts for Management Accounting (New York: National Association of Accountants, 1966) p. 63.

²⁹Ibid., p. 64.

³⁰Ibid.

EXHIBIT 6-9
Cost Data for Pricing Decisions
Shearing Segment

	<u>Amount</u>	<u>Percentage of Sales</u>
Net sales	\$15,000	100
Total variable costs (e.g. wages, supplies, power, etc.)	9,000	60
Contribution margin	<u>\$ 6,000</u>	<u>40</u>
Programmed costs (e.g. supervisory salaries, advertising, etc.)	1,200	8
Committed costs (e.g. depreciation, property taxes, insurance, etc.)	1,800	12
Contribution to common costs and profit	<u>\$ 3,000</u>	<u>20</u>
Allocated common fixed costs	1,500	10
Net operating profit	<u>\$ 1,500</u>	<u>10</u>

Adapted from: Walter B. McFarland, Concepts for Management Accounting (New York: National Association of Accountants, 1966) p. 63.

consequences. However, an N.A.A. survey of 38 companies which used this approach to pricing reported that there was no instance of unprofitable pricing which could be attributed to this approach. On the contrary, the survey indicated that most companies felt that the approach had resulted in better pricing decisions. The survey also revealed that these companies restricted the use of cost and margin data to individuals qualified to interpret such data and responsible for pricing policy decisions.³¹ This last point is particularly important because such data could easily be misused by persons who are not qualified to interpret it. The findings of the N.A.A. survey would also be applicable to pricing situations encountered by service centers.

In suggesting the above approach, McFarland notes that the allocation of common fixed costs to various segments should be viewed as a systematic way of planning for the recovery of these costs in pricing. As such, the selection of allocation bases should be based on pricing policy and should be made by management executives who are responsible for establishing such policies. The

³¹National Association of Accountants, Current Application of Direct Costing, Research Report No. 37 prepared by the N.A.A. Research Staff (New York: National Association of Accountants, 1961) p. 55.

allocation of common fixed costs should not, in any way, be looked upon as a means for measuring segment costs.³²

Acceptance of Special Orders

The decision to accept or reject a special order at a price which is less than the normal price will depend upon the availability of idle capacity and its impact on the long run pricing policy. For example, a service center may receive a processing order which involves some flame cutting operations to be performed on material provided by the customer. Assume that the normal price (which would recoup all costs plus a desired profit) charged by the service center for such a service would be \$100; and the total variable costs for servicing this order would amount to \$65. However, the customer insists on paying no more than \$85 for this processing service. Assuming that there is idle capacity and that the impact on the long run pricing policy will be negligible, the order should be accepted because all variable costs are being recovered and there is some contribution to the recovery of fixed costs.

The essential point in this analysis is the comparison of the incremental costs incurred in accepting

³²Walter B. McFarland, Concepts for Management Accounting (New York: National Association of Accountants, 1966) p. 64-65.

the order with the incremental revenues obtained. A similar analysis can also be employed in reaching decisions with respect to price reductions, special discounts, and special advertising campaigns.

The Use of the Contribution Approach
in Measuring and Rewarding Sales
Performance

The contribution approach can also be used for measuring the effectiveness of salesmen's performances. The traditional method of paying them a commission based on dollar sales or tonnage is not equitable because it ignores the relative profitability of the various products. Some companies have recognized this handicap and have instituted commission plans based on gross profit.

A still better approach would be to base the sales commissions on the contribution to other costs and profit as suggested by Horngren and shown in Exhibit 6-10.³³

Exhibit 6-10 contains only those items of costs and revenue which the salesman can control or influence. A careful examination of the exhibit shows that Baker is the better salesman even though his total dollar sales are less than those of Abel. This is so because his

³³ Charles T. Horngren, Accounting for Management Control: An Introduction (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965) p. 240.

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Exhibit 6-10

Salesman's Performance Report

For the Month Ending January 31, 1969

	<u>Abel</u>	<u>Baker</u>
Net sales	\$30,000	\$22,000
Cost of goods sold	\$24,000	\$15,400
Travel expenses	500	300
Special handling	400	80
Entertainment	100	60
Automobile	85	75
Total expenses	<u>\$25,085</u>	<u>\$15,915</u>
Contribution to other costs and profit	<u>\$ 4,915</u>	<u>\$ 6,085</u>

Adapted from: Charles T. Horngren, Accounting for Management Control: An Introduction (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965) p. 240.

contribution to other costs and profit is greater than that of Abel. Apparently, Baker is concentrating on products that are relatively more profitable and he is also keeping his expenses well under control.

The above approach is superior in two respects. First, it focuses the attention of the salesman on products that are relatively more profitable and second, it forces them to control their expenses and keep them at a reasonable level.

Feasibility of the System

Since the profit planning and control system presented above stresses cost behavior patterns, it would require the accumulation of cost data in a manner that would facilitate the distinction between variable and fixed costs. Such an accumulation procedure has been advocated by the proponents of the contribution approach for quite some time and has been used by a number of companies. Hence it can be designed without too much difficulty. The system also involves the use of well-known planning and control techniques which have been successfully used by numerous companies in other processing industries. Since this profit planning and control system has been used by companies engaged in other types of processing operations, it would also be feasible for metals service center operations.

In the previous chapter which dealt with the survey of pre-production processing cost control practices, it was found that there were a few companies which had well developed programs in this area. In this small group, the example of one large company is particularly noteworthy. This company has a sophisticated cost system which distinguishes between variable and fixed costs and also utilizes the concepts of profit planning and budgetary control outlined above. In fact, this company uses the profit planning and control system suggested above and has adapted the system to suit its own organizational and managerial requirements.

