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MAKE OR BUY

BY

JAMES W. CULLITON



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MAKE OR BUY

A CONSIDERATION OF THE PROBLEMS FUNDAMENTAL
TO A DECISION WHETHER TO MANUFACTURE OR BUY
MATERIALS, ACCESSORY EQUIPMENT, FABRICATING
PARTS, AND SUPPLIES

BY

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HARVARD UNIVERSITY
GRADUATE SCHOOL OF BUSINESS ADMINISTRATION

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PREFACE

Every economic entity, whether it be a family, a business, or a government, frequently must decide whether to make or to buy the things it needs. This thesis considers in detail the business problems faced by manufacturing business organizations when deciding whether to make or to buy the things they need.

The arguments of the treatise are based in part upon information received by the author in personal interviews with business executives of companies engaged in many manufacturing activities in widely separated geographical districts, reaching from Boston and Providence in New England, to Rochester, New York, and Pittsburgh, Pennsylvania. Twelve specific problems faced by these companies were written up by the author as business cases and appear in the treatise; many other business experiences, while not formally written as cases, are cited as examples; in addition to the material thus collected, extensive use was made of a large number of other cases already prepared as part of the general research program of the Harvard Business School. In order to facilitate reference by the reader to the cases and examples cited, there is included at the end of the thesis an alphabetical list showing the names, the numbers of the pages where reference is made to them in the thesis, and source references.

Since most business decisions and business problems inevitably are influenced to some extent by the current conditions extant in the world at large, it is necessary to recognize such influences — whether they be, for instance, the overoptimism of the 1920's or the overpessimism of the 1930's — when making any study based upon actual business experience. Few of the problems used as the basis for the argument in this study were dated prior to 1930, and the intensive field work was done in 1939 and early 1940. Thus, much of the argument is based upon experiences set against the background of the business psychology and business conditions of the 1930's. Specifically, for example, in sharp contrast to the later 1920's, overcapacity was almost universally present after 1929 and wrought important changes in the way in which businessmen approached and thought about their problems.

Consequently, recognition of the existence of unused capacity and its effect upon decisions to make or to buy was inevitable. Yet, there was no reason to assume that such conditions would prevail forever. Since any analysis based upon temporary conditions would be only superficial, the attempt has been made throughout this thesis to segregate the fundamental aspects of the problem from those accidental aspects which change with changing conditions. These accidentals, it is true, are extremely important and cannot be overlooked; it is necessary, however, that they be kept in their proper perspective and be given the proper emphasis.

A dramatic example of the way changing conditions require a change in the emphasis placed upon various aspects of a make or buy problem is found in the impacts of America's effort to rearm. The national defense program of the United States has given new emphasis to some of the arguments which might induce a company to make or to buy the things it needs. The funda-

mentals of the problem of make or buy remain the same, but the circumstances of the times make necessary the reconsideration of those fundamentals in a different light. For example, in any business producing national defense goods, the procurement problem remains, as always, one of getting the things that are needed, when they are needed, and at reasonable cost. The concept of what is reasonable cost may well have changed under the present pressure to produce, since the most important objective of procurement has probably become that of *getting* what is needed. Making and buying offer alternative methods of attaining the objective and the correct alternative can be decided upon in exactly the same way as in other circumstances, by examining the fundamentals and interpreting them in the light of existing conditions.

Because the war production program has not destroyed the logical basis upon which the argument of this thesis was built, rewriting the main body of the argument to show its specific connection with the problems of businesses engaged in war work was deemed unnecessary and even undesirable. Since any analysis of the fundamentals is more important than their application to temporary and unusual circumstances, little but timeliness would have been gained by changing the point of view to one embracing the specific make or buy issues arising out of the total war effort. In certain instances, however, where the argument as stated in the text was clearly inapplicable to conditions of the emergency, footnote comments have been added to the discussion.

I wish to express a debt of gratitude to the businessmen who so freely cooperated in giving me the benefit of their experience; to former Dean W. B. Donham, whose help has been indirect but essential; to Professor H. T. Lewis, whose help has been both direct and indispensable; to Professors E. P. Learned, C. A. Bliss, and Richard Donham for words of encouragement when they were needed most; and finally to my wife.

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SOLDIERS FIELD
BOSTON, MASSACHUSETTS
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MAKE OR BUY

CHAPTER I

THE PROBLEM OF MAKE OR BUY

Frequency of the Problem

In any business organization, every time a purchase order is made out something is being purchased; and every time a production order is given something is being made. Behind each purchase order, therefore, is a decision to buy and not to make; and behind each production order is a decision to make and not to buy. Some indication of the importance of those decisions can be found in the realization that a single automobile is made up of literally hundreds of parts, each one of which was either made or bought by the car manufacturer. Furthermore, in addition to the parts of the finished automobile, the manufacturer had need of other materials and supplies which never became part of the finished product but yet were necessary for its production. These include a wide variety of goods and services ranging all the way from electric power to pencils. Each one of these, too, was made or was bought. Nor are large companies the only ones having similar situations. The purchasing officer of one medium-size manufacturing company, for instance, reports that in the course of one year he bought as many as 20,000 different items. Theoretically, at least, each one of those could have been made by the company; yet, whether consciously or unconsciously, the decision was made to buy them.

Lack of Business Literature on the Problem

Despite the frequency with which make or buy alternatives arise in business there is little in business literature to tell how businessmen make the choice, and there is even less dealing with the way in which businessmen should proceed when faced

with the alternatives of making or of buying. A glance at the bibliography attached to this thesis, for example, will reveal less than two dozen books or articles dealing with the subject. Most of these are either brief and in general terms, or, on the other hand, deal with very specific problems without pretending to generalize. The following quotation from the *Handbook of Purchasing Policies and Procedures*, prepared and published by the National Association of Purchasing Agents, is typical of the approach to the problem:

... the fairest statement that can be made is that each case must be considered upon its individual merit, and that there are so many considerations . . . as to make any generalization practically impossible.¹

None of the works mentioned in the bibliography sheds much light on how "each case" should be "considered upon its individual merit." The most that is done is to list the possible advantages and disadvantages of making and of buying, without attempting to set up a satisfactory procedure for discovering whether, in a specific instance, making or buying could be expected to bring the greater advantages.

Importance of the Problem

One might ask: "Inasmuch as business literature deals, for the most part, with those problems which perplex businessmen most, does not this lack of written material on the make or buy problem indicate that the problems are, in reality, unimportant?" Part of the experience gained while doing the research for this thesis could also be

¹ *N.A.P.A. Handbook of Purchasing Policies and Procedures* (New York: National Association of Purchasing Agents, 1939), Vol. I, p. 198.

used in further substantiation of that opinion: a large number of businessmen, when they were approached for information about their make or buy problems, said they had none. They, too, then indicated that it was not a perplexing problem in their business. Furthermore, no one could seriously claim that every one of the many articles purchased by a company ought to be thought of as an incipient make or buy problem. Making some articles is clearly not within the practical scope of many businesses. For example, few, if any, manufacturing companies (other than pencil manufacturers) would consider making their own pencils. Nevertheless, there is evidence which shows that make or buy problems are real business problems of the first magnitude of importance. The business experiences reported in these pages are a proof of this thesis.

For every businessman who claimed he had no make or buy problems there were others who had recognized that they had important ones. These men were in companies making paint, envelopes, scientific instruments, chemical, leather, and many other products; and the products which these companies were considering making or buying included among others, containers, nitric acid, potash, rubber and moulded plastic parts, printing, tools, and stampings. Labor problems, quality considerations, questions of fundamental policy, as well as potential savings, made the problems highly important and of more than academic interest in those companies. It is the experience of such companies that forms the basis for most of the discussion in the following pages.

Furthermore, while it is true that business literature deals for the most part with those problems which perplex businessmen most, this is no proof that nonperplexing problems are unimportant. A problem has to be recognized before it can be solved, and not infrequently businessmen spend time solving perplexing but unimportant problems when they should be devoting their attention to more vital problems which are not perplexing merely because they are not recognized. It is not improbable, therefore, that some of the businessmen who said they had no make or buy problems, more accurately could be said to have had the problems but to have failed to recognize them.

Purpose of This Thesis

One of the purposes of this thesis, therefore, is to call to businessmen's attention the fact that make or buy problems do exist and can be of real importance in the conduct of a business. The ultimate purpose, of course, is to try to develop a group of working principles which would be of assistance to business management in solving one of its important problems. Flowing out of, and necessarily an integral part of, the development of a set of such principles will be an evaluation of the make or buy decisions which come to our attention. In some small way this will lead to generalizations about the preferability of making or of buying. Or, in other words, this thesis will make some attempt to provide the basis for an answer to the question: Should a company make or buy?

Since the problem which is the subject of this thesis is one involving alternative actions, the findings may indirectly apply to broader fields than make or buy. The whole problem of alternative actions and the way in which businessmen should select one course of action from two or more possible ones has been demanding the increasing attention of business scholars in recent years. For example, some of the problems of make or buy are very similar to the problems involved in the question of plant expansion, or change of plant location. While no attempt will be made to broaden the scope of the treatment, both the research behind this thesis and the discussion itself may shed light upon some problems beyond the immediate subject.

Make or Buy, Integration, and Combination

Logically, the problem of make or buy is a part of the broad discussion of enlarging business units by the processes referred to by economists as "integration" and "combination."¹ The differences between make or buy, integration, and combination are not differences of essence. For instance, from one point of view there is no essential difference between the manufacture rather than the purchase of a component part of a finished prod-

¹See Sumner H. Slichter, *Modern Economic Society* (New York: Henry Holt and Co., 1931), Chap. VII.

uct (such as the cap of a fountain pen), and the control of iron ore mines by a steel company (a common illustration of integration), or the operation of several food producing companies by one management (combination): the effect of each of these processes is to put more operations under the control of one company. If this combining of functions were profitable without limit, all the businesses of the nation and eventually the world might be merged into one business unit by the process of integration and combination. There are, however, limits to the profits to be derived by combining various functions in one company.

Many works have been published, discussing in general terms the desirability of integration and combination from the standpoint of the social and economic well-being, but little has been done with specific reference to the business problems involved. This thesis is intended to cover some of the business problems of integration. Logically, the entire field is the proper object of study. Practically, however, the subject is too broad to be treated intensively within the limits of this thesis and, primarily for that reason, arbitrary limitations were adopted.

Limitations

Business organizations

First of all, nonbusiness and nonprofit organizations were eliminated from the discussion. This removed from the study educational institutions, charitable organizations, government units, and the like.

Manufacturing businesses

Then the businesses to be considered were further reduced in number by eliminating non-manufacturing business organizations. This step excluded banks, insurance companies, and other financial institutions; public utilities; laundries and other service institutions; retail stores, etc.

Industrial goods

The third limitation has to do with the type of products to be considered. This thesis will deal with all industrial goods except installations and primary materials. Specifically, the products to be included may be more clearly understood by re-

ferring to M. T. Copeland's classification of industrial goods as follows:

1. Installations
2. Accessory equipment
3. Operating supplies
4. Fabricating parts
5. Fabricating materials
6. Process materials
7. Primary materials ¹

He defines each of these as follows:

Installations constitute the major equipment of a plant, such as rubber calenders, woolen cards, steel furnaces, and steam generators. . . .

Accessory equipment is the auxiliary or supplementary equipment of a plant; it serves to facilitate the operation of the installations, to aid in carrying on administrative and auxiliary services, and to assist in the performance of other miscellaneous tasks. Examples of accessory equipment are small motors, tools, time clocks, conveyors, factory trucks, and steel shelving. . . .

. . . operating supplies includes supplies which are necessary for the continuous operation and maintenance of a plant, store, or office, but which do not enter directly into a manufactured product. Lubricants, paint for maintenance purposes, cleaning compounds, accounting books and forms, and packings for pumps and valves are examples. . . .

Fabricating parts are manufactured articles which are incorporated without modification by the fabricator, with other materials or parts, in completed products. These fabricating parts range all the way from pressed metal parts used in the manufacture of electric meters and calculating machines to glass insulators and containers, bearings for railway cars, motors for vacuum cleaners, trolley catchers, engines for concrete mixers, and automobile bodies. . . .

Fabricating materials, like fabricating parts, are manufactured articles which become part of other manufactured articles. Fabricating materials, however, undergo physical modification or change in the further process of manufacturing, whereas fabricating parts do not change their form or require processing by the fabricator. Examples of fabricating materials are steel plates and rods, lumber, copper wire, wool tops, worsted cloth, leather, flour, and book paper.

Process materials . . . like fabricating materials enter into the finished product or directly affect its composition. Process materials, however, commonly undergo chemical change, whereas fabricating materials usually undergo physical change. Examples of process materials are soda used for the manufacture

¹ Harvard Business Reports, Vol. 9, Introduction by Melvin T. Copeland (New York: McGraw-Hill Book Co., Inc., 1930), pp. 5-6.

of wood pulp, muriatic acid for pickling iron and steel, and sulphate of ammonia for the manufacture of scouring compounds. . . .

Primary materials include such items as raw wool, hides, wheat, crude rubber, furs, raw sugar and sulphur.¹

For our purpose we must add one further classification that is closely akin to No. 4 above, "Finished products bought for resale to complete a line." An industrial company sometimes finds that, because of the nature of its market, it is expected to be able to furnish articles supplementary in use to those which it makes, even though the manufacturing processes are quite different. For instance, a paint manufacturer might find it necessary to sell brushes.

All but installations, No. 1, and primary materials, No. 7, above, are included in the scope of this thesis.

Results of Delimitation

The results of the process of delimitation have been threefold. First, the remaining problem is reduced to manageable proportions but yet is not so narrow as to be unrealistic. Secondly, the topic to be discussed closely resembles the problem which most businessmen associate with the title, make or buy. And, thirdly, several topics have been eliminated, each one of which is of sufficient importance to be the object of a complete study in itself. These include, for instance, the make or buy problems of nonmanufacturing companies such as insurance companies and retail stores; the problems faced by a company considering purchase of a source of its basic raw material supply; and the make or buy problems of municipal governments with respect to their own water supplies, electrical generating equipment, street paving facilities, and so forth.

The elimination of nonbusiness, nonprofit, and nonmanufacturing organizations in no way indicates that the principles developed in this thesis necessarily do not apply to those types of activity. Because the entire topic was too broad for intensive study, some limitations were necessary. As a result, the application of the findings to certain fields of endeavor was left unexplored. Such fields

¹ Ibid., pp. 6-9.

would undoubtedly furnish interesting topics for further study but they have been left for a later date or for other researchers.

Make or Buy Are Extremes

The question of make or buy so far has been discussed as if there were only two alternatives, make, or buy. Actually the case is not so simple as this. There are in-between stages, wherein a company may buy, but take over some function that is normally performed by the vendor; or a company may make, but allow outside suppliers to perform some of the functions involved. Examples range all the way from control of quality by a purchaser who puts inspectors in a supplier's plant to the control of a supplying company through financial investment or through management affiliations.²

To illustrate only one of the many complicated variations, the arrangement between the Campbell Soup Company and the Continental Can Company is interesting. For some time the Campbell Soup Company owned factories which it leased to the Continental Can Company for the exclusive purpose of making Campbell Soup cans. On January 1, 1937, the agreements were modified so that the Campbell Soup Company not only owned the plants (excluding equipment) but also bought the tin plate from which the cans were made. Under this arrangement the Continental Can Company furnished the can-making equipment and the labor, and received a fixed amount per can for performing the can-making operations.³

The implications of such an arrangement are many, so far as make or buy problems are concerned, but cannot be dealt with satisfactorily until the simpler forms of make or buy are under-

² Howard T. Lewis notes three types of "halfway measures,"

(1) Purchaser's inspection at the plant of the supplier of the goods he has ordered.

(2) Definitely fostering as sources of supply, other manufacturing companies.

(3) The manufacturer buys the material which goes into the product and has it shipped directly to a concern which fabricates that material and ships the finished product to the "buyer."

See Howard T. Lewis, *Industrial Purchasing, Principles and Practice* (Chicago: Business Publications, Inc., 1940), pp. 298-302.

³ See *Standard Corporation Records* (New York: Standard Statistics Co., Inc.) Individual Report Section C 133, Vol. 17, No. 3809, Sec. 7, March 24, 1939, p. 3.

stood. For purpose of analysis, therefore, we shall first examine the extremes of making and of buying, and then note the modifications that are necessary to explain the various possible combinations of the features of both extremes.

Three Types of Make or Buy Problems

Even among the extremes, there are three types of make or buy problems: A company might be contemplating, (1) making or buying something which it has never before procured; (2) making something which it is now buying; or (3) buying something which it is now making. All three are treated in this thesis and specific cases are included to illustrate each.

Arguments Against Making Are Usually For Buying

It is also clear that with respect to general problems of make or buy, arguments *against* making are usually arguments *for* buying, and vice versa. To avoid confusion and unnecessary repetition, many of the arguments will be presented in terms *for* or *against* making. Ordinarily they will not be reworded to apply specifically to each of the three types of problems. In those instances, however, where the arguments do not apply with equal validity to all three, that fact will be noted and explained.

Method of Analysis

Make or buy is mainly a problem in the selection of a source of supply — the determination of the best source from which to obtain the materials and supplies needed in a business. In this respect it is similar to the problems which industrial purchasing officers face in choosing the proper source of supply from among several outside vendors. These problems of the purchasing officer are clearly recognized and treated by all the standard texts on purchasing.¹ The principal reason why these texts do not adequately consider making is that they are devoting their attention primarily

¹ See, for example, Howard T. Lewis, *Industrial Purchasing, Principles and Practice* (Chicago: Business Publications, Inc., 1940), Chap. X; and N.A.P.A. *Handbook of Purchasing Policies and Procedures* (New York: National Association of Purchasing Agents, 1939), Vol. I, Chap. VIII.

to the theories and techniques of *purchasing*. Nevertheless, the objectives in each instance — the selection from among outside vendors, and the selection between outside vendors and the company itself — are the same. These objectives are the objectives of scientific purchasing which, in terms commonly used in texts dealing with procurement, are: to obtain the right materials, at the right time, in proper quantities, and at as little cost as possible.²

That source of supply which is most likely to enable a business to attain those objectives is desirable. This is true whether the source selected be one or more of several outside vendors, or the company itself. Consequently, if making rather than buying can help a business better to attain those objectives, making is preferable to buying.

But how would an individual proceed to discover whether making or buying would better attain those objectives in any given instance? And, in general, is making or buying more conducive to the attainment of the objectives? This thesis aims to find answers to these questions, and in order to do so will analyze the bearing of make or buy upon each one of the objectives. In following out this scheme, separate chapters will be devoted to the relationship of make or buy to each one of the objectives individually, after which the problem will be looked at as a whole and the various parts coordinated. Accordingly, Chapters II and III will be devoted to some aspects of cost; Chapter IV will have quality as its subject matter; Chapter V, dealing with quantity, will cover the concept of "right time" as well as the "proper quantities;" thereupon, Chapter VI will return to some further discussion of cost; Chapters VII and VIII will deal with some external factors which have a bearing upon individual make or buy problems; while Chapter IX will contain a summary and the conclusions.

Throughout the thesis, reference is made to the actual experiences of real business organizations, both to illustrate and to prove many of the arguments. Most of the experiences are written as "cases" reporting all the pertinent facts. Eleven

² For fuller discussion of the implications of the concepts of quality, quantity, and cost, see Lewis, *op. cit.*, Chaps. V, VI, VII, VIII, IX, X, XIII, and XIV.

cases which are not given in their entirety in the body of the thesis and which have not been published are reproduced in the Appendix.

A Warning

Before entering upon the main body of the discussion, one warning is in order. The arguments which have a bearing upon any business decision may range all the way from being so conclusive as to dictate the decision to being very minor and unimportant. This fact makes the task at hand one of unearthing all the relevant arguments, whether they seem important or trivial, and then evaluating the importance of each, not only in itself but especially in relation to other arguments and to the problem as a whole.

We must, however, always bear in mind three facts:

1. If any one argument is actually so conclusive as to dictate the decision, further analysis is unnecessary. Thus, for example, the United States Steel Corporation need devote no attention to decide whether or not it should file an income tax return. The facts that filing a return is expensive, interferes with other work, and may reveal company secrets become unimportant when contrasted with the requirements of the law and the courts.

2. In the great majority of business decisions, however, no one argument is so conclusive as to dictate the decision and a thorough analysis of all the arguments is necessary. Such an

analysis requires the examination of many arguments which may prove to be trivial; yet, they cannot be neglected, because prejudgment of what is trivial may lead to erroneous decisions. Furthermore, if no one argument is all-conclusive, a trivial argument may sway the decision if, exclusive of that argument, the scale is balanced.

3. The importance of any one argument cannot be determined apart from other arguments and circumstances. For this reason, identical arguments may in reality be of much different weight in different circumstances, and a simultaneous evaluation of all arguments is required.

These facts lead to the conclusion that, except in unusual circumstances, no one argument discussed in this thesis can actually be considered in itself without relating it to every other argument. Yet, in the analytical procedure which must be adopted, each argument has to be considered separately, because our attention can be focused on only one thing at a time. It should be remembered, therefore, that some arguments discussed in the next chapters may, in themselves, appear somewhat artificial if they are not referred to the problem as a whole.