Some other companies in this group also segregate cost data by processing segments. However, no distinction is made between variable and fixed costs and processing revenues are not identified with individual processing segments. It would be quite feasible to incorporate these latter features into their accounting systems so as to be able to generate profitability reports which would be more meaningful and useful.

It can, therefore, be concluded that the profit planning and control system suggested in this chapter is feasible and can be adapted for use by any service center regardless of size.

Summary of the Chapter

This chapter has dealt with the development of a profit planning and control system for metals and service centers. The aim of this system is to improve profitability of metals service center operations in general and pre-production processing operations in particular. The presentation of the system was done in four phases, namely, the organization phase, the planning phase, the control phase, and the decision-making phase.

The organization phase stressed the classification of costs into variable, programmed, and committed categories and the identification of all separable costs and revenues with each product line and processing segments. This was illustrated in Exhibit 6-1.

The importance of short-range and long-range planning was discussed in the planning phase. The preparation of the annual profit plan as well as the advantages of budgeting were also discussed at some length.

The control phase dealt with the meaning and significance of control in business operations. The use of responsibility accounting as an effective control mechanism was also noted.

The decision-making phase was concerned with the usefulness of the suggested cost classification system in the area of decision-making. The discussion of some

specific decision areas included the performance evaluation of product line and processing segments, pricing, acceptance of special orders, and the measurement of sales performance.

Finally, the feasibility of the system was discussed and it was concluded that the system is feasible for use by metals service centers.

CHAPTER VII

SUMMARY, CONCLUSIONS, AND NEEDS FOR FURTHER RESEARCH

A brief summary of the study is presented in the initial part of this chapter. This summary is followed by a discussion of some of the overall conclusions of the study together with observations on some areas which need further investigation.

Summary of the Study

The Metals Service Center Industry

Since the study deals primarily with the problem of pre-production processing costs (also referred to as processing costs) in the metals service center industry, it was necessary to begin with a brief description of this industry.

The metals service center industry has experienced rapid growth in the last three decades with the current sales volume being in excess of five billion dollars. Most service centers are small and independently owned although several large chains are owned and operated by the metal producers. The Steel Service Center Institute (referred to

as the SSCI) is a trade association representing 500 North American companies in the steel industry. The 400 active member companies operate 900 service centers in industrial areas and they distribute 85 per cent of all the industrial steel products that reach the market through distributors. Since many steel service centers also stock and supply non-ferrous metals such as aluminum, brass, bronze, and copper, they could be classified as metals service centers.

In the past, today's metals service centers were more appropriately termed warehouses since their main role was one of selling metals--with little pre-production processing. Today, however, pre-production processing is an increasingly important part of service center operations. The equipment used by service centers to provide these processing services includes saws, slitters, shears and flame cutters. The manufacturers who use the various metals require increasingly diverse shapes and forms of metals. Thus the service centers with their capacity to perform different types of pre-production processing services help to bridge the gap between the standardized output of the mills and the special requirements of the manufacturer.

The rapid growth in pre-production processing has had a big impact on the capital expenditures by metals service centers. It is estimated that service centers are now spending at the rate of 100 million dollars a year for

new plant and equipment and much of this new equipment is geared for pre-production processing. Therefore, when such services involve the use of expensive equipment, the pricing as well as the cost of providing these services needs to be carefully considered.

The Distribution Cost Analysis Program

In Chapter III the Distribution Cost Analysis program (referred to as the DCA) was discussed. The first part of the chapter examined the DCA in great detail. The latter part of the chapter contained a critical evaluation of the DCA and the results of the survey pertaining to the DCA.

The basic premise of the DCA is that all expenses should be related to the several functions that are performed. Thus it would be necessary to determine the functions performed in a company so that costs can be assembled accurately according to functions. The functional costs are then grouped into three broad categories, namely, product costs, customer costs, and general costs. The general outline of the plan is indicated in Chart A of Appendix B. The technique of DCA would enable the preparation of product line profitability reports (see Appendix B--Chart D) as well as territorial profitability reports (see Appendix B--Chart E) and customer profitability reports (see Appendix B--Chart F). The purpose of these reports is to provide the type of information which would enable management to

make sound decisions pertaining to product lines, territories, customers, etc.

One of the objectives of the DCA program was to assist in the widespread adoption of this accounting technique throughout the metals service center industry. Another objective was to collect and publish comparative percentage reports enabling the participating companies to judge their efficiency against other firms handling identical products.

A critical evaluation of the DCA study revealed some major drawbacks which are as follows:

1. It fails to distinguish between variable and fixed costs.
2. It involves the arbitrary allocation of many fixed costs.
3. It involves detailed record-keeping which is time-consuming and costly.
4. The information generated by the system has some utility but does not highlight the cost-volume-profit relationships and hence is not very meaningful and useful to management for planning, control, and decision-making.

The results of the survey (which are discussed at some length in the following section) pertaining to the DCA study revealed that at least 33 companies out of a total of 117 companies were not familiar with the DCA.

Only seven companies in the sample are still using the DCA and even here it is possible that some of these firms may be using modified versions of the DCA system. The principal reasons given by most companies for not using the DCA were the drawbacks of the system as indicated above. Company visitations found only one company which has used the DCA with success and the experience of this company was discussed in some detail.

The Pre-Production Processing Cost Survey

The data for this study was collected by means of a mail questionnaire and personal visits to about 30 companies. The results of the pre-production processing cost survey were presented in Chapter IV which contained an analysis of the questionnaire responses followed by a summary of the data accumulated during company visitations.

Replies were recieved from about 117 companies, representing a wide range of sizes and types of companies which are members of the Steel Service Center Institute. This sample of 117 companies includes the thirty companies which were personally visited by the researcher. An attempt was made to explain some of the differences and similarities in pre-production processing cost practices by using company size as indicated by total annual sales as a control variable for analyzing the questionnaire responses.

Some of the key findings of the analysis of questionnaire responses are:

- Fifty-five companies in the sample of 117 companies were single service center companies.
- Seventy companies, or about 60% of the sample, had sales of less than ten million dollars.
- Forty-seven companies do not use the DCA or any other cost system.
- With respect to a given pre-production processing order:
 - (a) 80 companies try to isolate the material cost
 - (b) 66 companies attempt to estimate the direct labor cost
 - (c) 48 companies try to estimate the overhead cost.
- Nearly 50 companies, or about 43%, indicated that they did not use any formal technique for controlling their pre-production processing costs.
- Almost 73% of the companies said that they made no cost estimate for a routine pre-production processing order whereas only 10% reported not making a cost estimate for special pre-production processing orders.
- Eighty-five companies felt that full cost was being recovered on the bulk of pre-production processing orders. However, it seems that in many cases this premise was not supported by adequate cost information.
- Fifty-three companies or about 45% of the sample indicated that they were planning changes in their cost system.

- The use of punched cards or tape for some phase of their operation--mainly payroll, billing, and sales analysis--was indicated by 48 companies or nearly 41% of the sample.
- The processing of these punched cards or tape through their own equipment was indicated by 34 of these 48 companies.

The thirty companies visited were divided into three groups on the basis of total annual dollar sales. The eleven smaller metals service centers comprised those companies with sales of up to ten million dollars. The nine medium sized service centers had an annual sales volume of ten to twenty-five million dollars and the ten large companies had total annual sales in excess of twenty-five million dollars.

The primary object of these visits was to obtain information in greater detail on many of the questions in the questionnaire from senior executives and the accounting staff. It was found that a diversity of approaches exist with respect to pre-production processing costs. The number of companies with well developed programs is still rather small and a direct relationship between company size and the degree of sophistication in pre-production processing cost control practices is not quite evident.

The Profit Planning and Control System

After a brief review of applicable cost concepts and classifications in Chapter V, a profit planning and control system was presented in Chapter VI. The aim of this system is to improve the profitability of metals service center operations in general and pre-production processing operations in particular. It stresses cost behavior patterns and requires the identification of variable and fixed costs both at the operation level and at higher organization levels. The system incorporates the contribution approach to cost control, segment profit contribution analysis, and pricing. It is presented in four phases, namely, the organization phase, the planning phase, the control phase, and the decision-making phase. The feasibility of the system from the standpoint of metals service centers was also discussed and it was concluded that the system is feasible for use by metals service centers.

Conclusions of the Study

From the foregoing discussion of the metals service center industry, it is clearly evident that the industry has undergone a basic change. With the growing importance of pre-production processing operations, the industry has become not only a reservoir of material but also a reservoir of pre-production processing capacity. Most service

centers have recognized this trend and have geared themselves for providing these processing services by acquiring various types of processing equipment. However, their accounting systems have not been properly geared to provide adequate cost information so as to cope with the problems of determining the prices and the profitability of these services.

The SSCI made a move in the late 1950's to make its members aware of the importance and usefulness of cost information by publishing the DCA study. However, the study failed to gain wide acceptance in the industry because of the drawbacks which were cited earlier.

The survey of pre-production processing cost practices revealed that as many as 47 companies did not use the DCA or any other cost system. A majority of these companies seem to rely on intuition and some past cost records for estimating the cost of special pre-production processing orders. Also, nearly 50 companies or about 43 per cent of sample indicated that they did not use any formal techniques for controlling their processing costs.

A major conclusion of this study, therefore, is that a majority of service centers and especially the smaller ones, lack sophistication in this area of pre-production processing costs. It can also be concluded that a logical starting point for gaining more sophistication in this area would be to adapt and use the profit planning

and control system suggested in this study. The system would not only enable the service centers to improve their planning and control of costs and revenues but more importantly, it would provide more relevant information for making decisions in such areas as pricing, performance evaluation of product line and processing segments, and the acceptance of special orders.

Needs for Further Research

As noted earlier, the growing importance of pre-production processing has had a significant impact on capital equipment outlays by service centers. On the basis of discussions with the executives of some companies, the author feels that little use is being made of the newer capital budgeting techniques for evaluating alternative investment proposals.¹ It is suggested that this area of investment decisions be investigated further by service center managers so as to become more conversant with the application of these techniques to their own investment problems.

In the survey of pre-production processing cost practices it was found that the use of punched cards or

¹A detailed discussion of these newer capital budgeting techniques will be found in Harold Bierman's The Capital Budgeting Decision (2d ed. rev.; New York: The MacMillan Company, 1966).

tape was indicated by 48 companies out of a total of 117 companies in the sample. The processing of these cards or tape through their own equipment was reported by 34 companies whereas the remaining 14 companies used service bureaus for this purpose. It is the author's opinion that more service centers, including the smaller ones, will be using punched cards or tape in the years ahead. It is also more than likely that the processing of these cards or tape of the smaller service centers will be done by service bureaus which generally cater to the needs of the small user. Consequently, the idea of having a service bureau which is specifically geared to meet the information needs of metals service centers is most appealing and should certainly be explored. More recently, time-sharing data processing systems have experienced a rapid growth and the possibility of using such an installation should not be overlooked by service centers.²

A final observation regarding cost reduction programs in the plant needs to be made. Most service centers are well aware of the savings and other benefits to be derived from such programs. However, during visits to some companies, it was felt that these companies had not fully

²For a discussion of time-sharing data processing systems see James R. Ziegler's Time-Sharing Data Processing Systems (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967).

explored the potential savings that could be realized through cost reduction programs in such areas as plant layout, work flows, inventory organization, and material handling.³

³A general treatment of this subject will be found in Lewis R. Zeyher's Cost Reduction in the Plant (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965).