With this thought in mind, let us turn to the consideration of the alternatives of make or buy as means of attaining the objectives of procurement. The first of these objectives to be discussed is cost.

CHAPTER II

SOME NOTES ON COST

The discussion of cost, as it relates to make or buy, will cause unending difficulty if we do not at the outset understand what we mean by the word, cost. There is a broad and a narrow interpretation of the word, cost, as it applies to make or buy problems.

Cost in the Broad Sense

In the broad sense, cost is the only factor determining a make or buy, or for that matter any business, decision. Since businesses are run for profit, any action which produces less profit than another action can be said to cost more than that other action. In this connotation, cost is practically equivalent to the economists' concept of cost in the long run. In a make or buy problem, for example, any consideration of quality or quantity would be reduced to cost considerations as they affected the profitability of either making or buying. Even intangible results of an action, such as its effects upon labor morale, upon supplier goodwill, or upon the trend toward government control, would be included as costs.

Consequently, the right answer to any make or buy problem could be summed up in the statement: "That course of action should be adopted which costs less." Such a statement is, however, practically useless for two fundamental reasons: first, it covers such a broad field that it offers no help in understanding or solving a specific problem; secondly, it includes so many immeasurable factors that there is absolutely no possibility of representing the cost by a dollar figure. As a result, any discussion of cost in the broad sense necessarily resolves itself into generalities.

Cost in the Narrow Sense

In the narrow sense, on the other hand, cost is but one of the factors determining a business decision. With some degree of accuracy it can be represented by a dollar figure which answers the questions: how much does it cost to buy part X?

and, how much does it cost to make part X? Cost in the narrow sense offers but a starting point in a logical analysis of a make or buy problem; in addition to cost, there are other important considerations which must be weighed if a proper solution is to be reached.

This thesis as a whole obviously deals with the cost of make or buy courses of action in the broad sense of the word, cost. Yet for the very reasons given in the description of the broad concept of cost, the broad make or buy problem had to be broken down into manageable parts. One of those parts is cost in the narrow sense. This and the following chapter will be devoted to cost considerations in the narrow sense. The factors involved in the broad concept are not to be neglected but are to be taken up after the narrower implications of cost have been examined.

Different Costs for Different Purposes

Even though it has been said that cost in the narrow sense can be represented with fair accuracy by a dollar figure, it should not be inferred that one, and only one, cost figure *accurately* measures the cost of buying or the cost of making in a specific instance. It is a truism that there are different cost figures for different purposes, and that each of the different cost figures can be accurate for its specific purpose. For instance, there are standard costs, actual costs, average costs, direct costs, overhead costs, etc., etc. Average costs may be best suited for valuing inventory and yet be entirely useless for control purposes; and standard costs may be just what are needed for production control and yet be entirely inadequate as the basis for pricing.

The experience of the Natland Company¹ illustrates the point. The purchasing officer was look-

¹ For the text of the case, see Howard T. Lewis, *Problems in Industrial Purchasing* (2d ed., New York: McGraw-Hill Book Company, Inc., 1939), pp. 408-411.

ing for cost data to enable him to decide intelligently whether the company should make or buy 15 steel pans. Both the purchasing officer and the head of the manufacturing department believed that the company's cost system did not give the figures which were needed. The officials of the accounting department acknowledged the deficiency but pointed out that the cost figures did meet the primary requirement for which they were prepared, namely, cost control. The accounting officials were reluctant to change the system but were willing to cooperate in estimating figures of the kind wanted by the purchasing officer.¹

The Natland Company case illustrates specifically two of the many uses to which cost figures may be put. To illustrate in more general terms the complications involved in the selection of the proper cost figure when dealing with make or buy problems, the following list gives a brief description of the expenses which might be included in a figure which could properly be called "cost." The list is by no means complete and is intended only to indicate the large number of possible cost figures which are attainable in any given instance.

| | |
|---|---|
| <p>The cost of making might be represented by the dollar amount of expenditures for any of the following:</p> <ol style="list-style-type: none"> 1. Labor and material 2. Labor, material, and other direct costs 3. Labor, material, other direct costs, and factory overhead 4. Labor, material, other direct costs, factory overhead, and selling expense 5. Labor, material, other direct costs, factory overhead, selling expense, and general overhead | <p>The cost of buying might be represented by the dollar amount of expenditures for any of the following:</p> <ol style="list-style-type: none"> 1. The purchase price 2. The purchase price, plus delivery expense 3. The purchase price, delivery expense, plus receiving and handling expense 4. The purchase price, delivery expense, receiving and handling expense, plus buying costs (i.e., purchasing overhead) 5. The purchase price, delivery expense, receiving and handling expense, buying costs, plus cost of inspection |
|---|---|

No one of the figures representing any of the five cost combinations described in either column

¹ The argument of the accounting officials implies knowledge of a fundamental principle with respect to figures: the cost of obtaining the desired figures must always be balanced against the benefit derived from using them.

would be universally right; nor would any one be universally wrong; each one would be right for some occasions and wrong for others. In order to clear up the confusion with respect to the proper cost figure to use, the remainder of this chapter is devoted to a discussion of the requirements of cost figures to be used as the basis for make or buy decisions and the methods of getting the proper figures.

Ceteris Paribus

A logical beginning to the analysis of a specific make or buy problem would seem to be a comparison of the cost of making with the cost of buying. Even in the narrow sense of the word, cost, however, if the difference between a figure representing the cost of making and a figure representing the cost of buying is to measure the difference between a make action and a buy action, it is essential that "other things be equal." By this is meant that the difference between the figure representing the cost of making and the one representing the cost of buying must be caused by the differences in the courses of action and not by "other things." Then, and only then, could the difference in cost rightly be attributable to the differences in the courses of action. A specific example should be of value.

In 1937, the Corewell Company,² a manufacturer of a precision instrument, was buying, at a cost per unit of 1¢, a small part included in the finished product. Although the same part could still be bought at the same price, the company, in 1938, stopped buying it and used instead a part which was made in its own plant at a cost of 8¢ per unit. The important point to be noted here is that, in commonly accepted terms, we may rightly say the company had been buying the part "at a cost of one cent per unit" and that the company used instead a part which it made in its own plant "at a cost of eight cents." In other words, we can say that the *cost* of making the part was eight cents, and that the *cost* of buying it was one cent without fear of contradiction. Yet, we have not the vaguest notion whether the difference in cost was caused by the change from buying to making.

As a matter of fact, the increase in cost was for

² Fictitious name; the company's experience was not written up in case form.

the most part attributable to a change in its structural design, and the company had absolutely no evidence of the comparable cost of buying the new part. In this illustration, therefore, "other things" were not equal, and, consequently, the difference in cost did not represent the difference between alternative courses of action, but represented some unknown combination, resulting from the shift from buying to making, plus a change in quality, plus any number of other changes which we have not noted.

We may conclude, therefore, that, for the difference between two cost figures to be of any value in deciding which of two courses of action should be followed, the effect of all other things except the change from one course of action to the other should be eliminated from the cost calculations. Practically speaking, this is a goal impossible of attainment because if a part is made some things must necessarily not remain the same as when the part was bought. It is unlikely, for example, that delivery schedules, exact quality down to the last detail, or handling expense would be equal if a company made and if it bought. Nevertheless, these are "other things," and according to our theoretical requirements should be equal if any cost figures are to be completely accurate. It becomes necessary, therefore, to recognize consciously that variations in "other things" will exist and to make the necessary logical and nonmathematical allowances in interpreting the cost figures used in any specific problem.

We have, therefore, two important points to remember with respect to cost figures: first, the figures, themselves, should be arrived at by following methods that are best calculated to produce accurate results; secondly, caution should be exercised in interpreting cost figures because even those figures calculated by the best methods never tell the whole story and are rarely completely comparable among themselves. These chapters on cost, being devoted specifically to the development of principles for attaining cost figures which are as close as possible to being satisfactory, deal with the first point. The entire thesis, being devoted to the development of an understanding of the make or buy problem as a whole (one of the parts of which is cost), deals with the second point.

Methods of Getting Correct Cost Figures

Our problem now is to discover the correct way to answer the questions: What would it cost to make, and what would it cost to buy? Acceptance of any figure which bears the label of cost is not sufficient; we need a procedure which will give accurate indication of the cost of adopting certain proposed courses of action.

It is impossible to set up exact formulae and procedures for obtaining the correct answer in every instance. Nevertheless, a few generalizations can be made, and suggested procedures can be outlined. It is necessary to realize that, even if a company is currently making something, the suggestion that it stop making and begin buying involves two alternatives, necessitating two cost estimates, not one. The corporation has the alternative of (1) continuing to make, or (2) changing from making to buying. Consequently, any consideration of the future cost of making or of buying involves two separate estimates. Furthermore, past costs are not sufficient: both proposed actions are in the future and the estimated costs must refer to the future, not the past. Therefore, any cost method to be satisfactory as a basis for a make or buy decision must provide two estimates of costs under future conditions.¹

Complete budgets

In the terms of business management, any such estimates of future costs may be called budgets.² The most obvious way of finding the cost of two proposed actions is to make successive complete budgets of the expenses of the entire business under the conditions which will be in existence if each of the proposed actions was adopted.³ Then,

¹ Throughout this portion of the discussion it will be assumed that two cost estimates are necessary. Practically, two will be the minimum, and the various combinations of future possibilities may increase the number of necessary estimates far beyond that number. The essential principles are the same, however, and two will be used in order to maintain, so far as possible, clarity and to avoid complications.

² MacDonald defines a budget as "merely a collection of figures or estimates which indicate the future in accounting terms." John H. MacDonald, *Practical Budget Procedure* (New York: Prentice-Hall, Inc., 1939), p. 2.

³ It may appear that the "complete budget" really measures cost in the broad sense. Such is not the case, inasmuch as the term budget, as used here, refers to the recording of the costs to be incurred by a business under varying conditions assumed to exist if the company makes and if the company buys. The

barring errors in the budgets, the lower cost action would be clearly revealed. For the technique of preparing such budgets, the reader is referred to the standard works on budgetary procedure, two of which are noted below.¹

For practical purposes, however, it is necessary to find a more workable technique than the preparation of two complete budgets because the clerical effort not only would be costly but probably would prevent the attainment of any answer in time for action. In order to make the procedure workable, two modifications of this method are suggested: the first limits the work of preparing the budgets by limiting the area² for which the budget is prepared; the second limits the work by limiting the types of expenses covered by the budget.

Localized budgets

The first will be called the localized budget. Under this modification a complete budget (i.e., one taking into consideration all the expenses) for only that area directly affected by the make or buy decision is prepared. For example, in the case of the Shipton Manufacturing Company³ the problem arose as to whether or not a manufacturing company should reconstruct its printing plant which had been destroyed by a flood. The localized budget would call for an estimate of the cost of procuring the printing requirements of the business under the two conditions: first, assuming that the plant was rebuilt, and, secondly, assuming that the printing requirements were purchased.

Students of business will immediately recognize

complete budget does not include a budget of expected income; yet any change in income produced by the varying conditions should be given consideration if cost, in the broad sense, was being measured. It is true that the complete budget is closer to the broad concept of cost than the modifications suggested later in this chapter; this fact is also one reason why the other methods are preferable to the complete budget, as will be seen presently.

¹MacDonald, *ibid.*; and James O. McKinsey, *Budgetary Control* (New York: The Ronald Press, 1922).

²"Area" is a term the meaning of which will be clearer after the cases in the following chapter have been discussed. In some instances the "area" affected may be a department; in others, it may be only a small segment of an operating machine group; while, in others, it may mean an entire operating division. It is purposely indeterminate so that the selection of the proper area in any given instance will be made in relation to the specific requirements of that instance, and not on the basis of preconceived definitions such as "department," "division," and the like.

³For text of case, see page 25.

that the problem of reconstruction of the printing plant raises a question of the availability of capital; under the scheme proposed here, this would not be included in the localized budget as a cost of making, but would be noted as a separate consideration to be thought of in addition to cost. In other words, the cost of making would be the answer to the question: Assuming that the plant is rebuilt, how much will it cost the company to procure its printing by making?

If we remember that cost in the narrow sense is what we are trying to ascertain, it will be seen that the elimination of the cost of capital from the localized budget is not a handicap but an advantage of this method. The figure representing cost in the narrow sense constitutes only the first step in arriving at a make or buy decision, and one of its characteristics is that it is made up of measurable costs. It is well, therefore, to avoid all the complications and controversial arguments about imputed interest, and to leave the cost of capital as a factor rightly to be considered when interpreting the narrow cost figures.

Increment cost method

The second modification of the complete budget, instead of limiting the area covered by the estimates, limits the items of cost to be included. In general, those costs which are not changed by either action need not be considered. The reason for this is obvious, inasmuch as costs which remain unchanged (sometimes called fixed) would appear in equal value in both budgets (i.e., the budget of the cost of making, and the budget of the cost of buying) and might just as well be omitted from both. This method of cost analysis frequently is referred to as the increment cost method, inasmuch as it considers only those costs which are added to (or subtracted from) current costs.

There is no universal rule as to which costs are fixed and which are not, but they must be determined in each set of specific conditions. An example, however, should clarify the reasoning behind the increment cost method. If a company which operated in a rented building was considering making a product which it was currently buying, rent would not constitute an expense of

making the product if the operations were to be carried on in the same building. In other words, the company would have to pay no additional rent *because* it decided to make the product. Rent, therefore, logically could be disregarded and the effect of the proposed actions on cost could be measured safely by looking only at those costs which would change.

Selection of Method to Use

All three of the methods discussed (i.e., the budget for the whole business; the localized budget; and the increment cost method) are fundamentally sound for the calculation of cost figures (in the narrow sense), and the selection of any one as being best suited for make or buy problems depends upon expediency. The importance of most make or buy problems, the frequency of their occurrence, and the speed with which they should be decided, would not, in most instances, justify the preparation of complete budgets for the whole business. Yet, if the product under consideration was particularly fundamental to the business, a complete budget might be necessary in order to assure consideration of all the costs. However, the major effect of most make or buy decisions is concentrated in one area of the business, or in a few selected types of cost, and it is therefore quite logical to make the cost calculations in the area or with respect to the costs directly affected, and to provide for other changes outside the cost calculations. Complete business budgets, therefore, are recommended for unusual and complex make or buy problems only.

The localized budget probably presents the most useful method of cost analysis for make or buy decisions. It lies halfway between the other two. On the one hand, it avoids the unnecessary work and delay of the first method and, on the other, as will be shown presently, it is more likely than the increment cost method to lead to correct answers.

The preferability of the localized budget to the increment cost method is not universal, but flows chiefly from the effect of time upon cost elements. The increment cost method ignores those costs which remain unchanged; yet, costs remain un-

changed only for a period of time. All costs change if the time period is long enough. Costs, such as the rent item referred to above in the illustration of the increment cost method, may remain unchanged for a month, a year, or two years, and yet change over a longer period of time. It is conceivable, for instance, that the rent might be indirectly related to profits. Then, while the addition of a new product would not immediately increase the rent, any additional profit therefrom might work towards a rent increase sometime in the future. It is necessary, therefore, that the time period be examined carefully before any cost can be safely labeled as unchanging.

The localized budget is more likely to force such examination than is the increment cost method because there exists a rule of thumb attitude towards those costs which businessmen consider "fixed" and "variable." For instance, a businessman is more than likely to adopt as a fact the statement that depreciation is a fixed charge. Without further thought, therefore, if he used the increment cost method, depreciation would be disregarded. This might be absolutely correct if the problem was one extending over a period of one month, and might be absolutely incorrect if the period extended over five years. The localized budget, on the other hand, by demanding that each cost be listed in total, is more likely to force attention upon the determination of whether or not depreciation would be the same under each proposed course of action.

Because of the effects of time upon costs, the localized budget is recommended except in those instances where the time period is actually short enough so that important costs do remain unchanged and the increment cost method therefore can be used advantageously. Always, however, care should be exercised to see that costs are not erroneously assumed to remain unchanged.

It should be kept in mind that no inherent advantage is claimed for the localized budget not granted to exist in the increment cost method. The general preference for the localized budget flows from the belief that it will, in the majority of instances, be more likely than an increment cost analysis to give correct answers, especially because it forces attention upon some costs which

might be overlooked if the increment cost method was used. Both methods will give identical results if properly followed. In most cases, however, the localized budget is easier to follow properly than is the increment cost method.

The Budget Period

The time factor is of importance from another angle. The period for which a budget or any cost estimate is prepared should be carefully selected and the implications of the time period fully recognized. The budget period in businesses is frequently one year. But many costs run for more than that time and have to be arbitrarily assigned among the years. It is essential, therefore, that, when cost comparisons are being made for use in solving make or buy problems, either (1) the actual time span of the costs be identical, or (2) specific attention be given to the differences.

An example will serve to illustrate this point. In 1929 the Sperry Company¹ was paying 40¢ per unit for pen caps. The company was contemplating making the caps in its own factory. One of the operations — fastening a clip to the cap — would require the purchase and installation of a machine, at a cost of \$3,000. Since, however, the quoted price for the cap was for a year's supply, it was necessary to put the cost of making the pen caps on a comparable basis. So far as the clip-attaching machine was concerned, this was done as follows. The life of the machine was estimated at five years. Consequently, each year bore a cost of \$600. Annual production was estimated at 600,000 caps, so that the cost per cap was figured at 0.1¢. Other costs were likewise calculated on a per-year and per-unit basis, and the total cost of making the caps was calculated at 27½¢ per unit. On this evidence, the company decided to install the machine and make the caps.

Three years later, however, the company could purchase caps for 25 cents and the question of whether the company should continue to make them was being considered. Let us assume,² for the moment, that the company resumed buying the

caps in 1932 and that the cap-attaching machine was scrapped at the end of three years. How accurate were the costs that had been figured in 1929? It is clear, now, that the machine did not cost \$600 per year, but \$1,000. Or more accurately, all that can be said is that the machine cost \$3,000 over a period of three years. If the original volume figures were accurate and the company actually produced 1,800,000 caps during the three years, the average cost per unit for making the clip would be 0.1⅔¢ instead of the original estimate of 0.1¢. The lesson to be gained from this example is that the cost *per year* of the machine, as calculated in 1929, was based upon an assumption, and the assumption later proved to be wrong. It seemed necessary to make the assumption in 1929 in order to make possible a comparison of a cost of \$3,000 for five years, with a cost per unit of buying the caps. This illustration should serve as sufficient warning that costs for a period of time should be examined carefully, to test the reasonableness of the assumptions by which costs, which really extend beyond the period of time used, are artificially expressed as being assigned to the period.

Unit Costs

Whether using the complete budget, the localized budget, or the increment cost method, unit cost figures should be avoided in almost every instance. It is extremely dangerous to base any management decision upon unit cost figures because unit costs, being calculated by dividing a given volume into total cost figures, are particularly subject to error because a change in volume not only has a bearing upon the total cost figure, but also affects the numerical value of the divisor. A higher volume, for example, will require more raw material (in total), but the unit cost of raw material may remain constant or change up or down; a higher volume will, however, reduce the per-unit cost with respect to those costs which are fixed in total. A unit figure, therefore, is accurate only if many conditions remain unchanged, and those conditions are of such a nature that they can change quite easily and, perhaps, without being noticed. In addition to this, businessmen are not

¹ For text of case, see the Appendix, page 118.

² This assumption is not based on the facts of the case, but is used for illustration only.

interested in unit profit, as such, but in total profit. The unit figure is, therefore, not only subject to error, but does not give the businessman what interests him most. Consequently, both the budgetary methods and the increment cost method should, except in special instances, deal with total cost figures and not unit costs.

This objection to unit costs does not entirely rule out their use when make or buy problems are being attacked. If, in given instances, executives are better able to get a clear picture of the actual facts by looking at unit cost figures, there is no objection to unit costs *provided* they were figured correctly. This means almost universally that costs and volume should be figured in total first and that then unit costs may be derived as a convenient method of expressing the interrelation between the two factors, cost and volume. In other words, the objection is not to the use of unit costs as a method of presentation of the results of a cost analysis but to the use of unit costs as the basis of the cost analysis.

A Specific Example

In order to illustrate the various cost figures which can be arrived at in a specific instance, the many assumptions which lie behind cost figures, and the bearing these figures would have upon a make or buy decision, the experience of the Horton Instrument Company is described in detail.

HORTON INSTRUMENT COMPANY

In 1934 the purchasing officer of the Horton Instrument Company was considering whether any of the parts and supplies manufactured by his company for use in its production might be procured more economically from an outside source. One of the items which the purchasing officer analyzed was a small brass stamping.

The Horton Instrument Company was a pioneer in the manufacture of precision instruments and therefore had found it necessary to set up manufacturing facilities for practically every part required in its production. As time went on, however, manufacturing companies were organized which specialized in the production of items used by the Horton Instrument Company, and frequently they were able to sell such items below the Horton company's cost of production. As a result, the officials of the company were from time to time faced with the problem of whether to manufacture certain parts or to buy them from other manufacturers.

A typical problem of this nature arose in connection with a small brass stamping which was produced by the company in four sizes and was used to enclose instruments as a protection during movement within the plant and later as a shipping container. Although the nature of the company's product was such that quality was usually the prime consideration in determining whether to buy or to manufacture parts or supplies, the principal consideration in this particular instance was price. Quality considerations ended with the assurance that the container fitted the instrument closely enough to prevent shocks to delicate mechanisms during transportation. When the item was produced in the company's plant, this quality assurance was obtained through normal inspection by the stamping machine operator. When the item was purchased from an outside source, quality assurance was obtained through relatively inexpensive inspection by the receiving department.

In order to determine whether these stampings should be purchased instead of manufactured, the purchasing officer submitted samples of each stamping to three manufacturers who specialized in this type of product, requesting that they quote prices on lots of 10,000 units. The company bought other items from each of the three manufacturers and the purchasing officer was certain that they would be reliable suppliers of this article.

Quotations returned by the three companies were as shown in Exhibit 1. In accordance with the custom of the industry, a tool cost was included in each quotation. This charge, which represented the cost of special tools required to produce the article, was made against the buyer at the time of the first delivery. The supplying company was thereby able to quote prices that did not include an amortization charge.

EXHIBIT 1
HORTON INSTRUMENT COMPANY
Quotations on Stampings
10,000 Unit Lots

| Size | Supplier A | | Supplier B | | Supplier C | |
|------|--------------------|-----------|--------------------|-----------|--------------------|-----------|
| | Price per Thousand | Tool Cost | Price per Thousand | Tool Cost | Price per Thousand | Tool Cost |
| 1 | \$7.25 | \$265 | \$6.00 | \$415 | \$6.70 | \$160 |
| 2 | 8.50 | 265 | 6.00 | 435 | 6.90 | 175 |
| 3 | 5.50 | 290 | 7.40 | 525 | 7.50 | 185 |
| 4 | 5.50 | 260 | 7.40 | 435 | 6.10 | 135 |

The Horton Instrument Company was equipped to produce all four sizes of stampings. The company's costs per thousand for producing each in lots of 10,000 were as given in Exhibit 2, page 14.

The past usage record of the various items indicated that it would be safe for the purchasing officer to make his decision on the basis of the following annual unit requirements: size 1, 60,000; size 2, 25,000; size 3, 250,000; size 4, 40,000.

EXHIBIT 2
HORTON INSTRUMENT COMPANY
 Cost of Stampings
 10,000 Unit Lots

| Items | Cost per Thousand | | | |
|--------------------|-------------------|---------------|---------------|---------------|
| | Size 1 | Size 2 | Size 3 | Size 4 |
| Labor | \$2.82 | \$2.64 | \$3.40 | \$1.61 |
| Material | 0.87 | 0.82 | 1.05 | 0.50 |
| Factory Burden. | 4.22 | 3.97 | 5.10 | 2.41 |
| Total | \$7.91 | \$7.43 | \$9.55 | \$4.52 |

The stampings would all be produced by one man operating a press. The quantity needed, the production per hour, and the total number of hours required are given in Exhibit 3.

EXHIBIT 3
HORTON INSTRUMENT COMPANY
 Number of Stampings Required,
 Production per Hour, and
 Total Number of Hours

| Items | Size 1 | Size 2 | Size 3 | Size 4 |
|----------------------|--------|--------|---------|--------|
| Number required .. | 60,000 | 25,000 | 250,000 | 40,000 |
| Production per hour | 2,200 | 2,400 | 1,800 | 3,900 |
| Total hours required | 28 | 11 | 140 | 11 |

The purchasing officer's decision was that the company should buy size 3 stampings from Supplier A but that it should continue to manufacture the other three sizes in its own plant. The purchasing officer determined the quantity of each size of stamping that the company would have to buy in order to realize a saving over its manufacturing cost sufficient to meet the tool cost. He based his decision on the resulting data, which were as shown in Exhibit 4.

EXHIBIT 4
HORTON INSTRUMENT COMPANY
 Data on Purchases of Stampings

| Size | Supplier | Number Required for Saving to Pay Tool Cost | Number Required for Use Annually |
|------|----------|---|----------------------------------|
| 1 | A | 401,500 | 60,000 |
| | B | 217,300 | |
| | C | 132,200 | |
| 2 | A | * | 25,000 |
| | B | 304,200 | |
| | C | 330,200 | |
| 3 | A | 71,600 | 250,000 |
| | B | 244,200 | |
| | C | 90,200 | |
| 4 | A | * | 40,000 |
| | B | * | |
| | C | * | |

* In this case the Horton Instrument Company's production cost per thousand was less than the price quoted by the supplier.

The facts contained in the Horton Instrument Company case are wholly inadequate for arriving at a make or buy decision if consideration is to be given to all the factors necessarily involved in such a decision. It is used here, however, for a different purpose and its simplicity is an advantage. By analyzing the figures in the case, the effects of time, volume, and type of cost are illustrated. Exhibits 5 through 7, pages 15 to 17, show these analyses.

Exhibit 5 gives two illustrations of the effect of time on the costs; the first assumes that the tools would last three years, while the second assumes they would last but one.

Exhibit 6 adds to the assumptions in Exhibit 5, and shows how the costs would react in each of the instances, (1) if volume was only one-half of that estimated, and (2) if volume were double that estimated.

Exhibit 7, following the type of analysis suggested by the increment cost method, shows the effect of the type of cost (fixed and variable) on the comparative costs, accepting the volume estimates but making separate calculations for tool costs if the tools last three years or one year.

From the facts presented in the case, and the further analysis given in Exhibits 5, 6, and 7, we may gather the following significant points:

1. The purchasing officer's decision to buy size 3 from Supplier A was made on the basis of calculations which indicated an annual saving of \$722.50; it was arrived at by subtracting from the total cost per thousand of making the stampings (\$9.55) the cost of purchasing them (\$5.50), giving a saving per thousand (\$4.05). This, multiplied by the quantity (250,000) gave an annual saving (\$1,012.50) from which the tool cost (\$290.00) had to be paid, leaving the net saving (\$722.50).

It will be noted that this figure is the amount shown in Column 3 of Illustration 2, Exhibit 5, and that this is also the only place that this same figure is found in the exhibits.

2. A large amount of mathematical and accounting work is involved in making the various calculations.

3. Different methods of figuring give different results. In Exhibits 5 and 6 we find total savings

EXHIBIT 5
HORTON INSTRUMENT COMPANY
Two Illustrations of the Effect of Time on Comparative Costs

| Illustration 1. (Assuming that the tools would be good for 3 years) | | | | | |
|---|------------|----------|------------|----------|------------|
| Size Supplier | 1 C | 2 C | 3 A | 4 C | Total |
| Cost of purchasing | | | | | |
| Cost of stampings | \$1,206.00 | \$517.50 | \$4,125.00 | \$732.00 | \$6,580.50 |
| Tool cost | 160.00 | 175.00 | 290.00 | 135.00 | 760.00 |
| Total cost of purchasing | \$1,366.00 | \$692.50 | \$4,415.00 | \$867.00 | \$7,340.50 |
| Total cost of making | 1,423.80 | 557.25 | 7,162.50 | 542.40 | 9,685.95 |
| Balance in favor of | | | | | |
| Buying | \$ 57.80 | ..... | \$2,747.50 | ..... | \$2,805.30 |
| Making ..... | ..... | \$135.25 | ..... | \$324.60 | 459.85 |
| Illustration 2. (Assuming that the tools would be good for one year only) | | | | | |
| Size Supplier | 1 C | 2 C | 3 A | 4 C | Total |
| Cost of purchasing | | | | | |
| Cost of stampings | \$402.00 | \$172.50 | \$1,375.00 | \$244.00 | \$2,193.50 |
| Tool cost | 160.00 | 175.00 | 290.00 | 135.00 | 760.00 |
| Total cost of purchasing | \$562.00 | \$347.50 | \$1,665.00 | \$379.00 | \$2,953.50 |
| Total cost of making | 474.60 | 185.75 | 2,387.50 | 180.80 | 3,228.65 |
| Balance in favor of | | | | | |
| Buying ..... | ..... | ..... | \$ 722.50 | ..... | \$ 722.50 |
| Making | \$ 87.40 | \$161.75 | ..... | \$198.20 | 447.35 |

from buying ranging from \$216.25 for one year (Exhibit 6, Illustration 1B) to \$6,060.60 for three years (Exhibit 6, Illustration 2A). Yet Exhibit 7 shows that buying only size 3, rather than making it, would result in a loss ranging from \$1,077.50 for three years to \$552.50 for one (Column 3, both illustrations).

Exhibit 7, for example, shows that the decision of the purchasing officer, as it was based on cost, would have been different if the factory burden costs had not been assigned to the product. It thereby illustrates in very pointed fashion the importance of getting the right cost figures for the specific problem at hand. The decision which the purchasing officer made and the one indicated by Exhibit 7 could not both have been correct for the company.

The case itself does not give sufficient data to indicate which cost figures were correct. There is no universal rule that factory burden costs should always be considered or should always be disregarded; the correct calculation in this, or in any other case, can be discovered only by finding the

answer to the question: Which cost figure accurately represents the facts which it purports to measure? All the cost calculations in Exhibits 5, 6, and 7 were intended to measure the same phenomena; they cannot all be right. It is entirely possible that they could all be wrong, for perhaps none is based upon the real facts. Those figures are right which correctly measure the real facts: whether the factory burden expense of the Horton Instrument Company would be changed if the company stopped making and bought the stampings, we cannot say, and the correct cost figures should accurately measure the effect of each action upon factory burden.

4. The usefulness of any of the calculations rests upon the accuracy of the assumptions that underlie the figures.

5. These assumptions are much more numerous than the few stated at the head of each illustration. This last point is of fundamental importance and should be examined further. For instance, the case states: "The purchasing officer's decision was that the company should buy

EXHIBIT 6
HORTON INSTRUMENT COMPANY
Two Illustrations of the Effect of Volume on Comparative Costs

Illustration 1. (Assuming that volume is one-half of that estimated)

A. On the basis of 3-year tool life (taken from Exhibit 5, Illustration 1)

| Size Supplier | 1 C | 2 C | 3 A | 4 C | Total |
|--------------------------------|----------|----------|------------|----------|------------|
| Cost of purchasing | | | | | |
| Cost of stampings | \$603.00 | \$258.75 | \$2,062.50 | \$366.00 | \$3,290.25 |
| Tool cost | 160.00 | 175.00 | 290.00 | 135.00 | 760.00 |
| Total cost of purchasing | \$763.00 | \$433.75 | \$2,352.50 | \$501.00 | \$4,050.25 |
| Total cost of making | 711.90 | 278.63 | 3,581.25 | 271.20 | 4,842.98 |
| Balance in favor of | | | | | |
| Buying ..... | ..... | ..... | \$1,228.75 | ..... | \$1,228.75 |
| Making | \$ 51.10 | \$155.12 | ..... | \$229.80 | 436.02 |

B. On the basis of 1-year tool life (taken from Exhibit 5, Illustration 2)

| Size Supplier | 1 C | 2 C | 3 A | 4 C | Total |
|--------------------------------|----------|----------|-----------|----------|------------|
| Cost of purchasing | | | | | |
| Cost of stampings | \$201.00 | \$ 86.25 | \$ 687.50 | \$122.00 | \$1,096.75 |
| Tool cost | 160.00 | 175.00 | 290.00 | 135.00 | 760.00 |
| Total cost of purchasing | \$361.00 | \$261.25 | \$ 977.50 | \$257.00 | \$1,856.75 |
| Total cost of making | 237.30 | 92.88 | 1,193.75 | 90.40 | 1,614.33 |
| Balance in favor of | | | | | |
| Buying ..... | ..... | ..... | \$ 216.25 | ..... | \$ 216.25 |
| Making | \$123.70 | \$168.37 | ..... | \$166.60 | 458.67 |

Illustration 2. (Assuming that volume is double that estimated)

A. On the basis of 3-year tool life (taken from Exhibit 5, Illustration 1)

| Size Supplier | 1 C | 2 C | 3 A | 4 C | Total |
|--------------------------------|------------|------------|-------------|------------|-------------|
| Cost of purchasing | | | | | |
| Cost of stampings | \$2,412.00 | \$1,035.00 | \$ 8,250.00 | \$1,464.00 | \$13,161.00 |
| Tool cost | 160.00 | 175.00 | 290.00 | 135.00 | 760.00 |
| Total cost of purchasing | \$2,572.00 | \$1,210.00 | \$ 8,540.00 | \$1,599.00 | \$13,921.00 |
| Total cost of making | 2,847.60 | 1,114.50 | 14,325.00 | 1,084.80 | 19,371.90 |
| Balance in favor of | | | | | |
| Buying | \$ 275.60 | ..... | \$ 5,785.00 | ..... | \$ 6,060.60 |
| Making ..... | ..... | \$ 95.50 | ..... | \$ 514.20 | 609.70 |

B. On the basis of 1-year tool life (taken from Exhibit 5, Illustration 2)

| Size Supplier | 1 C | 2 C | 3 A | 4 C | Total |
|--------------------------------|----------|----------|------------|----------|------------|
| Cost of purchasing | | | | | |
| Cost of stampings | \$804.00 | \$345.00 | \$2,750.00 | \$488.00 | \$4,387.00 |
| Tool cost | 160.00 | 175.00 | 290.00 | 135.00 | 760.00 |
| Total cost of purchasing | \$964.00 | \$520.00 | \$3,040.00 | \$623.00 | \$5,147.00 |
| Total cost of making | 949.20 | 371.50 | 4,775.00 | 361.60 | 6,457.30 |
| Balance in favor of | | | | | |
| Buying ..... | ..... | ..... | \$1,735.00 | ..... | \$1,735.00 |
| Making | \$ 14.80 | \$148.50 | ..... | \$261.40 | 424.70 |

EXHIBIT 7
HORTON INSTRUMENT COMPANY
Two Illustrations of the Effect of the Type of Cost on Comparative Costs

Illustration 1. (Assuming volume as given, and dies lasting 3 years)

| Size Supplier | 1 C | 2 C | 3 A | 4 C | Total |
|---|------------|----------|------------|----------|------------|
| Total cost of purchasing (from Exhibit 5, Illustration 1) | \$1,366.00 | \$692.50 | \$4,415.00 | \$867.00 | \$7,340.50 |
| Cost of making | | | | | |
| Labor | \$ 507.60 | \$198.00 | \$2,550.00 | \$193.20 | |
| Material | 156.60 | 61.50 | 787.50 | 60.00 | |
| Total labor and material | \$ 664.20 | \$259.50 | \$3,337.50 | \$253.20 | |
| Factory burden | 759.60 | 297.75 | 3,825.00 | 289.20 | |
| Total cost of making * | \$1,423.80 | \$557.25 | \$7,162.50 | \$542.40 | |
| Excess of cost of purchasing over total labor and material | \$ 701.80 | \$433.00 | \$1,077.50 | \$613.80 | \$2,826.10 |

Illustration 2. (Assuming volume as given, and dies lasting 1 year only)

| Size Supplier | 1 C | 2 C | 3 A | 4 C | Total |
|---|----------|----------|------------|----------|------------|
| Total cost of purchasing (from Exhibit 5, Illustration 2) | \$562.00 | \$347.50 | \$1,665.00 | \$379.00 | \$2,953.50 |
| Cost of making | | | | | |
| Labor | \$169.20 | \$ 66.00 | \$ 850.00 | \$ 64.40 | |
| Material | 52.20 | 20.50 | 262.50 | 20.00 | |
| Total labor and material | \$221.40 | \$ 86.50 | \$1,112.50 | \$ 84.40 | |
| Factory burden | 253.20 | 99.25 | 1,275.00 | 96.40 | |
| Total cost of making * | \$474.60 | \$185.75 | \$2,387.50 | \$180.80 | |
| Excess of cost of purchasing over total labor and material | \$340.60 | \$261.00 | \$ 552.50 | \$294.60 | \$1,448.70 |

* As per Exhibit 5.

size 3 stampings from Supplier A, but that it should continue to manufacture the other three sizes in its own plant." This decision was based on calculations presented in Exhibit 4, and assumed that the life of the tools would be one year, that the estimated volume was accurate, and that the total manufacturing costs could be compared with the purchase price. Had the purchasing officer given consideration to variations in time or volume or the exclusion of factory burden from cost as developed in Exhibits 5 through 7, his decision might have been different. The question arises as to whether the three assumptions made by the officer were the only assumptions to be recognized. Definitely not.

Assumptions behind Cost Figures

Rather than keep too close to the specific problem of the Horton Instrument Company, let us just list a few of the assumptions that *any* businessman makes whenever he uses past costs as a basis for a decision on future actions. This list is far from complete and is only given to bring out the point that these, and others, were made as soon as accounting costs of making were compared with the cost of buying.

Some of the assumptions are:

1. That the company's wage rates would not change.
2. That the efficiency of the labor force would not change.

3. That labor costs would be saved if the parts were purchased rather than made.
4. That there would be no interruptions in the production of the parts.
5. That the material either is or would be available at the cost indicated.
6. That there would be no unusual variation in the quality of the material.
7. That there would be no unusual change in the amount of waste.
8. That overhead is a cost.
9. That the overhead rate used was correct.
10. That the decision with respect to this problem would not affect other costs within the business.

In general, therefore, we may conclude that, whenever a figure is put down as a cost, it is based as much upon a series of assumptions as it is upon fact. For this reason, whenever a businessman uses cost figures as one of the arguments in a business problem, he should have a clear idea of what these assumptions were, so that he may make an intelligent appraisal of the aptness of the figures for his purpose. In the Horton company, for example, different cost figures were arrived at for each of the different sets of conditions assumed in Exhibits 5, 6, and 7, and even broader, basic assumptions were made before any cost figures could be collected. Erroneous decisions are frequently made because costs calculated upon one set of assumptions are applied to a situation where the assumptions do not hold. The only way to avoid such an error is to know what assumptions lie behind the cost figures, and to appraise their validity in the actual situation.

It seems quite clear that the purchasing officer of the Horton Instrument Company recognized few, if any, of the assumptions behind the cost figures which he used in making his decision. Partly because he was not interested, he did not have available the necessary information to check upon the accuracy of the assumptions; nor was the information available to the present author. Nevertheless, the purchasing officer can be criticized for using the cost figures he did because in all probability some part of the factory burden would not have been eliminated if the company stopped making the brass stampings. This would

be especially true if the figure used for factory burden was not calculated for the job being examined but was based upon a standard burden rate established for either the department or the business as a whole. Specifically, then, the figure he used, being based upon the assumptions similar to those shown in Illustration 2 of Exhibit 5 (viz., that volume estimates were accurate, that tools would last one year, and that all of the factory burden was to be considered as cost), was not correct. It is impossible to say which figure was correct, but some breakdown of the fixed and variable costs should have been attempted.

Cost of Buying

Most of the illustrations of cost problems presented so far have had to do with calculating the cost of making. This arose from the fact that such costs are the subject of much controversy especially since, in some instances at least, production cost figures supplied by an accounting system are not in correct form to be used as a cost figure for make or buy decisions. This does not mean, however, that no attention should be given to finding the cost of buying. On the contrary, the apparent simplicity of using the purchase price may lead to the use of inadequate figures.

In the case of the Horton Instrument Company, for example, the *price* per thousand, plus appropriate amortization charges for the tools, was accepted as the figure to be compared with the cost of making. But does that price equal the cost of buying? Should not, for instance, the purchasing department overhead be added to it? Or should not some handling or storage charges be included? The answer to these questions is found in the definition of the narrow concept of cost. Obviously, the purchasing department expenses must be met, but they are met by the business as a whole, not by any one purchase order. Such expenses, therefore, are not costs in the narrow sense and need not be included in the cost of buying, but should be taken up as other considerations affecting the final answer. It will be noted in the Kirwood Company¹ case to be taken up later that additional purchase expense in following one course of

¹ For text of case, see page 58.

action was considered as an important factor in the problem. Yet, such expense was rightly considered apart from the cost of buying, as we have defined it here, and was weighed as an argument in its own right.

It seems logical to assume that the *prices* given in Exhibit 1 of the Horton Instrument Company case included delivery to the Horton plant; otherwise, the comparisons neglected an important item and the cost of making and the cost of buying figures were not comparable. A general rule which seems safe to follow is that the articles under consideration, i.e., those proposed for buying and those proposed for making, should be costed in the same stage of their availability for use so that the purchased parts and the manufactured parts are considered under similar conditions. Thus, for example, if the parts manufactured in the Horton plant were costed on the basis of furnishing them to the stockroom, the purchase price should take them to the same place. Any variation between making and buying caused by carrying larger stocks of one or the other should then be eliminated from the "cost" (in the narrow sense) and be considered as a separate factor in the final determination.