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APPENDIX A

PRE-PRODUCTION PROCESSING COST SURVEY
Graduate School of Business Administration
Michigan State University

INSTRUCTIONS:

On the following pages are a series of questions. Many are followed by a series of alternative answers, so it is merely necessary to place check marks opposite the answers which apply in your particular case. When none of the listed answers apply, and for a few other questions for which it was not practical to list a series of possible answers, you are requested to fill in the requested information. All answers will remain confidential.

PLEASE ANSWER ALL QUESTIONS

Some questions may not be applicable to your type of system, or there may be doubt about the meaning of certain terms in a question. In either case please provide the answer you believe best answers the question, or put a question mark through the question. In this way it will be known that the question was not merely overlooked.

ALL REPLIES WILL BE VALUED

It is recognized that some companies have quite sophisticated pre-production processing cost control systems, while other firms rely on the more traditional methods of controlling these costs. It is this very diversity of practice which is one of the reasons for this survey. Regardless of what type of system you are using, your answers will be respected and valued.

PLEASE RETURN THIS PROMPTLY AT ADDRESS SHOWN BELOW

After completing this questionnaire please mail it to the address shown below. A prompt reply will be appreciated since it will facilitate the final tabulation.

HAVE A PENCIL IN HAND

May I suggest that you (or the executive to whom you delegate this task) have a pencil in hand, since most of the

questions can be read and answered in little more time than would be necessary for reading alone.

Your cooperation is gratefully appreciated.

Shirish B. Seth, SSCI Doctoral Fellow
Graduate School of Business Administration
Dept. of Accounting and Financial Adm.
Michigan State University
East Lansing, Michigan 48823

PRE-PRODUCTION PROCESSING COST SURVEY
Graduate School of Business Administration
Michigan State University

(STRICTLY CONFIDENTIAL)

1. Type of service center: Please place a "1" in box opposite major source of income (over 50%). Place a "2" opposite second most important source of income.

- ☐ 1. Industrial Steel Products 90% to 100%
- ☐ 2. Industrial Steel Products
- ☐ 3. Fabricating
- ☐ 4. Wholesale hardware and merchant products
- ☐ 5. Aluminum
- ☐ 6. Brass, Copper, and Miscellaneous

2. Number of branch plants, if any _____

3. Total corporate annual sales: (Please place a check mark in the appropriate box)

- ☐ 1. Less than one million dollars
- ☐ 2. One to five million dollars
- ☐ 3. Five to ten million dollars
- ☐ 4. Ten to twenty-five million dollars
- ☐ 5. Over twenty-five million dollars

The following four questions relate to Distribution Cost Analysis--a functional cost system--that was developed by Professor Thomas J. McGann and first published by the Steel Service Center Institute in 1956.

4. Are you familiar with the suggested Steel Service Center Institute Distribution Cost Analysis system?

- ☐ 1. Yes
- ☐ 2. No

5. If your answer to 4 is "Yes" then:

- (a) Have you used it in the past? ☐ 1. Yes ☐ 2. No

- (b) Are you using it now? ☐ 1. Yes ☐ 2. No

(Any further comments in response to the above questions will be appreciated. Use margins or back of this sheet if you desire.)

6. If your answer to 5(b) is "Yes," have you found it helpful in giving you accurate and meaningful cost information for isolating and controlling pre-production processing costs? Please also indicate any problems that you may have encountered when you first set up the system.

7. If your answer to 5(b) is "No," please give reasons why you do not use it.

8. If you do not use the Distribution Cost Analysis system, then what type of a cost accounting system do you use to isolate and control pre-production processing costs?

- () 1. Full Absorption Costing
 () 2. Direct Costing--prime costs only
 () 3. Direct Costing--variable costs only
 () 4. Responsibility Accounting
 () 5. Relevant costs
 () 6. Other (please specify) _____
 () 7. None

9. Specifically, how do you isolate the elements of pre-production processing costs of a given order:

Material _____

Labor _____

Manufacturing overhead for cost center or department

Manufacturing overhead--General _____

10. What techniques do you use to control these elements (viz. material, labor, and mfg. overhead) of pre-production processing costs?

- ☐ 1. Cost Center or Department Budgets
- ☐ 2. Plant-wide Budgets
- ☐ 3. Product Unit Standards
- ☐ 4. Other (please specify) _____
- ☐ 5. None

11. What type of pre-production processing cost reports are prepared?

How frequently _____

For whom _____

12. When a routine order for pre-production processing is received, how is the cost estimated?

- ☐ 1. By reference to standard cost elements
- ☐ 2. By reference to current cost records (not standard)
- ☐ 3. By reference to past cost records on similar or related jobs
- ☐ 4. By reference to published price schedules
- ☐ 5. Intuition
- ☐ 6. Other (please specify) _____
- ☐ 7. No cost estimate made

13. When a special (not routine) order for pre-production processing is received, how is the cost estimated?

- () 1. By reference to standard cost elements
- () 2. By reference to standard cost records (not standard)
- () 3. By reference to past cost records on similar or
or related jobs
- () 4. By reference to published price schedules
- () 5. Intuition
- () 6. Other (please specify) _____
- () 7. No cost estimate made

14. Person(s) in company who actually decide whether to accept or reject a special pre-production processing order:

1. _____ who reports to _____
Title Title

2. If joint decision, titles of principals involved in the decision:

<u>Title</u>	<u>Title</u>
--------------	--------------

<u>Title</u>	<u>Title</u>
--------------	--------------

3. Other (please specify) _____

15. In your opinion, do you feel that you recover the full cost (materials, labor, mfg. overhead, and applicable selling and administrative expense) on the bulk of your pre-production processing orders?