Once again, it is impossible to specify the answer in every case by a universal formula, but the best rule is the common-sense approach which rests upon two guiding principles: first, the cost of making and the cost of buying should both be figured with respect to similar products (or with conscious recognition of the differences) in similar conditions, especially with respect to availability for use; second, the costs included in the figure should be as close as possible to those which

can be measured with reasonable accuracy. For example, the purchase price can be accurately determined, as can in most instances delivery expense. The assignment of purchasing overhead, on the other hand, is purely arbitrary and would tend to lend to the measurement of overhead expense an air of exactness and accuracy which cannot be justified.

In general, then, the rule for cost determination for make or buy decisions should be: keep the costs as close to measurable realities as possible, and leave the other arbitrary expenses for further consideration as factors in addition to cost. In this last category would fall, for example, purchasing overhead with respect to buying.

Because this discussion of cost has been directed at many of the minute problems of obtaining correct cost data, the reader should not assume that the suggested procedures should be blindly followed in every instance. It is well to conclude this chapter with the common-sense recognition of the fact that for certain purposes the procedures for collecting cost data should be modified, sacrificing unnecessary accuracy in return for the lower cost of collecting the data. Just as there are products which are never considered as proper for most business to make (pencils, for example), so also are there cost figures which should be left uncollected (for instance, the cost of making pencils by a candy manufacturer). Similarly, when all the cost figures are assembled, businessmen should realize that minor differences between them are frequently unimportant in so far as they can be explained as well by errors in the figures as by any real differences in the facts which the figures purport to measure.

CHAPTER III

CALCULATING THE COST OF MAKING AND OF BUYING

The decision of the purchasing officer of the Horton Instrument Company, as set forth in the preceding chapter, was based on the assumption, among others, that the cost figures as reported by the accounting department were suitable for his purposes. Exhibit 7, page 17, illustrated, however, that the decision would have been different if factory burden had not been included as a cost. No attempt was made there to find out whether or not factory burden should have been included because the purpose was to illustrate the various cost figures which would be produced on various assumptions. Now let us look at another case to see whether or not overhead costs should be assigned to particular units. The Floss Company case presents circumstances somewhat similar to the Horton Instrument Company.

FLOSS COMPANY

Calculations of Costs of Purchase vs. Manufacture

The Floss Company manufactured production machinery for a specialized branch of the metal industry. It was a relatively large company and its production facilities were so set up that it was equipped to produce the majority of parts required for the finished machines. Nevertheless, because the purchasing officer kept in touch with outside suppliers, the question frequently arose as to whether it was more advantageous to produce certain component parts of the finished machines within the company's own plant or to purchase them from suppliers who were qualified with respect to price, quality, and service.

Most of the parts made by the Floss Company were of the same general nature; consequently the executives believed that substantially accurate cost information could be obtained by charging all labor costs at an average rate rather than applying different rates to each job. Since labor rates within the plant were fairly uniform, officials believed that this method of allocating costs did not result in any unusually large errors.

Overhead costs were charged in relation to labor hours. The company's accounting system divided overhead costs into two general classifications, fixed overhead and variable overhead. These were further divided, as follows:

Fixed overhead items:

- General taxes
- General insurance
- Building repairs and depreciation
- Obsolescence of equipment
- Superintendence
- Minimum budget for foremanship
- Administrative expense
- Selling expense

Variable overhead items:

- Indirect shop labor
- Drafting and engineering labor
- Timekeeping, cost department and payroll labor
- Power
- Depreciation of equipment
- Compensation insurance
- Social security taxes
- Foremanship (beyond a minimum budgeted for minimum production)
- Departmental supplies

At the end of each six months' period, ending in June and December, the total number of direct labor hours was divided into each of three following items: the total direct labor cost, the total variable overhead cost, and the total fixed overhead cost for the period. The three resulting figures were added together and the total was called the "basic cost of manufacturing" per direct labor hour. During the six months following the period for which the data were obtained, the cost of making any given part, exclusive of materials, was calculated by multiplying the number of direct labor hours it was estimated would be required for making the part by the basic cost of manufacturing. Material costs were added separately.

The basic cost of manufacturing in effect at the Floss Company plant at the time of this case was as shown in Exhibit 1.

EXHIBIT 1

FLOSS COMPANY

Basic Cost of Manufacturing

(Cost per direct labor hour, exclusive of material)

| | |
|-----------------------------------|--------|
| Direct Labor Cost | \$0.80 |
| Variable Overhead Cost | 0.91 |
| | \$1.71 |
| Fixed Overhead Cost | 0.75 |
| | \$2.46 |
| Basic Cost of Manufacturing | \$2.46 |

The purchasing officer believed that overhead costs were of primary importance in deciding whether to make or buy parts because "in any plant engaged in job manufacturing there are frequent periods when production declines below normal capacity and consequently overhead costs must have some degree of flexibility." By this statement he meant not so much that the overhead costs themselves should be flexible, but that the policy of the management should allow for flexibility in selecting the items which were to be manufactured and thus help absorb the overhead.

In order to help the management of the Floss Company attain this desired flexibility, the purchasing officer made two separate calculations of the company's costs whenever the cost of making was being compared with the cost of buying a particular part. The first calculation included all costs; the second included only material costs, direct labor costs, and variable overhead. He called the figure arrived at by the second method the "arbitrary manufacturing costs." He realized that it did not represent overall costs, but said that nevertheless during slack periods it served as an

EXHIBIT 2
FLOSS COMPANY
Selected Examples of Cost Calculations

| Example 1 | Example 3 |
|--|--|
| <p>Item: Steel Bushing Annual Requirements: 37,000 Material Cost: \$414.00 Direct Labor Hours: 349 1/2</p> <p>Calculation 1, total cost: 349 1/2 hours at \$2.46 per hour... \$ 859.77 Material 414.00</p> <p style="text-align: right;">Total Cost \$1,273.77 Unit Cost \$0.034 each</p> <p>Calculation 2, arbitrary manufacturing cost: 349 1/2 hours at \$1.71 per hour... \$ 597.65 Material 414.00</p> <p style="text-align: right;">Total Arbitrary Manufacturing Cost \$1,011.65 Unit Cost \$0.027 each</p> <p>Outside Purchase Price \$0.030 each</p> <p>The bushings were manufactured.</p> | <p>Item: Solid Steel Stud Annual Requirements: 20,000 Material Cost: \$150.00 Direct Labor Hours: 216 9/10</p> <p>Calculation 1, total cost: 216 9/10 hours at \$2.46 per hour... \$533.57 Material 150.00</p> <p style="text-align: right;">Total Cost \$683.57 Unit Cost \$0.034 each</p> <p>Calculation 2, arbitrary manufacturing cost: 216 9/10 hours at \$1.71 per hour... \$370.90 Material 150.00</p> <p style="text-align: right;">Total Arbitrary Manufacturing Cost \$520.90 Unit Cost \$0.026 each</p> <p>Outside Purchase Price \$0.026 each</p> <p>Other things being equal this part was manufactured because it increased the number of productive hours to distribute against the total overhead.</p> |
| Example 2 | Example 4 |
| <p>Item: Hollow Steel Stud Annual Requirements: 13,600 Material Cost: \$102.20 Direct Labor Hours: 883 1/10 hours</p> <p>Calculation 1, total cost: 883 1/10 hours at \$2.46 per hour... \$2,172.43 Material 102.20</p> <p style="text-align: right;">Total Cost \$2,274.63 Unit Cost \$0.167 each</p> <p>Calculation 2, arbitrary manufacturing cost: 883 1/10 hours at \$1.71 per hour... \$1,510.10 Material 102.20</p> <p style="text-align: right;">Total Cost \$1,612.30 Unit Cost \$0.119 each</p> <p>Outside Purchase Price \$0.065 each</p> <p>This part was purchased.</p> | <p>Item: Knurled Steel Roll Annual Requirements: 2,290 Material Cost: \$177.70 Direct Labor Hours: 193 4/10</p> <p>Calculation 1, total cost: 193 4/10 hours at \$2.46 per hour... \$475.76 Material 177.70</p> <p style="text-align: right;">Total Cost \$653.46 Unit Cost \$0.285 each</p> <p>Calculation 2, arbitrary manufacturing cost: 193 4/10 hours at \$1.71 per hour... \$330.71 Material 177.70</p> <p style="text-align: right;">Total Cost \$508.41 Unit Cost \$0.222 each</p> <p>Outside Purchase Price \$0.170 each</p> <p>This part was purchased.</p> |

EXHIBIT 3
FLOSS COMPANY
Costs for Selected Examples Summarized

| Items | Examples | | | | |
|--|------------|------------|----------|-----------|------------|
| | No. 1 | No. 2 | No. 3 | No. 4 | Total |
| Hours | 349.5 | 883.1 | 216.9 | 193.4 | 1,642.9 |
| Labor and Variable Overhead Cost | \$597.65 | \$1,510.10 | \$370.90 | \$330.71 | \$2,809.36 |
| Cost of Material | 414.00 | 102.20 | 150.00 | 177.70 | 843.90 |
| Total Variable Cost | \$1,011.65 | \$1,612.30 | \$520.90 | \$508.41 | \$3,653.26 |
| Fixed Costs | 262.12 | 662.33 | 162.67 | 145.05 | 1,232.17 |
| Total Costs | \$1,273.77 | \$2,274.63 | \$683.57 | \$653.46 | \$4,885.43 |
| Purchase Price | \$1,110.00 | \$884.00 | \$520.00 | \$389.30 | \$2,903.30 |
| Excess Purchase Price over Variable Cost | \$98.35 | -\$728.30 | -\$60.90 | -\$119.11 | -\$749.96 |

efficient guide to justify the company's decisions. He qualified this statement, however, as follows: "The arbitrary manufacturing cost should be invoked only when considered in relation to plant productivity, so that the maximum productive hours in normal operations can totally absorb the fixed and variable overhead expenses. In the examples cited, where it was decided to purchase rather than make a part, the loss of productivity was negligible compared with the substantial savings on the articles purchased outside."

Four examples prepared by the company to illustrate the purchasing officer's method of making cost calculations are given in Exhibit 2. In every instance, a year's supply of the part in question would be made in one run. The purchasing officer likewise considered that the outside purchase price as shown in each example was received from a potential supplier who was qualified with respect to price, quality, and service.

Essentially, the Floss Company was operating a metal working department for the benefit of the company's assembly department. The principal factor which affected the specific make or buy problems listed in the case was cost inasmuch as the quality and delivery were apparently accepted as satisfactory whether the company purchased or made the parts.

Problems of making or buying these parts could arise in two different sets of circumstances:

1. At certain times the company had to buy some parts because its capacity was not large enough to produce all that it needed. The problem was to decide *which* parts to make and which to buy.
2. At other times the company had sufficient capacity to make all the parts it needed. The question then became one of deciding

whether to make certain parts in order to keep the plant working.

The company treated both of the problems alike so far as cost calculations were concerned, and figured the cost of making on the increment cost basis. In the first circumstances — when deciding which parts to make when the plant capacity was being taxed — the company selected for manufacture those products the purchase price of which exceeded the variable costs by the widest margin. In the second circumstances — when deciding which parts to make when its plant capacity was sufficient to make all — the company selected for manufacture all parts the purchase price of which was in excess of variable costs. The difference in circumstances leading to the make or buy problem, therefore, had no effect on the cost calculations and only acted to establish the border line between those parts which would be made and those which would be bought.¹

In order to facilitate a critical examination of this policy, the cost figures presented in the case as Exhibit 2 are summarized in Exhibit 3.

As was stated in the case, the parts in Examples

¹ This method of selecting the parts is essentially similar to the method sometimes known as the calculation of "contribution to overhead." Yet, where there is no sales price on the article under consideration, as in the Floss Company, it is difficult to conceive of a part contributing to overhead. It is better, therefore, to consider revenue as fixed, regardless of the decision to make or to buy, and to calculate the costs which have to be met from that revenue if the part is made and if the part is bought. Whether the cost calculations neglect expenses which are fixed in either case, or include all costs, makes little difference.

Numbers 1 and 3 were made: in Example Number 1 because purchasing would have cost \$98.35 more than the variable cost of making, and in Example Number 3 because the difference between the purchase price and the variable cost of making was so small as to be negligible. The products in Examples Numbers 2 and 4 were bought because the purchase price was substantially below the variable costs of making.

If we assume for the moment that the company's distribution of its costs between fixed and variable was correct, the decisions, as they were based on cost, were correct. The following re-statement of the costs proves this point:

| | |
|--|-------------------|
| If all parts were made, costs would be: | |
| Total Variable Costs | \$3,653.26 |
| Total Fixed Costs | 1,232.17 |
| Total Cost | \$4,885.43 |
| If all parts were purchased, costs would be: | |
| Total Purchase Price | \$2,903.30 |
| Total Fixed Costs | 1,232.17 |
| Total Cost | \$4,135.47 |
| If parts in Examples Numbers 1 and 3 were made and parts in Examples Numbers 2 and 4 were purchased, costs would be: | |
| Variable Costs | |
| No. 1 (Steel Bushing) | \$1,011.65 |
| No. 3 (Solid Steel Stud) | 520.90 |
| Purchase Price | |
| No. 2 (Hollow Steel Stud) | 884.00 |
| No. 4 (Knurled Steel Roll) | 389.30 |
| Total Fixed Costs | 1,232.17 |
| Total Cost | \$4,038.02 |

It can be seen readily that the third course of action, the one decided on by the company, shows a cost \$97.45 less than the second, so that by making rather than buying steel bushings and solid steel studs the company would add \$97.45¹ to its profit, providing the cost figures were correct.

This last proviso is extremely important. Yet it is a point that cannot be finally determined using the information given, inasmuch as we do not know exactly how each decision to make or to buy one of the parts would affect costs.

Nevertheless, we may examine the company's methods of computing costs to see whether the

¹This favorable difference would be increased by 90¢ to \$98.35 if the company also bought solid steel studs, but the company was probably wise in recognizing that few cost figures are so accurate as to allow such a small difference to dictate a decision.

costs might be reasonably expected to be correct. The company's general cost accounting system followed closely accepted accounting practice, so we may assume that its figures for the total cost of making any one of the parts were as accurate as would be obtained in an ordinary business. Thus, we may accept as being reasonably accurate the company's total cost figures (calculation 1, in each example in Exhibit 2 of the case). Consequently, if the decisions were to be made on the basis of total cost, the necessary figures were available.

Next, let us look at the distribution of those total costs between fixed and variable. The company assumed that direct labor and material were variable, and also the following items of overhead:

- Indirect shop labor
- Drafting and engineering labor
- Timekeeping, cost department and pay roll labor
- Power
- Depreciation of equipment
- Compensation insurance
- Social security taxes
- Foremanship (beyond a minimum budgeted for minimum production)
- Departmental supplies

It included as fixed overhead items the following:

- General taxes
- General insurance
- Building repairs and depreciation
- Obsolescence of equipment
- Superintendence
- Minimum budget for foremanship
- Administrative expense
- Selling expense

There can be little question but that each of the expenses in this last group would remain unchanged regardless of a decision to make or to buy any of the parts under consideration. Specifically, for instance, general taxes or selling expense would not change in the least if the company made or bought 37,000 steel bushings or 20,000 solid steel studs. The list, if anything, is short and such items as depreciation of equipment and timekeeping might properly be shifted from variable to fixed. Nevertheless, it is obvious that the com-

pany made an honest attempt to segregate its costs between fixed and variable and that fixed expenses were not overstated. Consequently, any action which enabled the company to meet more of the fixed expenses is to be desired over an action which enables it to meet less of the fixed expenses.¹

As was brought out in the notes on cost,² such costs as the Floss Company considered "fixed overhead items" may be fixed for short periods of time and yet be variable for longer periods. The company, however, understood this and correctly met any possible objections by reviewing its costs every six months. A glance at the list of fixed items will reveal that none of the costs would ordinarily or unexpectedly change violently within any six months' period. It will be further noted that the longest production time for any of the parts under study was less than 900 production hours, or the equivalent of the labor of one man working 40 hours a week for 22½ weeks. It is seen, therefore, that the time element, which may be one of the chief sources of error in the use of the increment cost method, was properly handled by the Floss Company, inasmuch as the costs which it called fixed could be reasonably expected to remain unchanged not only during the production period of any one of the parts but also during the period between review of the costs themselves.

There are some possible objections to the cost figures used by the Floss Company. Probably the most serious is a criticism of the use of average labor costs and the application of overhead cost rates based on the experience of the plant as a whole to the cost of making products in a specific department. For example, it is quite possible that the steel bushing (Example 1) and the solid steel stud (Example 3) might be made in different departments with varying wage rates and with various degrees of fixed and variable costs. If that were true, the use of one labor rate and one plant-

¹ It may be pointed out that any division of total costs between fixed and variable which understates the fixed expenses tends to favor purchasing; the larger the fixed expenses, the smaller the variable, and the more difficult for outside purchase prices to be as low as the variable expenses. While theoretically it is desirable to have the costs accurate, it might be called conservative to consider as fixed only those costs which are certain to remain fixed and to call those variable which may, but probably will not, change.

² Chapter II, page 11.

wide division of fixed and variable overhead would give erroneous figures.

The seriousness of this objection is minimized by certain conditions not clearly stated in the case.³ First of all, the company believed that the variations in the operations of its various departments were not great enough to distort seriously the accuracy of the figures it used. Secondly, the method outlined in the case constitutes a semi-routine system of analysis which is applied to a large number of make or buy problems recurring frequently and dealing with many of the parts used by the company. The purchasing officer investigates the advantages of making and buying many of the parts needed and the company might buy a specific part one time and make it the next. No new equipment is required for any of these parts; existing equipment is used to make them, is used for something else, or is left idle. Instances where new equipment is needed are not analyzed by this system but are subjected to a more specific analysis.

We must admit that closer study of the operations of each department might give more accurate figures than those used by the company. Whether or not the added expense of getting them would be worth while is for the company to decide. Meanwhile, the way in which the company used its cost figures shows that its executives had a grasp of the proper relative importance of fixed and variable costs.

It is also well to realize that the company's estimates of the amount of labor time required to make the parts is a crucial point in its calculations. Both its total cost and its arbitrary manufacturing cost figures could be high or low depending upon the accuracy of the estimate of labor requirements. Once again we must trust the company's judgment which in this instance is bolstered by past experience in making each one of the parts which came up for consideration.

Thus, on the basis of the facts as given in the Floss Company case, we may make the following summary comments:

1. There are times when overhead costs (such as factory burden in the Horton Instrument Com-

³ They were known to the author but inadvertently omitted from the case released by the company.

pany and those costs specifically called "fixed" by the Floss Company) may be disregarded as a cost of making. In fact, fixed costs must either be left out of the cost of making and the cost of buying (as in the increment cost method) or must be added to both the cost of making and the cost of buying (as in the budgetary method). Including them as a cost of making and not as a cost of buying gives erroneous results.¹

2. The increment cost method gives satisfactory results if the effects of time upon the costs are correctly measured. In the Floss Company, the frequent review of the costs themselves and the short production period for the parts under consideration helped the company avoid errors with respect to the determination of fixed and variable costs.

The foregoing comments about the Floss Company case deal, as was intended, with the narrow aspect of cost. While no attempt will be made here to cover the broad concept of cost, mention should be made of the fact that, despite the relative simplicity of the circumstances being considered, despite the assumption that quality and delivery are satisfactory, and despite an underlying assumption that the company's purchasing is done as efficiently as possible, the final decision should not be made on the cost figures alone. The figures, for example, give no thought to the possible effect upon supplier goodwill or upon the assurance of a source of supply, if certain parts are sporadically made and bought. Nor, on the other hand, do the calculations allow for any savings (or added expense) brought about by skillful (or uneconomic) scheduling of parts in efficient combinations. Nevertheless, they provide a proper starting point and the other aspects of the case may be properly postponed until after we have given consideration to the factors other than cost in the narrow sense.

Having thus illustrated a practical application of the increment cost method and demonstrated its merit, let us turn our attention to certain other

¹ The term, fixed costs, as used here, refers to those costs which really are fixed, the assumption being that these costs are measured with reasonable accuracy. The statement is not intended to reopen the discussion of which costs are fixed and which are variable, but merely to point out the correct procedure with respect to those costs which in reality are fixed.

aspects of cost as a factor in make or buy decisions. This will be done by reference to two specific business cases. The first is the Shipton Manufacturing Company.

SHIPTON MANUFACTURING COMPANY

Rehabilitation of Company-Owned Printing Plant

The property of the Shipton Manufacturing Company was severely damaged by the hurricane which swept New England in September, 1938. Besides damaging the manufacturing plant, the hurricane and resulting flood almost destroyed the company's printing shop. After a thorough examination of the wrecked printing plant, company officials estimated that an investment of \$50,000 would be necessary to restore it to operating condition. Since none of the loss was covered by insurance, the executives decided to re-examine the desirability of having a company-owned printing plant.

The Shipton Manufacturing Company had a large, well-established organization; its products were well known to consumers throughout the United States and were noted for their excellent quality. The company's chief product required a high degree of accuracy and precision in manufacture and, consequently, was of relatively high value. Potentially almost every person in the United States was likely to have need for the product at some time in his life. The majority of the company's customers, however, were over 30 years of age. Company-owned branches for distributing the product to retail outlets were operated in over 200 cities in the United States.