- () 1. Yes () 2. No

Additional Comments

16. If you found that, on any particular order, less than full cost was being recovered through selling price, would your order-acceptance decision be affected? (In other words, would you still accept the same order for service or other reasons, hoping to make it up elsewhere?)

17. Do you have evidence (e.g. in the form of a report) of the contribution being made to recovery of fixed costs and profit over and above directly applicable (i.e. variable) costs of servicing an order?

☐ 1. Yes

☐ 2. No

Additional Comments

18. Are you presently planning any changes in your cost system?

☐ 1. Yes

☐ 2. No

Please indicate the principal reason(s) for any planned changes.

19. Do you presently make use of punched cards or tape for pre-production processing cost analysis and/or other purposes?

☐ 1. Yes

☐ 2. No

20. Are these cards or tape processed through your own equipment or through a service bureau?

☐ 1. Processed with own equipment

☐ 2. Service Bureau

21. Company Name: _____

Name of individual providing the above information:

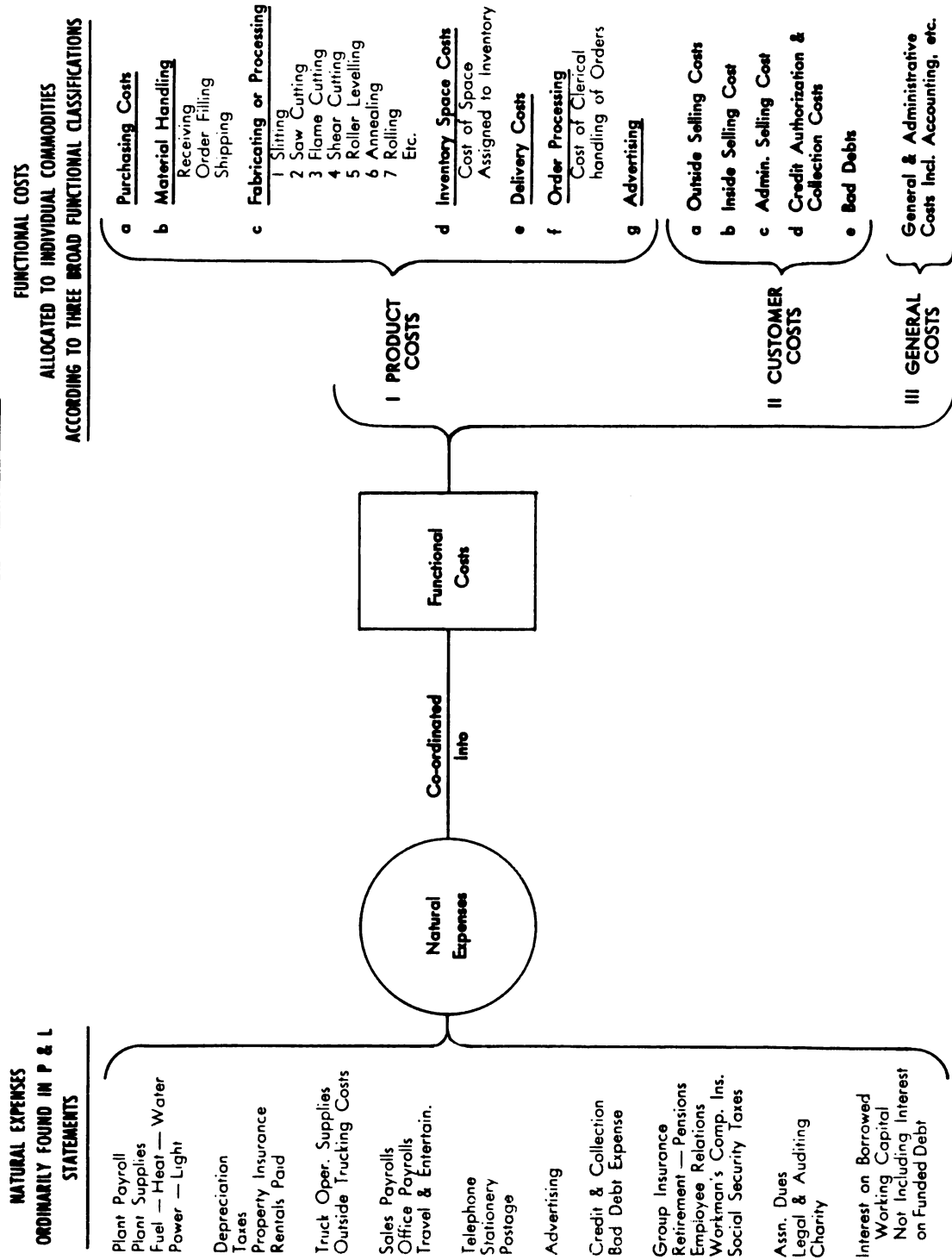
Other Comments:

(Any further comments in response to the above questions will be appreciated. Use margins or back of this sheet if you desire.)