The company used a considerable amount of printed material. The nature of its organization was such that it required many accounting forms and the wide appeal of its products had prompted the company to use many advertising bulletins with colored illustrations.

All the products of the company were made in a central factory located in a town having a population of about 25,000 and situated in a rural section about 60 miles from two important industrial cities. From a small organization, the Shipton Manufacturing Company had grown steadily so that in 1937 it constituted the chief business of the town. Its distance from large cities had in part led to a policy bordering upon self-sufficiency in manufacturing. Consequently, the Shipton company made many products the manufacture of which seemed somewhat foreign to its main activities and which similar companies bought from outside suppliers. Executives believed, however, that the large volume in which the company used such products enabled it to manufacture them efficiently.

In many instances, the company had been forced to develop and train its own labor supply. This proved to be desirable, however, because the company's training policy, by offering promotion to those able to do more skilled work, kept labor turnover at a minimum and thus helped keep labor costs down. The soundness of its labor policy was demonstrated by the experiences in the printing shop. In 1910 when the shop

was established, there were few printers in the town. Consequently, the company trained men to operate the presses, set type, etc. As the print shop was expanded, more help was trained and the personnel was found to be very satisfactory, in fact more satisfactory than help trained elsewhere. Once, when a new and complicated press was installed, the company had engaged a specialized and experienced printer from a neighboring town to run it, but later had dispensed with his services when one of the company's own workers proved to be a superior operator. None of the company's labor force was unionized.

For the first few years after its establishment in 1910, the print shop had annual expenses,¹ including fixed charges, amounting to slightly less than \$100,000. After the business depression of 1920 it had expanded rapidly, and in 1937 its total expenses were well over \$500,000. Throughout the same period fixed charges, as a percentage of total costs, had decreased from 42% to about 22½%. The shop had very modern equipment which was unsurpassed in any of the commercial shops in the vicinity.

The necessity of buying printing from commercial printers while the company's own shop was shut down in the fall of 1938 made available accurate data concerning the cost of buying certain kinds of printing. A comparison of the cost of purchasing a four-page advertising folder with the cost of printing it in the company's shop is given in Exhibit 1.

EXHIBIT 1
SHIPTON MANUFACTURING COMPANY

Cost of Printing as Compared with Purchasing a Two-Color Four-Page Folded Leaflet (3½" x 6½" Folded Size)

| | |
|---|----------------------------|
| Cost to print in the company's shop (in lots of 50,000) | |
| Labor | \$0.66 per thousand |
| Material | 1.36 |
| Overhead | 0.59* |
| Total cost | \$2.61 per thousand |
| Cost to purchase (in lots of 100,000) | |
| Supplier A..... | \$2.70 per thousand |
| B..... | 3.05 |
| C..... | 3.16 |
| D..... | 2.95 |

*Charged in relation to direct labor and calculated separately for each component part of the job.

The company's cost figures were for production lots only one-half as large as those used as the basis for quotations by the commercial printers. Although the company had had no actual experience in making larger quantities, the printing plant manager estimated that he could produce the leaflet for \$2.20 per thousand in lots of 100,000.

Overhead, as shown in Exhibit 1, was based on standard costs established in accordance with experience and assigned to each job on the basis of the component

¹Total expenses were the best indication of volume, there being no common unit and no selling price.

operations. It included overhead costs assignable directly to the shop itself, but no portion of the company's general administrative and overhead expense. Over a period of years, the total of the overhead absorbed by the individual jobs never varied substantially from the total overhead of the print shop as a whole. The purchasing officer, therefore, believed that the cost calculations for any one job were reasonably accurate and that as a result the cost figures given in Exhibit 1 were typical. According to his experience almost all prices quoted by outside printers were about 50% above the company's costs. The comparison made in Exhibit 1 was not so favorable to the company's plant as it might have been at some other time because the suppliers, especially A, were seeking work to keep their machines and men busy at a time when there was little demand for printing, owing to the after-effects of the hurricane on business.

The purchasing officer attributed the large difference between the company's costs and the quoted prices to several factors. First, he admitted that the company's labor costs were probably somewhat lower than those of commercial printers. Second, because of the large size of its orders and its good credit standing, the Shipton Manufacturing Company was able to buy paper in carload lots at prices cheaper than any commercial printers except the largest. Third, the company's print shop operated at a fairly steady volume and therefore had little idle equipment. In this respect the company's print shop differed from most commercial printing plants, since the latter had to have many kinds of equipment in order to be prepared to fulfill orders that were received only infrequently. Hence, the company's overhead costs of printing were substantially less than those of outside suppliers. Finally, the company's requirements were of such a nature that the print shop manager was usually able to find fill-in work to keep machines operating even if there was no immediate demand for the work. Accounting forms, for instance, were sometimes produced in advance of need in economical groupings and stocked until required.

The total loss sustained by the Shipton Manufacturing Company because of the hurricane amounted to more than \$500,000. Consequently, there was a heavy drain on the company's cash resources. Sufficient money was available, however, to make the investment in rehabilitating the print shop.

Exhibit 1 in the Shipton Manufacturing Company case shows that the company's costs for printing the two-color four-page folded leaflet were calculated as \$2.61 per thousand, and that the lowest purchase price was \$2.70, which is 9¢ or almost 3½% higher than the company's cost figure. This, from the point of view of rebuilding the print shop, is the least favorable comparison of any cost figure in the case. The percentage would be increased if we accepted the cost figure

of \$2.20 which the print shop manager said could be attained on comparable lot sizes. Furthermore, the purchasing officer believed that purchase prices would normally be about 50% more than the company's costs and that the quotations received were unduly low because of the unusual circumstances following the hurricane.

On the basis of \$500,000 expended per year for printing, a 3½% increase in expense would amount to \$17,500 per year and a 50% increase would come to \$250,000. Either figure would seem to indicate that an investment of \$50,000 would be well worth while.

The figures, however, are open to question because the cost units used as a basis of comparison were not really comparable, considering the purpose of the comparison. True, the basic cost figures were both for the same job, and in similar quantities (or with information to adjust the figures to similar quantities); and, if the question were one of making or buying the folded leaflet which is the subject of Exhibit 1, there would be no quarrel with the decision because, on the basis of the figures, printing them in the company's shop would help to absorb overhead to the extent of 68¢ per thousand copies. This is the total of 59¢ charged as an overhead cost, plus the 9¢ by which the company's total cost was less than the lowest quoted price.

Yet it was entirely erroneous to compare this, or any other single quotation, with the cost of making the same product in the company's plant. Since the problem facing the Shipton company was one of reconstructing a plant in which to produce all its printing requirements, it was improper to compare the cost of doing one printing job with the cost of purchasing that same job. The sample is not adequate; nor is it known whether or not the cost of the pamphlet was representative of the company's printing costs. The job was selected merely because the pamphlet happened to be one of the items that was needed while the company's plant was unable to operate. Perhaps the cost of printing that particular pamphlet was low for some unusual reason and the company's printing costs for other items might have been unduly high. There is no concrete evidence one way or the other.

Not only was the cost of doing its own printing not revealed by the figures used, but the purchase price likewise was not representative of the cost of purchasing all the Shipton company's printing requirements. It is a well-known fact that small-order printing jobs cost relatively more than larger orders. Thus, if the company really wanted to know how much it would cost to purchase all its printing requirements, it should have asked for bids on all its requirements and not on printing 100,000 folded leaflets. Further, many of the savings which the company claimed for its own print shop — such as large-scale purchase of raw materials — would also become available to an outside printer, once he was assured of all the Shipton company's business.

The Shipton Manufacturing Company case illustrates once again that any figure bearing the label "cost" is not necessarily the correct figure to use as the basis of a make or buy decision and further that different cost figures must be used for different purposes. The cost of printing the folded pamphlet, as it was computed by the company, may have been correct if the problem was whether to make or buy that pamphlet, but it did not measure costs in the proper area to be used as the basis of deciding whether or not to rebuild the printing plant. Here, too, the warning must again be repeated that we have been commenting only upon the cost aspects of the case. Many other complicating factors, such as the desirability of purchasing all printing from one supplier, properly are not included in a cost calculation.

The Shipton Manufacturing Company actually did rebuild the plant, principally on the basis of the cost arguments. Nevertheless, in circumstances essentially similar, the Creely Company came to the opposite conclusion. Its problem was as follows.

CREELY COMPANY

Abandonment of Company-Owned Printing Plant

For several years the Kirn Corporation, commercial printers, had been trying to persuade the Creely Company to abandon its company-owned printing plant. When a new president was installed by the Creely Company early in 1939, the proposal to abandon the company's printing plant was again being considered.

The Creely Company manufactured a single food product that was sold throughout the United States

and in many foreign countries. The product, packed in tin cans which bore paper labels, was carried in almost every grocery store in the United States. Distribution was effected by the company's own salesmen, who also made collections.

For more than 50 years the company had been doing its own printing. Of the output of the printing department in 1938, 35% consisted of labels, 40% of books and pamphlets that were given to customers, and 25% of advertising cards, handbills, and display material.

For a period of eight or ten years the volume of printing required by the Creely Company had been diminishing, so that in 1938 it was about 80% of the peak reached in 1930. The main cause of the decline was a reduction in the number of books and pamphlets given to customers. During these years the company had placed more emphasis on other advertising media, such as the radio. No substantial further decline in the volume of its printed advertising material, however, was expected.

In the calendar year 1938 the operating costs of the printing plant of the Creely Company had amounted to approximately \$110,000. A detailed analysis of this figure was not available, but it was estimated that 33% was for labor, 40% for material, and 27% for overhead. One-half the overhead was for administration, one-quarter for fixed factory expense, and one-quarter for current factory expense.

Mr. E. P. Kim of the Kim Corporation was quite familiar with Creely's printing requirements. On the basis of figures which he submitted, it was estimated that the same volume of printed material would cost only \$75,000 to \$80,000, if purchased. Mr. Kim insisted that any comparison of the cost of individual items printed by the Creely Company with prices quoted by the Kim Corporation was of doubtful value because of the poor cost accounting system in use in the company-owned printing plant. It was his opinion that the cost of printing labels, for instance, was unduly low and that other items were bearing part of the real cost of printing labels. The Creely Company had followed the practice of setting up arbitrary costs for the various printed products which were then "sold" to the operating department at those prices. To illustrate his point that comparing these costs with Kim quotations item by item was useless, Mr. Kim showed the following comparison of costs of two books essentially similar:

| <i>Volume per Annum</i> | <i>Creely Cost *</i> (per thousand) | <i>Kim Quotations</i> (per thousand) |
|-------------------------|--|---|
| 287,000 | \$28.60 | \$22.40 |
| 112,017 | 17.00 | 21.50 |

* Arbitrary transfer price as explained in text.

As Mr. Kim pointed out, both these books contained approximately the same number of pages, the same type of material, and the same number of illustrations. The Kim price, he said, reflected their similarity whereas the Creely figures apparently had no relation to actual costs but had been arbitrarily set at different times.

Mr. Kim also claimed that the quality of the product turned out by his organization would be higher than that of the Creely printing plant. The Kim Corporation maintained an art staff which would be at the disposal of the Creely Company at no additional cost; it also had three-color presses that could produce both the labels and the books quicker and better than the single-color presses being used by the Creely Company.

The purchasing officer of the Creely Company was of the opinion that the higher quality was not of primary importance. He believed that the company would pay no more for the quality offered by the Kim Corporation than for a slightly inferior quality, and he used the lacquer finish upon the labels to illustrate his point. The label printed by the Kim Corporation seemed to have a higher luster than the one produced in the Creely print shop. In his opinion the higher luster was desirable and, in a sense, constituted higher quality. Yet the finishing material used by Kim Corporation cost less than that used by the Creely Company. The purchasing officer contended, therefore, that the higher quality was not a deciding factor, inasmuch as it cost no more than a poorer quality would, and the degree of improvement was not great. The size of the Kim Corporation, however, and the many kinds of work it was equipped to do did enable it to do certain jobs a little better and, at the same time, a little cheaper than the Creely print shop. Nevertheless, in every instance, the improvement in quality was not great and any reduction in cost which a lower quality would make possible was negligible.

One of the objections to purchasing outside was that the Kim plant was in a city about 60 miles away from the Creely Company's plant. In the past, if labels had not been accurately cut, they were returned to the printing plant where the error was corrected in a short time with no additional charge. This procedure would be more difficult with a printing plant 60 miles away. Mr. Kim answered this objection by saying that the work of his plant was of such high quality that very seldom would there be need for adjustments in the future. The Kim Corporation was the largest commercial printing company in the industrial area where it was located, and would guarantee to keep the Creely Company supplied with its requirements.

Mr. Kim expressed the opinion that the proximity of the Creely printing plant had in the past occasionally led to poor work because mistakes could be easily corrected. In addition, he pointed out that, even though no charge was made for the corrections, they involved a cost to the Creely Company as a whole.

As an added inducement for the Creely Company to have its printing work done by the Kim Corporation, the latter agreed to purchase for \$18,000 the Creely printing equipment which was carried on the company's books at \$25,000. Appraisers who had been engaged by the Kim Corporation to value the Creely printing equipment also reported that, if the Creely shop was not abandoned, an additional investment of

approximately \$40,000 would be needed within the next two years to keep the plant in operating condition. Since most of the equipment in the print shop was 20 or more years old, the Creely executives agreed that the appraisers' report was probably correct. Mr. Kirn made use of this fact in an additional argument for abandoning the plant as follows: "Why should the Creely Company make such an investment when we have already done so?" Furthermore, because it specialized in printing, the Kirn Corporation could afford better equipment than any print shop operating at an annual volume of about \$100,000. For instance, the three-color press, on which the labels would be run, cost over \$18,000 and could print a year's supply of labels for the Creely Company in eight weeks. Obviously, the Creely Company could not afford such specialized equipment.

There would be other expenses involved in abandoning the printing plant equipment. Inventory losses on inks, paper, and supplies would amount to about \$5,000. The building in which the print shop was located had been built only ten years before at a cost of \$100,000. It could, of course, be adapted to other uses, but, inasmuch as the company already had unused space available within its manufacturing plant, there seemed to be little possibility that the space in the print-shop building would be needed for five years at least. Since the building was heated by waste steam, there would be few costs involved in maintaining the idle building except depreciation, taxes, and insurance. The purchasing officer estimated that these would not exceed \$10,000 a year; of this amount \$2,000 would be for depreciation.

Frequently within the past seven years the Creely Company had had some of its printing done by the Kirn Corporation. Usually this had been work that was urgently needed when the presses of the Creely Company were busy on other jobs and could not be released, or was of a highly specialized nature such as special advertising displays. Once, for instance, the company's advertising agent decided that about 7,000,000 small pamphlets should be used within a short period of time. Speed was essential because the advertising scheme was to be used in connection with an important holiday. The Creely printing equipment was producing other material at the time and was not available. Moreover, the equipment was not sufficiently high speed to produce all the material within the specified time. This printing was, therefore, secured from the Kirn Corporation. As long as the Creely plant printed the company's advertising material, it would be unable to avoid such peaks, and some of its printing would have to be done by commercial printers. Even under such pressing circumstances, the Kirn Corporation had proved to be satisfactory as a source of supply with respect to the mechanical quality of its work, its artistic design, and delivery.

According to the proposed plan, the Creely Company, in return for the purchase of its printing equipment, was to agree to give the Kirn Corporation all its printing of labels, books, and advertising material for a period of two years. Even during this period, how-

ever, the proposed contract allowed the Creely Company to accept other offers if "prices, quality, and delivery were substantially better." In effect, then, there were no legal ties which bound the Creely Company to the Kirn Corporation; practically, there was little more than the intent of the Creely Company to deal fairly with its suppliers.

The Creely Company employed five men in its printing plant. The company had always enjoyed extremely satisfactory labor relations, and was reluctant to dismiss these men, each of whom had been in the employ of the company for more than five years. The executives of the Creely Company asked the Kirn Corporation to take these men into its organization. Mr. Kirn, however, stated that he could not place any of them, with the possible exception of the manager of the plant, since the Kirn plant was located in a city where there were several printing establishments and the skill of printers was much higher than that of men employed at the Creely printing plant. Even the manager would not find work in the Kirn plant similar to that which he had been doing.

The Creely Company case illustrates the type of cost calculation that should have been made by the Shipton Manufacturing Company. The basic facts are fundamentally very much like the Shipton case, and yet the tone of the management's thinking is entirely different. Where, in the Shipton case, the costs for an individual job were used as a basis of comparing the cost of making with the cost of buying, in the Creely Company the same information was used to illustrate the peculiarity of the company's costing system. In the Creely Company, for instance, the costs of printing the second item as shown in the table in the case was \$1,904 ($112 \times \17.00), whereas the purchase price for the same amount would have been \$2,408 ($112 \times \21.50), or more than 25% higher. The reasoning of the Shipton company applied to this fact would have justified continuation of the printing plant.

The management of the Creely Company, however, proceeded on the theory that the proper unit for cost comparison was not an individual printing job, such as an issue of a book or a label, but the company's whole printing requirements. On this basis the commercial printer was able to quote lower prices, because he had some assurance of a satisfactory volume to absorb part of his overhead expenses. It is a well-known fact (and one recognized by the Shipton company) that the overhead of commercial printers is large because

many kinds of equipment must be available if the printer is to be able to serve all customers or the varied needs of any one customer; yet, much of this equipment is idle a large portion of the time because, at any given time, customers do not want all the types of work a well-equipped print shop can produce. The amount of money invested by printers in equipment which is frequently idle is also increased by reason of the fact that, among certain types of printing equipment, the smallest efficient unit has a productive capacity in excess of available work. This was true, for instance, of the three-color press on which the Kirn company proposed to run the Creely labels. As the case states, the Kirn Corporation was the largest commercial printer in its industrial area; in order to be in a position to maintain its leadership and be prepared to do any kind of work, the Kirn company felt it should have a three-color press. No other competitive printer had this type of equipment, but even so the volume of work in the area had never kept the one three-color press running full time.

As a result of the high overhead in the printing industry, the pricing system of most printers provides for a "loading" factor to take care of the cost of carrying idle equipment. A printer, therefore, who is assured of a large volume of work for some of this equipment is in a position to pass on to the customer some of the benefits derived from the reduction of idle time, by reducing or eliminating the loading.

The Creely case brings out that, from a cost aspect, the unit of the cost study is important. In the Shipton case the unit of one printing job was not correct for the purpose because it overlooked the possibility of lower purchase prices if the unit was changed. The unit of the entire printing procurement problem, used by the Creely Company, more nearly approached the area within which costs had to be studied. In one respect, however, even that unit was not large enough to encompass all the cost changes which might result from a decision to buy. Specifically, for example, the effect of abandoning the printing plant on the company's labor relations was given consideration. It is conceivable, for instance, that dismissing five printers could have, under certain circumstances,

precipitated a strike in the company's main plant, and thereby brought losses far in excess of possible savings from any decision about the printing. As was pointed out in the previous chapter, however, wherever possible, we are using cost in the narrow sense of expenses directly connected with procurement by making and by buying. In this sense, therefore, any additional costs arising out of general labor difficulties precipitated by the make or buy decisions become further considerations to be taken into account when interpreting the cost figures.

Summary

By way of summary, Chapters II and III indicate that five points should be noted when calculating cost figures to be used as the basis for make or buy decisions. They are:

1. *Other things should be equal:* When two cost figures purport to represent the cost of making and the cost of buying, respectively, the differences between them should represent the advantage of one course of action over the other, so far as cost is concerned. This is actually true, however, only if other things (other than the fact that one figure represents making and the other buying) are not allowed to affect the cost figures. This has already been illustrated by the case of the precision instrument manufacturer¹ who made for 8¢ a part to be used in place of one which had been previously purchased for 1¢. The 8¢ and the 1¢ figures were not comparable, however, because quality was not equal. The difference between them, therefore, did not represent the difference between a make and a buy decision.

Frequently the effect of "other things" on the cost figures cannot be reduced to mathematical terms. In the preceding example, for instance, the company would never have considered making the same quality that it had been buying. The actual comparison, therefore, had to be made between the purchase of one quality for 1¢ and the manufacture of a better quality for 8¢. This is, of course, not an ideal situation because "other things" are not equal and there is no way of making them equal. The situation, furthermore, is

¹ Corewell Company, pp. 8-9.

not unusual inasmuch as other things will rarely be completely equal in any make or buy problems. Decisions must be made in such cases, therefore, by using the available cost figures and interpreting them in the light of known differences. It will be found that quality and quantity will be the most frequent "other things" to change. More detailed attention will be given these topics in succeeding chapters, partly with a view to showing the proper interpretation of cost figures when quality and quantity considerations do not remain equal.

2. *The costs should cover the proper area:* In addition to the first point, that costs should not be affected by other things than those which they purport to measure, it is necessary that the costs be complete and not leave out anything that should be included. The "proper area," therefore, refers to the full breadth of activities within a business that are directly¹ affected by the proposed actions. The Shipton case illustrated how one company used cost figures which covered too small an area in making a make or buy decision while the Creely case showed how an essentially similar problem was solved with cost figures covering a broader part of the company's business. In some cases — like the individual items in the Floss Company, for instance — the area might properly be just one run of a small part, while in others it may be the entire business.