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APPENDIX B

CHART A — GENERAL OUTLINE OF PLAN



**CHART B — ALLOCATION OF CERTAIN NATURAL EXPENSES
OR PORTIONS OF NATURAL EXPENSES TO SUPPORTING (S) FUNCTIONS**

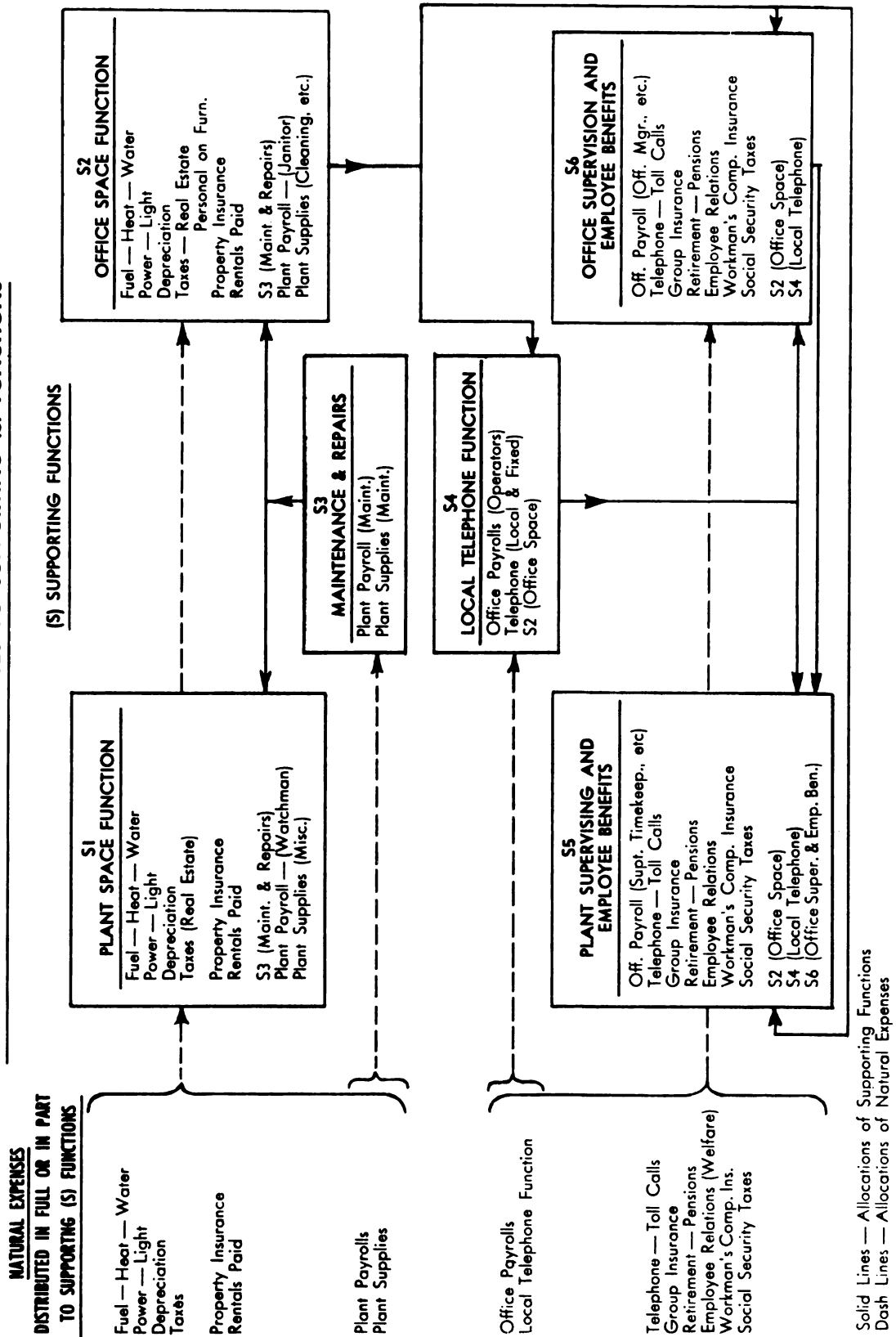


CHART C — FINAL FUNCTIONAL COSTS AND COMPOSITION OF NATURAL OR SUPPORTING FUNCTIONS (S) INCLUDED

I PRODUCT COSTS

a. PURCHASING

Office Salaries of purchasing (inventory) employees
Travel and Entertainment
Telephone — Toll Calls
Stationery
S2 — Allocation of Office Space Function
S4 — Allocation of Local Telephone Cost
S6 — Allocation of Office Supervision — Employee Benefit Costs

b. MATERIALS HANDLING

Plant Payrolls — Labor in Receiving and Assembly
Plant Supplies — Supplies in handling stock, tags, marking paints, etc.
S1 — Allocation of Plant Space Function
S5 — Allocation of Plant Supervision — Employee Benefit Costs

c. FABRICATING OR PROCESSING

Separate each specific operation such as
Slitting, Saw Cutting, Flame Cutting, Shear Cutting, Roller Level, etc.
— example following.

1. Slitting

Plant Payroll — Machine Operator Labor incl. packing and delivery of cut material to shipping floor
Plant Supplies — Oils, strapping, blades, separators (gas for flame cut)
Depreciation — Machine and all appliances
Taxes — Personal taxes on machine and appliances
Property Insurance — On machine, etc.
S1 — Allocation of Plant Space Function (Gross machine space)
S3 — Allocation of Maint. & Repair Expense applicable to machine
S5 — Allocation of Plant Supervision — Employee Benefit Costs

d. INVENTORY SPACE COST

S1 — Allocation of Plant Space Function to Inventories

e. DELIVERY

Plant Payroll — Truck Chauffeurs
Truck Operating Supplies — Gas, Oil, License, etc.
Outside Trucking Function
Depreciation — Delivery Trucks
Taxes — Delivery Trucks
Property Insurance — Delivery Trucks
S3 — Allocation of Maint. & Repairs — Trucks
S5 — Allocation of Plant Supervision — Employee Benefits (Chauffeurs)

f. ORDER PROCESSING

Office Salaries — Order writing, stock records, pricing, billing, shipping department and other clerical groups handling orders prior to billing.
Stationery — Order forms, bills of lading, invoice
Postage
Telephone — Tolls
S2 — Allocation of Office Space Function
S4 — Allocation of Local Telephone Function
S6 — Allocation of Office Supervision — Employee Benefit Costs