3. *The costs should cover the proper time period:* Just as a make or buy decision affects wide areas of a business, so, too, its effects continue for a long time. Once again, the limits cannot be defined by an all-inclusive formula and actual cost figures for a logically selected time period must be consciously adjusted by management. An illustration of the effect of the time period on the type of cost may be found in the Floss Company, where the longest time period for the make or buy action to be in effect was under 900 labor hours. No permanent changes were expected to last beyond that time, and the production time was a satisfactory period. It should be noted, however, that the cost calculations made by the

¹ "Directly" is included because of the narrow interpretation of costs; those indirectly affected come under the heading of factors which are used in interpreting the cost figures.

company would be entirely inadequate if the problem it was facing consisted in whether to expand its productive facilities rather than to make or buy a steel stud or bushing.

4. *The costs should be calculated by the proper method:* It is a truth sometimes overlooked, that the same business situation can be accurately described by different cost figures. There is no one cost figure that is correct for all purposes: one cost might be used as the basis of pricing, while another might properly be used in a make or buy decision. The cost figure that is best suited to help management appraise two alternative courses of possible action by accurately representing the facts should be adopted. For reasons explained in the text, the method described as a localized budget is recommended for most make or buy problems. Occasionally, however, especially where the time period is short, the increment cost method may be safely used. In almost every instance, unit costs are to be avoided.

Review of the discussion of the merits of the various methods available will show that the use of total cost (i.e., including every item of cost) is not always necessary. Those costs which will remain fixed whether a company makes or buys may be ignored when figuring the cost of making and the cost of buying. As a matter of fact, it is essential that fixed costs either be ignored in figuring the cost of both making and buying or be included in both costs. Extreme care must also be exercised in determining which costs are in reality fixed, with especial consideration being given to the time during which they will remain fixed.

5. *The assumptions behind cost figures should be understood:* It has been pointed out that every figure intended to represent the cost of doing something in the future is based upon a series of assumptions. Some of these have wide implications and the proper interpretation of cost figures demands that those assumptions be known and their soundness verified.

In addition to the factors noted in these two chapters on cost there is one aspect of the cost problem which should not be overlooked. The aims and ideals of specific business organizations vary widely: some may seek short-run profits,

others long-run; some may seek primarily profits, while others place greater emphasis on public service; some may even seek illegal ends. Depending upon the aims of each business, therefore, similar cost figures may have different meanings. It is, of course, impossible to deal with this problem here, and we must assume that the businessman knows what he wants and acts with his aims in view. We are in no position to examine or question his aims.

Chapters II and III have been devoted to (1) a discussion of the meaning of cost, as it refers to make or buy problems, and (2) an attempt to devise the best means of obtaining cost figures to be used by executives faced with make or buy

problems. Since the narrow definition of cost was used, the discussion led only to specific recommendations about *how* to figure costs in the narrow sense, and not *which* alternative action would lead to doing the procurement function "at as low a cost as possible," (i.e., cost in the broad sense). The broader question can only be answered in the light of the whole problem, and therefore should properly be deferred until after consideration of the other objectives of industrial procurement, quality and quantity. Quality and quantity will be taken up in the next two chapters, and then we shall return to an appraisal of the whole picture to find out which course of action will give the lowest cost — in the broad sense.

CHAPTER IV

QUALITY

Quality as One of the "Other Things"

The discussion of costs brought out that other things must be approximately equal if a cost differential is to be accepted as representative of the difference between making and buying. One of the basic "other things" assumed to be equal is quality. Yet, in most make or buy problems, quality is *not* equal in each of the proposed actions. Consequently, the correct solution of a make or buy problem consists in more than merely finding out whether the cost of making an article exceeds the cost of buying it. For one thing, it is necessary also to discover whether the article made would be equal in quality with the one bought, and if not, what the effects of the differences in quality are on the business. We must, therefore, explore two aspects of the effects of quality on make or buy problems. We must (1) discover the methods of determining whether or not quality is equal, and (2) determine the correct analytical procedure to follow in solving a make or buy problem when quality is not equal.

When Is Quality Equal

With respect to the first part of our task, we may accept the basic principle of purchasing that the businessman should know exactly what quality is needed for his specific requirements and then describe that quality accurately so that the suppliers — be they outside companies or the company itself — will be able to know what is wanted and so that the company itself may check the goods received against some known standard and thereby assure itself that its needs are being satisfactorily fulfilled. The determination of whether or not quality is equal is, therefore, not peculiar to make or buy problems. The fact — i.e., whether or not quality is equal — is discovered in a make or buy situation by following the same procedure followed in all procurement activity.

If, when the desired quality¹ is determined on this basis, it is found that the quality of the thing to be bought is identical with that to be made, the quality factor ceases to have any net effect on a decision to make or to buy. The solution then must rest upon other factors, such as cost or quantity.

If, on the other hand, it is found that the quality of the thing to be bought and of the thing to be made are not equal, some weight must be given in the final decision to that fact. This is the second aspect of quality and make or buy, as outlined above, and becomes the burden of this chapter: how can variation in quality between the purchased and the manufactured article be appraised as an argument for or against making or buying?

Quality as a Reason for Making

Arguments for making based on quality range all the way from being so conclusive as to dictate the decision, to cases where the variation in quality is so slight as to be almost immaterial and of importance only as one in a list of arguments no one of which is very decisive.

Quality cannot be purchased

Probably the most compelling argument based upon quality that can be brought forth in favor

¹"Desired quality" is a term adapted from H. T. Lewis (see his *Industrial Purchasing Principles and Practice* [Chicago: Business Publications, Inc., 1940], Chap. V) and implies more than unreasoned "desire" for a certain quality — the way, for example, many people can be said to desire an expensive automobile. The term presupposes that reasoned thought has been given to the subject and that the desired quality is desired because it is best suited to the specific purpose for which it is to be used. If this is not true, the problem is not one of make or buy, but of general procurement, because make or buy is concerned with *how* to attain the objectives of procurement, not with the objectives themselves.

It should be further noted that "desired quality" must also allow some range of acceptable goods if the present discussion is to be of any significance. For, if the desired quality was so precise as to allow no variation whatsoever, the quality of any acceptable articles would be identical and any article whose quality varied even slightly would not be acceptable.

of making rather than buying is that the desired quality cannot be purchased. The *N.A.P.A. Handbook* says, "This . . . is a very rare situation"¹ and the cases analyzed for this thesis show that as a current argument it is rare. It is, however, brought up historically. Frequently businessmen defend their company for making something which apparently should be bought by saying, "When we first started to use the article, it was something new and couldn't be bought anywhere." This can be illustrated by the experience of several companies in the metal working industry, with respect to dies. Most of the older manufacturers of screws, bolts, carpenter tools, precision instruments, etc., at one time or other made the dies they used. As industry progressed, there came into being specialized companies which equipped themselves to make these dies in large quantities. As a result of their production methods, these die-making companies in many instances were able to make the dies cheaper than the companies which used them and many of the latter changed to buying them.

The die companies were helped in their development by the move toward standardization of industrial parts, inasmuch as, after standards for a product have been accepted, the dies for making the product can be standardized, thereby giving sufficient volume in one kind of die to enable a specialist to make it cheaper. Reduction of costs has not been the only contribution of the die makers; they have done extensive research and not infrequently have improved both the design and the material from which the dies are made.

The relationship of make or buy to standardization can be seen from the experience of the Vineta Company,² a large tool manufacturer. This company used in its tools many metal taps and studs, and for some time it had made its own in its screw machinery department. The type of taps and studs used by the Vineta Company was slightly different from that used by other similar companies and for a period of 10 years attempts were made by the industry and by the government to standardize the parts. Several times a so-called

standard was established, but the company's executives never believed that the authority behind the standard was strong enough to enforce the standard except in name only. Consequently, the company continued to make its own taps and studs according to its own design. Finally, the government and a powerful group of manufacturers established a real standard which was almost universally adopted. The increased volume resulting from its adoption enabled independent screw manufacturers to make the parts efficiently, and the Vineta Company stopped making and began to buy them.

Armour and Company is likewise said to have begun the manufacture of refrigerator railroad cars because they could not be bought. The Ford Motor Company, too, it is claimed, was forced to make many of its parts in the early days of its existence because the methods of production followed in other factories did not produce parts accurate enough to be interchangeable on high-speed assembly lines. While many examples can be brought forth to illustrate the necessity of making in order to obtain a desired quality at some time in the past, the number of instances discovered in 1940 where the desired quality really could not be bought are relatively few.

Of more importance now, however, than general examples is a specific situation where a company was faced with the problem of attaining satisfactory quality and was unable to locate a supplier able to furnish it. The management of the Carrigan Manufacturing Company had such a problem.

CARRIGAN MANUFACTURING COMPANY

Manufacture of an Operating Supply to Insure Quality

The Carrigan Manufacturing Company of Chicago manufactured a wide line of metal products. Approximately 10% of the company's sales were composed of products that required the use of buffing compounds for finishing. In 1925, as a result of the finishing department's dissatisfaction with the quality of compound then being purchased, the company's purchasing officer suggested that production facilities be set up so that the company might manufacture its own requirements of this operating supply. The buffing compound department was supervised by the purchasing officer, who later made sales of this product directly to other brass manufacturers.

Buffing compounds were used extensively in the finishing of metal products, particularly those made

¹ *N.A.P.A. Handbook*, Vol. I, p. 199.

² Fictitious name; this company's experience was not written up in case form.

of brass. The first finishing operation on brass castings, for instance, was to dress them roughly on an emery wheel in order to remove metal projections caused by imperfections in the joints of the mold. After this preliminary operation, the exterior of the casting was as rough as the sand mold in which it was cast. In order to smooth the casting preparatory to polishing or electroplating, buffing was necessary. This process consisted of holding the casting against a rapidly turning wheel of cloth or felt, which was made abrasive by frequent applications of buffing compound to its surface. Buffing compounds were distributed in the form of cakes or sticks of about the consistency of hard soap and were applied to the buffing wheel by holding them against its revolving surface.

In the Carrigan Manufacturing Company's organization the purchasing officer reported to the controller, who had equal authority with the sales manager and the production manager. The purchasing officer, in addition to doing some buying himself and directing the activities of three buyers, controlled raw material inventories and supervised the company's box-making plant.

The Carrigan Manufacturing Company, which annually expended approximately \$20,000 for buffing compounds, was considered a large user of this product.¹ For several years, however, the finishing department had complained about the quality of buffing compound being purchased. Dissatisfaction was based on (a) lack of uniformity in the buffing compound which resulted in scratches during the process of finishing, the elimination of which required additional buffing, and (b) improper seasoning, which caused an excessive consumption of compound when the latter was too moist and excessive heat and dragging of the metal when too dry. Although buffing compounds represented but a small part of the company's annual purchases, which generally amounted to several million dollars, the purchasing officer was considerably concerned because his department had been unable to obtain a compound satisfactory to the finishing department. Furthermore, although the actual expenditure for buffing compounds constituted but a small part of the total manufacturing cost, the quality of the compound selected did have a substantial effect on the length of time required for finishing and therefore indirectly contributed to the cost of performing this operation.

The purchasing department had informed suppliers about these complaints and had tried products from various sources in an effort to obtain a compound suitable to the requirements of the finishing department. Although complaints had largely been reduced to those concerning improper seasoning, the purchasing officer

believed that a more satisfactory product could be developed than any that was being offered on the market.

At the purchasing officer's suggestion the laboratory of the Carrigan Manufacturing Company experimented with buffing compounds and successfully developed a formula that met the company's requirements. The laboratory's research work and trial production in small quantities indicated that the manufacturing process consisted simply of mixing the ingredients and storing them for a period of three months. It was apparent that the manufacturing cost would be small in relation to the raw material cost. The additional facilities needed by the company for producing its own compounds would necessitate so small an expenditure as to be negligible. Moreover, the process of manufacture required no technical skill.

Having determined that the nature of the manufacturing process was such that the company could easily produce its own compounds, the purchasing officer proceeded to investigate other aspects of the question. He learned that the direct expense incident to the company's manufacture of its own requirements would total about \$7 per 100 pounds. Although there was no standardized price for buffing compounds, \$8 per 100 pounds was approximately what the company would reasonably expect to pay for the compound if it continued to buy from outside concerns. In addition to the saving, the manufacture of its own requirements would give the company complete control over quality.

There was an alternative method by which satisfactory quality could be obtained, however. The Carrigan Manufacturing Company might make arrangements with some supplier whereby the latter would (a) produce the compound in accordance with the Carrigan formula and (b) deliver the unseasoned product to the company's plant where aging would be under the company's control. Past experience had convinced the purchasing officer that suppliers could not be depended upon to carry sufficient inventory to insure proper seasoning.

Since the laboratory's experiment with buffing compounds indicated that the company's requirements of this product could be manufactured in a satisfactory quality and at a cost under the purchase price, the Carrigan Manufacturing Company set up a compound department within its plant and placed the purchasing officer in charge.

In this instance, the purchasing officer of the Carrigan company "had tried products from various sources" but was unable to obtain a satisfactory quality. He was convinced, therefore, that satisfactory quality was unavailable from outside sources. On these grounds experiments were conducted and the company itself developed an acceptable compound. In this case, however, as in every one which has been discovered in preparing the material for this study, this fact alone was not

¹There are 32 concerns in this industry (Buffing and Polishing Composition Industry), with a total volume of business of \$1,000,000 in 1932, which was only 27% of production capacity (\$3,500,000) and 63% less than the 1929 sales volume (\$2,600,000)." N.R.A. Administrator's letter recommending President's approval of the Code of Fair Competition for the Buffing and Polishing Composition Industry, November 2, 1933.

sufficient to induce the company to make one quality rather than to continue to buy an inferior quality. Costs were considered. It was discovered that direct expense would amount to \$7; and overhead to \$1.05 per hundred pounds.¹ This compared with a purchase price which averaged about \$8 per hundred pounds. Thus, the company was convinced that, in addition to obtaining the quality it had long sought, it would be incurring no substantial extra costs for the compound itself. The argument may be restated, therefore, as follows: "Since the cost to manufacture the compound was not excessive, the company decided to make rather than to buy the compound in order to obtain a quality which could not be purchased."

Let us, however, examine the situation further to see if the decision was wise. The case states that there were two other possible ways of obtaining the quality compound developed by the Carrigan laboratory. One was to have the compound made by outside suppliers according to specifications; the other was to have the compound made by outside suppliers but delivered unseasoned and for the Carrigan company to age it. The first was rejected because the suppliers were not sufficiently trustworthy to maintain sufficient inventory for proper aging. The second was rejected apparently because the aging was the most important part of the Carrigan formula, and, if that was done, the little extra work of mixing and grinding might just as well be done also, thereby assuring complete control of quality. It would appear, therefore, that no existing source of supply was conducted by reliable businessmen of the type from whom the Carrigan Manufacturing Company would purchase other supplies.

If it is assumed that the purchasing officer's search for available suppliers was complete and that actually none was in existence, does this make it imperative for the company to make its own buffing compound, especially if cost is not too far out of line? It does not, for the reason that a decision to make, based upon such evidence, would

¹ Author's note: Though it was not reported in the text of the Carrigan Manufacturing Company case, overhead throughout the plant was charged at the rate of 140% of direct labor. This would amount to \$1.05 per hundred pounds.

ignore the possibility that at some future date a satisfactory supplier might come into existence, and thus such a decision would neglect the time element by failing to determine the exact period during which the current circumstances will remain unchanged. If the need for better quality compound is as great as the Carrigan company case indicates, someone should arise to fill the need within a short time. Presumably a company making a better compound than those currently available could demand a premium price for a product which would eliminate loss caused by excess grinding time when inferior compounds are used. This should be an inducement for reliable businessmen to enter the business. And again, if the Carrigan company engineers could develop a satisfactory compound with such little effort, it appears likely that someone else could also produce a compound of good quality. Furthermore, other companies using compounds were in all probability facing problems similar to the one described in the Carrigan case; they, too, would add to the potential market for a good quality compound.

Two generalizations flow from the experience of the Carrigan Manufacturing Company:

1. Current circumstances will change some time or other. Either outside suppliers will come into existence who will be able to supply the desired quality, or the company's need for the specific quality may change. In the Carrigan company, for instance, a carborundum or some other synthetic abrasive might be developed as a substitute for the buffing compound.

2. It is imperative that the length of time during which current conditions will remain unchanged should be determined as accurately as possible, inasmuch as a change in the desired quality will change all the calculations upon which a decision was made.²

The following letter received from the purchasing officer of the Carrigan company with reference to its problem of obtaining buffing compounds illustrates the fact that conditions do not remain unchanged. The letter is dated 10 years after the original problem arose.

² For another illustration of this point, see the case of the Renick Appliance Company, Appendix, page 117.

Carrigan Manufacturing Company
March 14, 1935

Mr. _____
Research Staff
Harvard University
Soldiers Field
Boston, Mass.
Dear Sir:

Your letter of March 11 addressed to Mr. _____ has been passed to me for attention. Some time ago it was a fact that it was almost impossible to obtain a satisfactory buffing compound from the producers of this material. This condition, however, has changed in the last few years and we have no trouble at all now in obtaining materials that are satisfactory both as to the type and also as to their being kept uniform. We, at one time, made our own buffing compound but found that while we were able to make a very uniform product it was costing us much more money than we could purchase the same type of product elsewhere; then too, the thought in our mind being that while we made the best _____* that we knew how to make probably we were not as efficient in manufacturing buffing compound as a manufacturer who gave his whole time to this and who figured to make the best buffing compound that he knew how to make. If there is any further information you may desire we will be only too pleased to give it to you.

Yours very truly,
The Carrigan Manufacturing Company

Purchasing Department

* The company's product.

One factor in the Carrigan company situation which lessens the serious effects of starting to make compounds and then abandoning the venture is found in the following statement, taken from the case: "The additional facilities needed by the company for producing its compounds would necessitate so small an expenditure as to be negligible." With respect to equipment costs, therefore, the actual cost of getting into and getting out of the manufacture of buffing compounds was in all probability small enough to justify the company's procedure.

The argument that making is necessary because of the impossibility of buying the desired quality has been illustrated in a general way by the experience of Armour and Company, the Ford Motor Company, and companies in the machine tool industry, such as the Vineta Company, which used screws and taps; more specifically and in detail, it was presented in the case of the Carrigan Manufacturing Company. All of these il-

lustrations lead to the following generalizations:

1. Before the argument can be the compelling force leading to the adoption of a make program, the company must be sure that the desired quality cannot be purchased. For, if the desired quality can be purchased, even at higher prices or with poor delivery schedules, these other factors enter the picture and no longer can the claim be truthfully advanced that "it was *impossible* to purchase the desired quality."

2. Even though the desired quality cannot be purchased, it does not necessarily follow that making is the only solution. First of all, the desired quality itself should be reviewed to see if it is really required, or whether perhaps a satisfactory substitute is available. While this, strictly speaking, is not a make or buy problem, it is a by-product of the consideration of make or buy. The desired quality, however, must be established on the basis of accepted procurement principles apart from the make or buy problem. Secondly, if the concept of the quality desired is not changed by such a review, there may still be another alternative to making. As has been stated, conditions change. The company must, therefore, balance the cost of making against the cost of doing without the desired quality until conditions do change. In other words, the time element must be correctly considered. Furthermore, it is not necessary for the company to wait passively for conditions to change; it might well take active steps to make them change by aiding the development of an outside supplier. This, however, involves so many additional factors that it is taken up as a separate topic in a later chapter.¹

Finally, with a view to appraising the company's chance of being able to manufacture the desired quality, some thought might well be given to a consideration of why the desired quality cannot be bought. In the experience of Mr. Armour and Mr. Ford, for example, their concepts of desired quality were so advanced and so revolutionary that only an Armour or a Ford could conceive of them and dare to accomplish them. If such a pioneering venture is the cause of the dearth of outside suppliers, manufacturing prob-

¹ See Chapter VIII, page 83.

ably is completely justifiable. Caution, however, is advisable. The successes of the Fords and the Armours are glamorous. Yet, only the successes stand out; the failures are soon forgotten. If the desired quality is not available because no one else has succeeded in making, caution is again desirable because a company contemplating making may also fail. It would seem that, with the advanced state of technical development of modern business, any company which attempts to produce a quality which others cannot attain should carefully survey the possibilities of failure.¹

Closer control of quality by making

We have just seen circumstances where it was argued that making was necessary to attain the desired quality. In some instances it is claimed that making is desirable, even though not absolutely necessary, because it gives a company closer control of quality. The *N.A.P.A. Handbook* calls it "control of quality in the most intimate way," and further states that the situations in which this procedure is necessary are rare.² Fundamentally, the arguments are much the same as those already advanced. While superficially it may appear that they should apply with less rigor to the desire to control quality than to the necessity of making to obtain a desired quality, actually other considerations make the control of quality frequently more important. This will be illustrated by a brief quotation from the Van Dyke Radio Corporation case. In this situation the company made its own coils, not because quality could not be purchased, but because quality was of such importance that the company wanted to have it directly under control. But let the case speak for itself:

... In the case of coils the decision to manufacture was based largely on the advantages accruing from a close control over the quality of the part.

The coils were of major importance to the effective performance of a receiving set. The presence of an undesirable "hum" and the inability of the set to "stand up" in use were often traceable to a lack of synchronism in the coils and condensers. Correct turns

¹ This is not intended to apply to companies developing products within their own fields and through scientific research methods. It would be applicable, for example, to Mr. Armour's manufacture of refrigerator cars, except for the date of his venture, many years ago.

² *N.A.P.A. Handbook*, Vol. I, p. 199.

and spacing in the design of a coil were essential to high quality; the amount of labor and skill involved to insure quality was considerable. Furthermore, major changes in the design of the set necessitated a re-designing of coils. The number of concerns engaged in the manufacture of coils was limited, thereby decreasing the assurance of supply during peak production periods.

Coil production involved many manufacturing problems. The wires had to be carefully selected; special equipment was necessary for the winding operation; a ready supply of girl workers was required and had to be trained; and careful inspection was imperative. Constant development in design and methods of economical manufacture necessitated continuous research. . . .³

It will be readily seen that there were several factors involved in the decision to make rather than buy coils. One was the assurance of supply during peak seasons. This is a quantity consideration, discussion of which appears in the following chapter. Another was the peculiar relationship of the quality of the coils to the quality of the finished product; in other words, if the Van Dyke company wanted to assume responsibility for the quality of its radios, it had to assume responsibility for the quality of its coils. In assuming this responsibility, the Van Dyke company's engineers engaged in extensive research and set up exacting specifications for coils so that they would fulfill accurately known requirements. Consequently, rigid inspection of outside goods would be absolutely essential to assure that the specifications were being followed. All these considerations, plus the fact that coils were made of wire and other materials commonly used in radio manufacture made it seem reasonable for the Van Dyke company to make its coils.

Nevertheless, some of the other radio manufacturers did not make their own coils, but bought them from independent coil manufacturers. Why? The arguments advanced in the Van Dyke case would seem to indicate that such radio manufacturers would not have so close a control over the quality of the coils as the Van Dyke company and that as a result the quality of their finished product would suffer. We have no evidence about the merit of such a claim but, to a large extent, the quality of the coils would be determined by the

³ For text of case, see the Appendix, page 122.

reliability of the coil manufacturers. If, for instance, coil manufacturers were as unreliable as the manufacturers of buffing compounds were alleged to be in 1925 (as described in the case of the Carrigan Manufacturing Company) the expense of testing and rejecting below-standard coils would be tremendous. If, on the other hand, coil manufacturers had developed to a point comparable to the position of the manufacturers of dies, they might well be better able to produce high-quality coils than a radio manufacturer. The advisability of making coils in order to control quality seems to depend, therefore, on the nature of the coil manufacturers: if they are reliable — so far as quality is concerned, which is what interests us now — only a radio manufacturer that was sufficiently large to carry on extensive research in coils and to have satisfactory quality-control mechanism could match the quality of purchased coils; if, on the other hand, coil manufacturers produced unreliable quality and carried on little research, almost any radio manufacturer could probably produce a more satisfactory quality coil in its own plant.

The experience of the Van Dyke Radio Corporation shows also the relationships between inspection and make or buy problems. If outside suppliers cannot be relied upon to deliver a product of the desired quality, minute inspection by the purchaser becomes necessary. Inspection, of course, costs money and is only worth while if it saves more than it costs. Thus, if closer control of quality by making reduces either the amount of inspection necessary or the cost of necessary inspection by combining it with production, making may be preferred to buying. Furthermore, duplication of inspection by outside suppliers could be avoided. Thus, if close tolerances are required and inspection is necessary to assure that the tolerances are being maintained, making rather than buying might lead to lower inspection costs by combining quality control with inspection.¹

¹Apart from the make or buy problem of selecting the source of supply from which the desired quality is to be obtained, there is here a quality-control problem. In other words, the quality of the article, whether it be made or bought, must be kept under control and within predetermined limits.

T. H. Brown, in a paper presented before the annual meet-

Two further arguments, based upon quality, were introduced in the Raleigh Simons case.² Briefly, the situation is as follows:

The Raleigh Simons Company, a large food producer "was faced with the problem of deciding whether to purchase 15,000 stainless-steel hooks from one of its sources of supply or to have the machine shop of its central plant fabricate these stampings." The hook was one of a special design developed by a member of the company's equipment developing department and was considered practical enough to be placed in use at all the plants. The master mechanic believed that the company should have the hooks made in its own shop.

Company's own organization is in better position to improve quality

The first new argument introduced in the case is that the company's own organization and personnel, by reason of its experience and familiarity with the needs of the company, was in a better position than an outside source of supply to improve on the quality specified. With respect to this point, the case states:

In this particular instance the master mechanic felt that if he was permitted to make the stampings, he might, while fabricating, work out a better type of hook and that, by being able to control production, he could make these improvements as they occurred to him. If the work was done outside, he would not be in a position to study the new item and thus his experience and knowledge would be of no benefit to the company.

A brief glance at the entire case would show that this was one of several arguments advanced by the master mechanic to try and persuade the purchasing officer to let him make the hooks. He was attempting to amass as many arguments as possible for his case, to overcome the advantage of the outside supplier who was apparently fav-

ing of the American Statistical Association in Chicago, December 26, 1940, pointed out some of the implications of production control (one part of which is quality control) with respect to rearmament. The paper, which may well serve to introduce the reader to the many problems of production control which are implied but not discussed in this thesis, is reproduced in the *Bulletin* of the Harvard Business School Alumni Association for February, 1941 (pp. 126-131), under the title "Business Approaches to Rearmament Production Control."

²For text of case, see Howard T. Lewis, *Problems in Industrial Purchasing* (2d ed., New York: McGraw-Hill Book Company, Inc., 1939), pp. 391-395.

ored purely on a cost basis. This brings out precisely the value of the argument. In itself it could never be a deciding argument; arrayed with others, or put upon a scale that is balanced without it, it might influence the decision.

From a theoretical point of view, however, this argument has some interesting implications. First of all, it raises the question of whether or not a supplier — be it an outside supplier or a department of the company itself — should be allowed to revise specifications. Obviously, if the specifications are carefully worked out in advance, changes should be made only after consultation between the supplier and the purchasing officer (and the department in charge of specifications, if it is distinct from the purchasing department) and through him with the using department. If the master mechanic is a person who “tinkers” with designs, his revisions might be undesirable either because they made the product less desirable or because they delayed delivery. Such unwelcome revisions may, because of personalities involved, become much harder to control when dealing with a company unit than with an outside supplier. Aside from this aspect of the argument, however, the master mechanic seemed to assume that outside suppliers could never submit helpful suggestions. It might be, for example, that the supplier’s familiarity with the stamping process may enable him to offer a suggestion which would be every bit as helpful as one coming from the master mechanic.

The second theoretical implication arising from the master mechanic’s argument has to do with the validity of the cost estimates. As soon as the master mechanic changed the design, all cost estimates would be rendered noncomparable with outside quotations, inasmuch as the hook made in the shop would not be the same as the one upon which outside suppliers were asked to figure.

Making preserves secrets

The second quality argument which the Raleigh Simons case introduces is that making gives a company the opportunity of maintaining as a secret the exact nature of the product or the process by which it is made, or both. This argument is peculiar in that it falls at either end of

the list in its importance: it can be, like the preceding argument, one that is of value only as one additional argument; or it might be the most important consideration in a decision to make. No one would suggest, for example, that a company whose success depended upon a product based on a secret formula should have the ingredients of the product mixed outside because it could be done cheaper. On the other hand, keeping the design of a metal hook secret is a rather difficult job once the hook is used in a large number of plants. The way in which the master mechanic of the Raleigh Simons Company used the argument is illustrated by the following quotation:

Protection of the design. — The master mechanic reasoned that by letting an outside source of supply furnish special items the company was throwing open to the industry any new ideas which it might have developed. By fabricating the hook in the shop, the style and the type were kept entirely within the Simons company, and any benefits that resulted from this new unit would benefit only the Simons product.

The arguments advanced by the master mechanic of the Raleigh Simons Company, in one respect, do not illustrate the full force which the same arguments might have in different circumstances. The master mechanic was trying, first of all, to reopen a question of policy with respect to make or buy, and, secondly, to argue a case which was probably indefensible with respect to the hook, inasmuch as the company’s variable costs were more than 20% above the lowest bid from an outside supplier. The argument that a company’s own organization is in a better position to improve upon design is probably only rarely of great importance. Yet, in some circumstances, the protection of design can be a major consideration. Where such is the case, however, the product would probably be one of the company’s main items, which only rarely would even be considered as something which might be bought.

Quality as a Reason for Buying

Quality cannot be made

One of the most convincing arguments for buying rather than making exists when making the desired quality is impossible for the company. The most common circumstances under which such conditions exist are when the article is either

patented or its production methods are the secret possession of another company. Some companies, for instance, might like to make their own carborundum because they are paying what is commonly believed to be a price considerably above the supplier's cost. They are unable to make it, however, because the article is patented and only the Carborundum Company may make it.

When such patent conditions exist and the desired quality is afforded by the patented article only, a company has no choice but to buy.¹ There is, however, the ever-present possibility that the company may be able to change its idea of desired quality and use a substitute. This, as has already been pointed out, is beyond the scope of make or buy which deals with the means of getting the quality which is really desired.

Specialists should be better able to produce desired quality

It will be recalled that the purchasing officer of the Carrigan Manufacturing Company in his comment about buying buffing compounds said that "while we made the best (the company's product) that we knew how to make, probably we were not as efficient in manufacturing buffing compound as a manufacturer who gave his whole time to this and who figured to make the best buffing compound that he knew how to make." This is stating

¹ It should be noted that the possibility of making articles, upon which someone else holds a patent, without infringement of that patent is in general limited to "bona fide experiment." Even though questions in this area should be answered only by a well trained lawyer, the following quotations from Corpus Juris sketch the general background of the law on patents in this respect.

"Broadly speaking, the infringement of a patent may consist of any one, two, or all three of the acts of making, using, or selling the patented invention without authority from the owner of the patent.

"Although unaccompanied by use or sale, the unauthorized making of a patented invention for sale, profit, or practical use constitutes infringement of the patent; but the making of a patented invention merely as a bona fide experiment and without any intent to sell it or use it for profit is not infringement. A purchaser of a patented machine has no right to use a portion thereof to complete the manufacture of another machine within the scope of the patent."

* * * *

"Thus it is an infringement to make for use, although the invention is not used, . . . or is not used by the maker, . . . or is used, or intended to be used, in some way other than that suggested by the patentee. Also it is an infringement to make for sale, although no sale is actually effected." 43 Corpus Juris, p. 294.

in specific terms the generalization frequently brought forth as an argument against making, viz., a specialist in making a product should be able to do a better job than a company producing the same product as a side line. The argument is closely related to the historical development of modern industry.² At the time just preceding the Industrial Revolution and for a long time prior thereto, such business firms as were in existence performed multiple functions ranging from banking to shipping; from having goods made under their direction to trading in foreign countries. Much production was also carried on in family groups which were almost literally nonspecialized. This economic system was known as Mercantile Capitalism.

With the advent of machine production, technical problems became so complicated that a firm found enough to occupy it in making one product without devoting any attention to other products, much less banking or transportation. Throughout the period of what Professor Gras calls Industrial Capitalism, firm specialization was the accepted order, i.e., a firm or a company specialized in the production of a single product, or even a single part of a product or one operation in the production of a finished product. For example, there were companies that did nothing but weaving; others that did nothing but spinning; etc., etc. The reason for this lay in the many technical and production problems that arose with the introduction of the new manufacturing methods.

With the solution of many of the technical problems, however, individual firms ceased to have an advantage from a manufacturing standpoint and competition for markets became so keen as to bring in the new system of Financial Capitalism. Under this scheme, the excessive competition among individual specialists was lessened by combining many functions in one company, supervised by a financial capitalist. Thus, industry again came to consist of firms doing many functions, just as they had under Mercantile Capitalism. There was, however, one important difference: the individual units or departments of

² For a complete historical analysis of business, see N. S. B. Gras, *Business and Capitalism, An Introduction to Business History* (New York: F. S. Crofts & Co., 1939).

a financial capitalistic company were still operating as specialists from a production point of view. The multiple function was one of management, not production. One of the earliest examples of a financial capitalistic company in the United States was the United States Steel Corporation which, as it does now, mined ore, transported it, made pig iron, made steel, fabricated steel structures, erected them, and in some instances financed various suppliers and customers. Thus, the United States Steel Corporation, as an economic unit, and as a group of men managing a business, performed many functions; yet, its mining unit did mining; its steel division made steel; and its bridge company erected bridges. There are, then, two aspects of specialization, management and production, which we must examine to see whether or not a specialist actually should (as claimed) be able to do a better job than a nonspecialist.

These two aspects of specialization make it necessary to examine thoroughly just what is meant when it is claimed that "a specialist should be better able to produce a given quality product than a company embarking on its production without experience and as a side line." Which kind of specialist is meant, a management specialist or a production specialist? And, conversely, which kind of nonspecialist is meant, management or production? Adding too many functions to one management organization will, at some stage, reduce the efficiency of management. In other words, there seems to be a maximum amount of diversification of tasks that can be efficiently coordinated into one management organization. This means that the typical unit in a financial capitalistic system cannot expand indefinitely by adding new functions, but is definitely limited in the diversification it can successfully achieve. The results of adding too many functions to management, however, only indirectly affect quality and are more properly considered in connection with the costs involved.¹

Our particular problem, here, is to find when a production specialist should be able to produce a better quality than a nonspecialist. Before this can be decided, a more precise definition of a pro-

¹ See Chapter VI, Cost in Relation to the Business as a Whole.

duction specialist will have to be agreed upon. In the textile industry, for instance, there are companies that do nothing but spinning. Yet, a company like the American Woolen Company does both spinning and weaving. Dare we call the weaving activities of the American Woolen Company nonspecialized? It hardly seems so. Our term must, therefore, be flexible, and from this example it seems to have some relation to optimum size. But, on the other hand, would we have called the Carrigan Manufacturing Company a specialist in the making of buffing compound? The answer, again, seems to be, "No." But what is the difference between its buffing compound department and the weaving department of American Woolen Company? It is not optimum size, from a production point of view, because the buffing compound department was able to make buffing compounds well. It must be, therefore, some characteristic of its importance to the company and its relation to the company's major problem. Weaving, for instance, is closely related to making wool cloth, its problems in many respects are common to various stages of wool production, and its value in the final product is fully as important as spinning. Making buffing compound, on the other hand, is not similar to making metal products, nor is its value, in any one metal concern, proportionate to the value of the metal products.

Thus, there seem to be two requirements for a specialist:

1. From the point of view of amount produced, the company must either: (a) be producing nothing else and therefore be, obviously, a specialist; or (b) be producing such an amount as can be produced in efficient lots, so that the production unit will not be far from optimum size.

2. (a) The value of the product produced must have an importance somewhat proportional to, or not too insignificant in relation to, the products of the other parts of the business. (b) If 2a is not true, the production problems should be very similar to those of the company's main interests.

The soundness of the argument that a specialist should be able to produce better quality, therefore, depends to a large extent upon the type of

specialist we are talking about. Consequently, the argument cannot be used as a blanket condemnation of any company making something which it had previously bought. The circumstances may be such that the company can become a production specialist of even better skill than the so-called specialists in the business at the time. The Shipton Manufacturing Company,¹ for instance, was not a specialist in printing when it first began to do its own printing; yet, in 1938 when the problem arose about replacing its destroyed shop, the company from the standpoint of quality, at least, was an expert; its plant was superior to that of any commercial printer in the competitive area, and company officials believed that its costs were far below what could be obtained outside. Since the argument that a specialist should be better able than a nonspecialist to produce satisfactory quality was raised against making as proof that the so-called nonspecialist would be unable to make a quality equal to that produced by a specialist, it is apparent that reference is to the production specialist and not the management specialist. Consequently, the validity of the argument depends upon whether or not the company embarking upon a make program can become a production specialist able to compete with the existing specialist.

From a technical point of view, it is probable that almost any company could attain the status of a production specialist in any field it chose, if costs were disregarded.² The costs involved fall into two classes: (1) the cost of production after the status of a production specialist has been attained; (2) the cost of attaining that status. The first group of costs we may assume have been correctly figured because businessmen carefully estimate the amount of labor, material, and other costs which should enter into a new product. Their effect upon a make or buy decision can be readily understood from the figures and has been discussed in the previous chapters. The second group, however, should be given further attention, because they are frequently overlooked. The ex-

perience of the Ulman Machine Company³ illustrates the point: the company had developed a new product that required accurate tools in its manufacture. The company had its own tool department where it had made the experimental tools. When regular production was contemplated, however, the company investigated the possibility of buying, rather than making, the tools. It could hardly have been claimed that the Ulman Manufacturing Company could not have become a production specialist: the work was similar to its regular work, the value of the work was substantial, and the company had successfully made the experimental tools. Yet the tools were purchased and the reason lies partially in the cost of becoming a specialist. In figuring material costs, the company had weighed the finished product, allowed for normal fabricating waste, and calculated the amount of raw material which should have been required for each tool. The calculations proved to be low, however, because of the large amount of spoilage. For this reason, when an outside supplier agreed to make the tools for the same price as the Ulman company's calculated cost, the company decided to buy. Ultimately the company should have been able to make its actual production costs equal its estimated costs, but meanwhile there were expenses involved in learning how to do it. The specialists already knew how.

All too frequently such costs are not recognized until after a decision has been made. Although it is not reported in either of the cases,⁴ the Willmarth Company admitted that for some time it encountered difficulty in producing staked-base radio tube bases of satisfactory quality. In that instance, the costs not only included the extra time and material in making the bases, but also the waste involved in later assembly caused by poor quality bases.

Outside suppliers' ability to improve on quality

In favor of making, the point has already been raised that a company's own organization, because

¹ For text of case, see page 25.

² These costs would include the cost of acquiring new personnel, managerial as well as technical and operating; new production facilities; and new capital, if any of these were necessary.

³ For text of case, see the Appendix, page 120.

⁴ Willmarth Company (A) and Willmarth Company (B); for the text of Willmarth Company (A), see Howard T. Lewis, *Problems in Industrial Purchasing* (2d ed., New York: McGraw-Hill Book Company, Inc., 1939), pp. 377-381; for the text of Willmarth Company (B), see the Appendix, page 125.

of its experience and knowledge of the quality required, should be in a better position than an outside supplier to improve upon the quality specified. Nevertheless, a similar advantage can also be claimed for an outside supplier. He, being a specialist in the manufacture of a given product, should be in a position to know much more about ways and means of accomplishing a desired end than the purchaser. To cite the Ulman Machine Company again, it was the experience of that company that the manufacturer from whom it bought the tools helped considerably in improving not only the design of the tools but especially the material from which they were made. In that instance, despite the fact that the Ulman tool department knew exactly what was to be done with the tools, the outside company, because of its wider experience, was able to suggest ways of developing the best tools for the purpose. In other words, the Ulman company's complete familiarity with its quality requirements was not nearly so helpful as the supplier's familiarity with the manufacture of tools.

Outside suppliers' research activities

Another point, closely akin to the ability to improve quality, is that, by buying, the purchaser participates in the benefits of the vendor's research activities. For example, it was not only the tool maker's experience, in the usual sense of the word, but his research experience that enabled him to make the helpful suggestions to the Ulman Machine Company.

Flexibility

One final advantage accrues to a company which buys rather than makes: in most instances, it retains a higher degree of flexibility by maintaining the ability to adapt itself more quickly to changes in the desired quality. It has flexibility not only in being able to change suppliers, but also in being able to change the type of product bought. This, furthermore, refers to the end product of the company as well as to the particular product being considered. The experience of the Bell Chemical Company¹ illustrates this lesson. In

1905 the company had built a plant for the manufacture of box shooks for the shipping cases used by the company in shipping its products to various parts of the country. During the 1920's, however, the chemical industry began to ship in bulk, and paper boxes were being substituted for wood boxes in many industries.² This affected the Bell Chemical Company in two ways: (1) Adoption of the bulk method of shipment by the Bell company was somewhat retarded because it had its shook factory. (2) The shook factory was not able to produce shooks at a price low enough to compete with the market prices, which were depressed by the overcapacity in the industry, resulting from the declining demand. So, for the box shooks which the company continued to use, there was always the problem of whether to buy outside or make them in its own plant at a higher cost. Inflexibility also arose from the unwillingness of the company to close down the shook factory and thereby lower its value as a going concern.