1

g. ADVERTISING

Office Salaries — Assignable to advertising work
Advertising — Outside purchases
Stationery
Postage
Telephone — Tolls
S2 — Allocation of Office Space Function — if Advertising Department
S4 — Allocation of Local Telephone Function
S6 — Allocation of Office Supervision — Employee Benefit Costs

II CUSTOMER COSTS

a. OUTSIDE SELLING

Office Payroll — Outside Salesmen
Travel and Entertainment
Telephone — Toll Calls
Stationery
Postage
S2 — Allocation of Office Space Function (Space for General Sales)
S4 — Allocation of Local Telephone Function
S6 — Allocation of Office Supervision — Employee Benefits

b. INSIDE SELLING

Office Payroll — Inside Desk and Others applicable to Selling
Travel and Entertainment
Telephone — Toll Calls
Stationery
Postage
S2 — Allocation of Office Space Function (Space for Inside Sales)
S4 — Allocation of Local Telephone Function
S6 — Allocation of Office Supervision — Employee Benefits

c. ADMINISTRATIVE SELLING

Office Payroll — Administrative or Executives applied to Sales
Travel and Entertainment
Telephone — Toll Calls
S2 — Allocation of Office Space Function
S4 — Allocation of Local Telephone Function
S6 — Allocation of Office Supervision — Employee Benefits

d. CREDIT AUTHORIZATION AND COLLECTION

Office Payroll — Credit Department
Travel and Entertainment
Telephone — Toll Calls
Stationery
Postage
S2 — Allocation of Office Space Function
S4 — Allocation of Local Telephone Function
S6 — Allocation of Office Supervision — Employee Benefits

e. BAD DEBTS

Bad Debts

III GENERAL ADMINISTRATION & ACCOUNTING COSTS

Office Payroll
Travel and Entertainment
Telephone — Toll Calls
Stationery
Postage
Association Dues
Legal Function
Charity
S2 — Allocation of Office Space Function
S4 — Allocation of Local Telephone Function
S6 — Allocation of Office Supervision — Employee Benefits

CHART D

XYZ STEEL AND ALUMINUM COMPANY

Statement of Product-Line Profitability
for the three month period ended (.....)

	Products*																		
	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Misc.
Net Sales & Misc. Inc.																			
Cost of Goods Sold																			
Gross Profit																			
Product Costs																			
Purchasing																			
Order-processing																			
Slitting																			
Shearing																			
Sawing																			
Edge-rolling																			
Flame-cutting																			
Burning																			
Levelling																			
Annealing																			
Materials Handling																			
Delivery																			
Inventory Space Cost																			
Advertising																			
Total																			
Profit after Product Cost																			
Customer Costs																			
Outside Selling																			
Inside Selling																			
Administrative Selling																			
Credit Authorization and Collection																			
Bad Debts																			
Total																			
Profit after Customer Cost																			
General																			
General Administration and Accounting																			
Carrying Costs																			
Sales Discounts																			
Total																			
Net Profit before Taxes																			

*See Section II, Page 8 for products corresponding to numbers

CHART E

XYZ STEEL AND ALUMINUM COMPANY

Statement of Territorial Profitability

For the month ended.....

Function	Total	Territory					Miscellaneous
		1	2	3	4, etc.	House	
1. Net Sales & Misc. Income							
2. Cost of Goods Sold							
3. Gross Profit							
PRODUCT COSTS							
4. Purchasing							
5. Order Processing							
6. Machine Processing (total)							
7. Slitting							
8. Shearing							
9. Sawing							
10. Burning							
11. Upcut processing and roller leveling							
12. Other							
13. Materials Handling (total)							
14. Receiving							
15. Order Filling							
16. Shipping							
17. Delivery							
18. Inventory Space Cost							
19. Advertising							
20. Total Product Costs							
21. Profit After Product Costs							
CUSTOMER COSTS							
22. Outside Selling							
23. Inside Selling							
24. Administrative Selling							
25. Credit Auth. & Collection							
26. Bad Debts							
27. Total Customer Costs							
28. Profit After Customer Costs							
GENERAL COSTS							
29. Gen'l Admin. & Acctg.							
30. Carrying Costs							
31. Sales Discount							
32. Total General Costs							
33. Net Profit Before Taxes							

1

CHART F
XYZ STEEL AND ALUMINUM COMPANY

STATEMENT OF CUSTOMER PROFITABILITY

Territory.....

For the month ended.....

	Total	Customer						Miscellaneous
		A	B	C	D	E		
Sales								
Cost of Goods Sold								
Gross Profit								
BASE COSTS								
Sales Base								
Cost of Goods Sold Base								
Orders Base								
Cutting Ticket Cost Base								
Tons-out Base								
Direct Delivery Base								
Calls Base								
Gross Margin Dollar Base								
Sub Total								
Sum of Total Costs Base								
Total Costs								
Net Profit Before Taxes								



CHART G
XYZ STEEL AND ALUMINUM COMPANY – Territory 1
Composition of Bases of Cost for Statement of Customer Profitability
For the month ended

Functional Cost	Total Territorial	Sales Base	C of G Sold	Orders Base	Cutting ticket cost base	Tons-out Base	Direct Del'y. Base	Calls Base	Gross Margin \$ Base	Sum Total of Cost Base
Purchasing	X		X							
Order Processing	X			X						
Machine Processing (total)					X					
Slitting	X				X					
Shearing	X				X					
Sawing	X				X					
Burning	X				X					
Upcut processing & roller leveling	X				X					
Other ()	X				X					
Materials Handling (total)	X					X				
Receiving	X					X				
Order Filling	X					X				
Shipping	X					X				
Delivery	X			X		X	X			
Inventory Space Cost	X					X				
Advertising	X	X								
Outside Selling	X							X		
Inside Selling	X			X						
Administrative Selling	X									
Credit Auth. & Collection	X			X					X	
Bad Debts	X	X								
Gen'l Admin. & Acctg.	X									
Carrying Costs	X		X							
TOTAL	X	X	X	X	X	X	X	X	X	X

August, 1957

LIST OF METAL PRODUCTS AND CODE NUMBERS**Warehouse Shipments Only**

Code No.	Product	Code No.	Product
			Alloy Steel (Cont'd.)
10000	INDUSTRIAL STEEL PRODUCTS	13300	Cold Finished Bars
10100	Carbon Structural (Standard and Wide Flange)	13400	Sheet and Strip Products
10200	Carbon Plates (U.M., Sheared and Floor)	13500	Mechanical Tubing
10300	Carbon Hot Rolled Bars and Bar Shapes	13600	Pressure Tubing
10400	Carbon Cold Finished Bars (Rounds, Squares, Hex, Flats)	14000	Alloy High Strength (All Products)
11000	All Carbon Sheet Products	15000	Stainless & Heat Resisting
11100	Carbon Hot Rolled Sheets and Strip	15100	Plates
11110	Flat Sheets & Strip—Primes	15200	Hot & Cold Rolled Bars
11120	Flat Sheets & Strip—Other than Prime	15300	Sheet and Strip Products
11130	Coils	15400	Tubular Products, including pipe
11200	Carbon Cold Rolled Sheets & Strip	15500	Wire Rods and Drawn Wire
11210	Flat Sheets & Strip—Primes	15600	Fasteners & Fittings
11220	Flat Sheets & Strip—Other than Prime	16000	Tool Steel
11230	Coils	16100	Carbon tool steel
11300	Coated & Misc. Sheet Mill Products	16200	Alloy tool steel
11310	Galvanized Flat Sheets	20000	MERCHANT STEEL PRODUCTS
11320	Galvanized Coils	21000	Nails and Staples
11330	Enameling Sheets	22000	Barbed and Twisted Wire
11340	Electrical Sheets & Strip	23000	Woven Wire Fencing
11350	Tin Plate—Flat Sheets & Coils	24000	Bale Ties
11360	Terne Plate—Flat Sheets & Coils	25000	Standard Pipe
11370	Tin Mill Black Plate	30000	SEMI-FINISHED AND MISCELLANEOUS STEEL PRODUCTS
11380	Other Coated Sheets	31000	Ingots, Blooms, Billets & Slabs
11390	Expanded or Processed Flat Rolled Products	32000	Rails, Rail Accessories, and Piling
12000	Carbon Tubular Products	33000	Skelp
12100	Carbon Mechanical Tubing	34000	Wire Rods (except stainless)
12200	Carbon Pressure Tubing	35000	Wire Drawn (except stainless)
13000	Alloy Steel	36000	Reinforcing Bars (Deformed)
13100	Plates	37000	Oil Country Goods
13200	Hot Rolled Bars	37100	Carbon
		37200	Alloy
		38000	Line Pipe
		39000	Other Miscellaneous Steel Products

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LIST OF METAL PRODUCTS AND CODE NUMBERS

Code No.	Product	Code No.	Product
40000	ALUMINUM	53400	Seamless Tube
41000	Flat Rolled Products	53500	Wire
41100	Sheets	53600	Miscellaneous
41200	Coils		
41300	Plates	54000	Bronze and Other Alloy Products
		54100	Sheet, Coil, & Plate
42000	Wire, Rod, & Bar Stock, Rolled	54200	Rod and Bar
	Structurals	54300	Seamless Tube
42100	Wire	54400	Wire
42200	Rods, Bars, Screw Machine Stock	54500	Miscellaneous
42300	Rolled Structurals		
		60000	INDUSTRIAL PRODUCTS (HARDWARE) (Includes nuts and bolts, valves, fittings, and other machined and assembled products sold in conjunction with industrial metals.)
43000	Tubing — Drawn		
44000	Extrusions and Pipe		
44100	Extrusions		
44200	Pipe		
		70000	CUSTOMER SERVICE WORK (All Metals)
45000	Miscellaneous Aluminum Products		
50000	BASS & COPPER PRODUCTS		
		Direct Mill Shipments Only	
51000	Copper, Products (Standard Stock Sizes)	12109	Carbon Mechanical Tubing
51100	Sheet, Strip, and Roll	12209	Carbon Pressure Tubing
51200	Water Tube and Pipe (Copper and Red-Brass)		
51300	Refrigeration Tube	15009	Stainless & Heat Resisting
51400	Welding Rod	15109	Plates
		15209	Hot & Cold Rolled Bars
52000	Copper Products (other)	15309	Sheet and Strip Products
52100	Sheet, Strip, Plate	15409	Tubular Products, including pipe
52200	Rod and Bar	15509	Wire Rods and Drawn Wire
52300	Seamless Tube	15609	Fasteners & Fittings
52400	Wire	16009	Tool Steel
52500	Miscellaneous	16109	Carbon Tool Steel
		16209	Carbon Alloy Steel
53000	Brass Products		
53100	Sheet, Coil, and Plate	20009	Merchant Steel Products
53200	Screw Machine Rod (round, square, hex)	30009	Semifinished Steel Products
53300	Rectangular Bar	40009	Aluminum
		50009	Brass and Copper Products

Note: This List of Metal Products and Code Numbers replaces the product classifications listed on Page 8 of Section II dated May, 1956 and should be used by companies in reporting Product-line Profitability statements.



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