Being behind the times

Closely akin to the two advantages of receiving the benefits of a supplier's research activities and maintaining flexibility is another advantage for buying. Rather, it is a disadvantage which may be the unwelcome result of a company's deciding to make. It is "being behind the times," i.e., losing touch with current developments. Lack of flexibility consists in being behind the times and *knowing* it, but not being able to do anything about it because of previous commitments; being behind the times is just being behind the times but *not knowing* it. Consequently, there is no desire to remedy the situation. The costs of being behind the times may exceed any gain derived during the first years of a make program. These costs cannot be calculated exactly and entered in the accounts. They are, nonetheless, important. In fact, just because they cannot be accounted for directly is a good reason why management should consider them more thoroughly than those which can be called to its attention by accounting reports.

² Although the shook factory was originally built to assure a source of supply—a quantity argument—the problem in the 1920's was one of quality in the sense that the quality of shipping container needed had changed from wood to something else.

¹ For text of case, see Howard T. Lewis, op. cit., p. 382.

For exactly the same reason that these costs do not appear in the accounts, it is difficult to find specific illustrations from business experience. The situation in three companies, however, will indicate the seriousness of being behind the times. First, the experience of the Bell Chemical Company which was just recounted appears to have had an element of being behind the times in it, before lack of flexibility became the real difficulty. Secondly, the purchasing officer of the Creely Company¹ acknowledged in a personal interview that his company did not abandon its printing plant so early as it should have, thus indicating that the company had been behind the times for a few years, in not recognizing that commercial printers had developed to the point where they could furnish better printing service at lower costs than the Creely Company itself. Finally, the Cosgrave Paint Company² case brings up an illustration of the way in which the effect of being behind the times should be considered. This company was debating the advantages and disadvantages of maintaining its own can plant, and one of the objections to making cans was stated as follows:

One of the major can manufacturers reported that important developments in can-making technique might be expected within the next five years. Such developments, it was expected, would not only reduce the cost of cans but would also result in drastically changed can designs.

Summary

Without knowing the specific conditions under which a make or buy problem arises, it is impossible to place a value upon the arguments brought out in this chapter. Nevertheless, it is possible to indicate the way each argument is more likely to point. Although it is dangerous to say that a certain argument favors making or buying because almost every time a specific case can be cited as contradictory evidence, it is helpful. In general, the arguments based on quality seem to favor buying rather than making, if everything else is equal and quality is the determining factor. This con-

clusion was arrived at in the light of the following arguments:

1. The experience of a specializing supplier, in many instances, is just as conducive to producing the best possible quality (for the purpose) as a company's own organization. (The experience of the Ulman Machine Company vs. the argument raised by the master mechanic of the Raleigh Simons Company.)

2. The benefits of outside suppliers' research facilities become available to the purchaser. (The Ulman Machine Company.)

3. Buying maintains flexibility in changing suppliers, changing the product being bought, and also changing the final product. (The Bell Chemical Company.)

4. Buying avoids, or at least passes on to someone else, the production difficulties in attaining a given quality. (The Ulman Machine Company.)

5. Sometimes the desired quality has to be bought. (Patented or branded.)

6. Despite the fact that nonspecialists can become specialists, specializing outside suppliers have an advantage in having already attained the status of a specialist. This argument is closely akin to Number 4, above, but has slightly broader application.

One further argument raised in this chapter seems to point, in itself, in neither direction, but depends entirely upon the circumstances. This is the claim that a company should make, even though it is not absolutely necessary, in order to attain a more intimate control of quality. The discussion pointed out the circumstances in which that intimate control of quality might be desirable.

On the other side of the picture, there are three arguments that point towards making:

1. At times the desired quality cannot be purchased. It was noted, however, that current application of this argument is rather rare.

2. Under certain conditions the production methods must be kept secret.

3. Inspection sometimes may be less expensive if parts are made. (Van Dyke Radio Corporation.)

¹ For text of case, see page 27.

² For text of case, see the Appendix, page 107.

CHAPTER V

QUANTITY

Desired Quantity Changes with Conditions

We have seen that the principles of sound procurement require that the desired quality be accurately determined and accurately described. Barring substitutions that may occur as a company gains wider knowledge of available materials to fill its needs, the exact quality specified remains unchanged as the search is conducted for the proper source of supply, whether it be the company's own organization or some outside supplier or suppliers.

With quantity, however, there is no such stability. Ideally, materials and supplies would be purchased and delivered just at the time when they were needed by the department using them, with no penalty for buying or requiring delivery in small lots.¹ In such an ideal situation, the quantity to procure would be the quantity needed by the using department; the procurement officer would have to devote but routine attention to quantity considerations, inasmuch as the quantity needed would be stipulated by the using department. Actually, however, this ideal is almost never reached, for three reasons: (1) the quantity needed can rarely be accurately forecast because of the universal difficulty of estimating sales accurately; (2) transportation facilities, suppliers, distributors, and other persons, companies, or organizations involved in the process of producing and delivering the goods cannot be relied upon to work on exact schedules without some delays (or even without getting ahead of schedule which would upset the ideal situation just as much as getting behind); (3) actual economies in certain large-scale manufacturing, selling, and distributing operations lead to penalties for buying in small quantities.

¹ See Howard T. Lewis, *Industrial Purchasing, Principles and Practice* (Chicago: Business Publications, Inc., 1940), pp. 193-194; and *N.A.P.A. Handbook of Purchasing Policies and Procedures* (New York: National Association of Purchasing Agents, 1939), Vol. I, p. 308.

It is evident that the desired quantity, as a production matter, is not known with the same degree of accuracy as the desired quality because of the difficulty of forecasting demand. Yet, even if the desired quantity were accurately known, the additional quantity needed to offset possible delays in production and delivery cannot be exactly calculated. Furthermore, in certain instances, the economies of getting large quantities may yield prices so low as to change the quantity ordered.² Thus, instead of there being on one side of the scale a known constant (such as is the case of desired quality) to be balanced against the possible ways of attaining that constant, there are, with quantity, changing entities on both sides of the scale. Neither desired quantity, on the one side, nor the method of attaining it, on the other side, remain constant. Consequently, the optimum quantity to procure is determined by the interaction of several independent variables.

Quantity and Time Inseparable

One further difference between quality and quantity should be kept clearly in mind. The concept of quantity cannot be separated from time; quality can. Even though most businessmen require a desired quality for some specified length of time, it is perfectly possible to think of a specific quality without reference to time. It is possible, for example, to read the specifications for a lubricating oil and get a clear picture of what is required, without ever considering time. On the other hand, the concept of the need for 100 barrels of oil requires a time concept to complete it; it may be that 100 barrels of oil are all that will ever be needed, or it may be that 100 barrels of

² An extreme of this nature was discovered in one company with respect to certain printed forms. At one time the company made more of one form than it would ever use and actually threw away the extra ones, because the cost of stopping the printing presses and removing the one form from a number that were being run together would have exceeded the cost of the materials going into the ones not needed.

oil will be needed per day, per week, or per some other unit of time. The concept of quantity is incomplete without the time unit.

Reserve Stocks

Sometimes as a result of the uncertainty about the quantity needed and about the exact time needed to secure additional supplies, businessmen keep on hand reserve stocks from which needs can be supplied whenever the quantities delivered vary from those needed. Lower prices obtainable by buying in larger quantities may also induce businessmen to carry stocks in excess of current needs. In purchasing, therefore, the purchasing officer faces the problem of how much to buy. He has to buy that amount which will give a reserve supply large enough to meet demands when the quantities actually needed exceed the estimates and also large enough to provide materials if deliveries of new ones are delayed. Throughout the process, however, he must not allow the reserve supply to get so large that the expense of maintaining it exceeds any possible loss that might occur if the required quantities were not on hand when needed. Reserve stocks are at best a necessary and costly evil designed to eliminate so far as practicable the occurrence and the expense of delays in production caused by lack of goods with which or on which to work.

How Much to Buy

The question of *how much* to buy, therefore, is the usual manifestation of the quantity problem in purchasing. In attaining the objective of having the "proper amount on hand at the proper time" the typical purchasing officer does two things, both of which are closely related: first, as we have seen, he keeps a reserve supply on hand; secondly, he buys from reliable suppliers whose delivery performance he can estimate with reasonable certainty. In relation to the rate of use, knowledge of the amount on hand and the time for delivery determine, from the supply side of the picture, the amount to buy.¹ From this point

¹ As has already been noted, quantity has an effect on price. For the moment, however, this can be treated as cost if care is exercised in comparing the cost of buying with the cost of making different quantities. (See Chapters II and III.)

of view, it is advantageous to buy from the suppliers who can give the quickest delivery and who can be relied upon to deliver at the time specified. When speedy and reliable delivery performance is obtained, the ideal situation is being approached: stocks can be kept at a minimum and yet the business is assured of the supply of materials it needs.

Speculation

Among industrial purchasing officers, determination of how much to buy raises the questions of speculation and of the extent to which purchasing in advance of normal requirements is justifiable when a price rise is foreseen. In some respects, making is similar to speculation because, to a large extent, it consists of an investment resulting in future commitments on the basis of present facts and future hopes, and because the equipment for making is frequently productively useful beyond the known demand for its output at the time of its installation.

It is widely recognized that every business commitment has in it some element of speculation. Consequently, the term, speculation, may designate business actions ranging all the way from the everyday transactions involving normal business risks to those actions approaching pure gambling. As it applies to industrial purchasing, however, speculation usually refers to purchases in advance or in excess of normal needs in the hope of reaping extra profit from a rise in prices, or postponing purchases in expectation of a price decline. Essentially speculation makes price — rather than quality or immediate need — the determining factor.

Just as with speculative purchases, there are certain make actions that are obviously unjustifiable because the risks involved are disproportionate to the probable benefits or are beyond the real scope of those accepting the risks; there are other actions which are just as obviously justifiable because the risks involved are rightly assumed; and finally, there is the large majority of actions, whose justifiability is debatable. Likewise, just as it is difficult to determine the exact point beyond which speculation in purchasing is undesirable, so also is it difficult to know when commitments for making are justifiable. The de-

termination of any particular problem, whether it be to speculate or not to speculate, to make or to buy, depends upon two things: (1) a knowledge of the specific facts; and (2) an understanding of the broad business principles lying behind the specific situation. With respect to speculation in industrial purchasing, both aspects are well covered in authoritative texts.¹ With respect to make or buy, this thesis is attempting to point out some of the basic principles together with an indication of how these principles should be applied to specific problems. The similarity of making to speculation, therefore, offers little help in finding the correct solution of a make or buy problem, beyond emphasizing the need for a conceptual scheme within which the problem may be analyzed. The analogy between speculation and making may be useful in suggesting angles of approach, but the make or buy problem must be solved within itself, after establishing complete and logical methods of analysis. The peculiar way in which making resembles speculation (i.e., both involving commitments in excess of current need) can only be completely understood in the light of this whole thesis and not with respect to quantity alone.

Quantity as a Reason for Making

It is with respect to the assurance of a supply of the things that are needed that most of the advantages based on quantity are claimed for making rather than buying. For example, the *N.A.P.A. Handbook* lists two arguments of this nature. They are independence of disturbance and independence of transportation delays, difficulties, and costs.

Independence of delays

1. Independence of disturbance, whether by strike, interference with service, or otherwise, of outside sources of supply. It is obviously possible to co-ordinate the supply with the demand if the material is manufactured or produced by the same organization which uses it.

2. Independence of transportation delays, difficulties, and costs. These depend particularly upon the geographical aspects of the case and may be offset to a considerable degree by the traffic problems with reference to the material which must be secured for the production of the item in question within the plant. This difficulty disappears, naturally, when the material

needed for production of the item is a material in general use by the plant for the production of its own product.²

These arguments are of especial interest, first of all, because they head the list of arguments for making, as presented in the *Handbook*, and secondly, because they illustrate the argument that is advanced in theory. Yet the research for this thesis revealed in actual practice only one situation that could be used to illustrate even remotely these conditions. This does not, of course, indicate that such instances do not exist. According to the testimony of executives of some 40 companies examined, however, the fear of interruption of supply was not important to any of them. The closest approach to fear of interruption was the experience of the Atlantis River Company³ which found: "It was difficult in periods of business prosperity to secure prompt deliveries (of castings) because foundries often were fully occupied in filling orders for other companies and because of the delays incident to shipments from other cities." It may be noted, however, that this problem arose in 1923. The company actually built the foundry in 1925 and operated it through 1931, since which time it has been shut down and the company has been purchasing its castings from outside suppliers.⁴

Prevention of delays

The infrequency with which these arguments actually are used in business is a good indication of their importance (or lack of it) which can also be discovered by an analysis of their merits. Both arguments claim that the adoption of a make program by a company will enable that company to prevent certain interruptions in the procurement of the items to be made.

The worth of these arguments must be weighed in two different ways. As stated, they seem to place most weight upon the ability to be independent of delays themselves. Probably of equal importance, however, is an assured source of supply even if the delays are not avoided. Let us

² *N.A.P.A. Handbook*, Vol. I, p. 198.

³ For text of case, see *Harvard Business Review*, January, 1928, pp. 236-237.

⁴ Late in 1940, part of the foundry building was remodeled and devoted to the production of parts needed in the national defense program; it was used, however, not as a foundry but as a machine shop.

¹ Cf., for example, Howard T. Lewis, op. cit., Chap. XV.

look, first of all, at the possibility of avoiding delays. Making is supposed to enable a company to eliminate interruptions that might occur in suppliers' plants. In order to evaluate such a claim it is necessary to know what the potential delays might be. The *N.A.P.A. Handbook* mentions strikes and transportation delays. There are, of course, others, but all may be put in three classifications: (a) natural disasters, such as flood, hurricane, and other ravages of nature; (b) semi-natural disasters, such as fire, industrial accidents, etc.; and (c) delays caused by the human element, through misunderstandings and errors, strikes, etc.

The control over purely natural causes of interruptions seems to be entirely nonexistent whether a company makes or buys. For the only way to avoid the effects of natural disasters such as hurricanes, floods, earthquakes, etc., is not to be where they happen. But this, to a large extent, is a matter of luck, for it is impossible to locate where none of these destructive forces may strike. If, for instance, you avoid floods, you may get windstorms.

Management, of course, has some control over seminatural disasters. Perhaps a company contemplating making rather than buying could exert better control over that possible source of interruption than could suppliers. The fact cannot be accepted as necessarily flowing out of a decision to make, and must be proved.

Those delays caused by human errors are probably more controllable by management than either of the other types. Yet, the argument that making affords better control over such delays than buying assumes that the making company has better management than the supplying companies and is in a better position to avoid labor troubles and to prevent human errors and misunderstandings.¹ This also is not necessarily true; in fact, just the opposite may be true.

The experience of the Creely Company² gives

¹This attitude of management is one of the personal elements which are found at every level of business action and which should never be ignored. Management's pride and confidence in its own ability lead it to assume, quite subconsciously perhaps, that it is capable of success where others failed. Such subconscious assumptions should at least be brought to management's attention.

²Text of case already given; see page 27.

an interesting example along this same line, even though the fundamental point at issue was not one of quantity. When abandonment of the company-owned printing plant was being considered, one of the objections was that a plant 60 miles away would not be in a position to render so satisfactory service as a company-owned plant immediately adjacent to the main factory building. To prove the point, the example was cited of those instances where corrections were needed, and the work was returned to the company-owned print shop where the necessary changes were made immediately and without charge. Despite this objection, the plant was abandoned and it was found that the need for such corrections was eliminated because the plant of the new supplier, even though 60 miles away, furnished such satisfactory work that changes were no longer necessary. In other words, in that case, the outside supplier was better equipped to prevent the very type of error that is advanced as an argument for making.

From this discussion it can be seen that prevention of the delays in any of the three categories is not necessarily more certain when a company makes than when it buys. Control over delays does not automatically go with making but must be attained. Whether the company contemplating making can attain a degree of control superior to that of suppliers is questionable and must be examined in the light of the facts of each case.

Alternative sources of supply

As was noted above, the avoidance of the delays themselves is only part of the argument that a company, by making, avoids delays; the second, and probably the more important, aspect of the argument involves a consideration of the courses of action left open if, perchance, the delays are not avoided. There can be no general answer to the problems which arise in this area, but some of the possible situations should be pointed out. If, for example, making would require a company to depend on one plant (its own), destruction of that plant, interruption of transportation facilities from it, or interference with production by strike would cut off all supplies. If by depending entirely upon its own plant the company had severed

all connections with the market, it might find difficulty in establishing contact with outside suppliers. If, on the other hand, a company uses sufficiently large amounts of a product to enable it to build scattered plants, it may attain immunity from the more serious results of disasters. Geographical distribution is especially helpful in preparing for natural and seminatural disasters, and may be of some help in meeting some of the delays caused by the human factor, such as strikes, inasmuch as these do not ordinarily occur on a national scale.

In most instances, if a company continues to buy and does not make its own requirements, the plants of potential suppliers are geographically separated. Thus, it is unlikely that all suppliers' plants will be affected at once. Furthermore, if the company had been buying from only one supplier, there is in times of emergency more likelihood that other suppliers would be willing to help than if the company were making its own.¹

The seriousness of delays is frequently increased if a company is completely dependent upon any one supplier — whether it be its own plant or that of an outsider. To a certain extent, preparation for meeting such contingencies may be made in advance by maintenance of geographically distributed stocks. This, however, cannot be cited as an argument exclusively in favor of making, as the same procedure can be followed while buying. Thus, it is dangerous to claim as a universal advantage of making "independence of disturbance." If there are other good reasons for making, measures may be taken to make the company relatively independent of disturbances, but in most instances making does not, *per se*, offer greater assurance of freedom from delay than buying. Such assurance, however, may be attained by making in special circumstances.

The seriousness of the interruptions in the attainment of goods in the instances thus far mentioned have seemed to imply that it is always desirable to have an active source of supply. Suppose, for a moment, however, that the main plant

of a company has been disabled by disaster. It is quite probable that an interruption of the supply of some parts would be necessary. If the company were making the parts at the same plant, that interruption would probably be automatic and costly; if it were making them in a geographically removed plant, the interruption could be attained by executive action in shutting down the supplying plant but would still be costly; if the company were buying the parts, however, there is strong probability that a postponement of deliveries might be arranged that would provide the necessary interruption of deliveries at a lower cost than the cost of maintaining a temporarily unnecessary plant. Specifically, for example, the American Optical Company needed no glass while its plant was under water during a severe flood in 1936; its glass supplier therefore stopped shipments until repairs were made. The company suffered less loss from the flood because it purchased glass than it would have suffered if a glass-making plant was also under water.

Assurance of a source of supply

The assurance of a source of supply is relative. If all possible interruptions of the flow of goods from a supplier to the user are prevented, the user is assured of a supply. If, on the other hand, an alternative source is open, if and when an interruption occurs, a source is likewise assured with only minor delays occurring. Consequently, the methods of avoiding or circumventing possible delays by having alternative sources of supply frequently lead to greater assurance of a supply than would making.

There are, however, further implications involved in the desire to have an assured source of supply. The delays just considered are, for the most part, temporary, and the implication is that, after the delays have been adjusted, conditions will return to their former state. In some instances, however, there is a permanent change in the sources of supply. A vendor may, for example, decide to discontinue making a certain product; or a vendor may ask for a price that is so high as to remove his product, for practical purposes, from the availability of the buyer. Consequently, making is sometimes advanced as a means of at-

¹In some respects, worry over a source of supply implies business conditions in which there is not a disorganized buyers' market. See Chapter VII for a discussion of the relationship of make or buy to the business cycle.

taining an assured source of supply. It is obvious, for example, that a company-owned plant could not, without the approval of the company management, refuse to sell or decide to discontinue making a particular product that the company needed. From this point of view, therefore, making gives an assured source of supply.

An illustration of an attempt to get an assured source of supply may be found in the Willmarth Company¹ which constructed a plant for making staked-base radio tubes, partly because the company had been forced "to depend upon the Electronic Corporation, a competitor, as its only source of supply." Then too, the Cosgrave Paint Company² case illustrates a situation where there was no fear of being unable to get the physical requirements, but where it was feared that prices might become unreasonably high. This company decided to maintain an existing can-making plant partly because it was considered an effective weapon in bargaining for favorable prices from can-manufacturing companies.

In each of these companies, making had other sound arguments in its favor, and the added argument of an assured source of supply was, of course, given consideration. As a main argument in favor of making, however, assurance of supply has many weaknesses. First of all, its very strength can become a weakness, because in many instances the source of supply becomes assured for too long a time. The Bell Chemical Company,³ for example, found itself with an unwanted box-shook factory. Conditions had changed so that the chemical industry was using few shooks, and overcapacity in the shook-making plants had reduced prices substantially. Consequently, not only could the company's shook plant produce more shooks than the company needed, but also its costs were substantially above the current market prices. The situation caused unending managerial controversies, especially between the purchasing officer (who insisted that he should be allowed to buy at the lower market prices) and the manager of the

shook plant (who claimed that he was entitled to the company's orders, so that the volume of his plant could be kept as high as possible).

Coordination attained by making

One argument given by the *N.A.P.A. Handbook* also raises a further point which, while having wider application than to quantity alone, should be mentioned in passing. The *Handbook* states: "It is obviously possible to co-ordinate the supply with the demand if the material is manufactured or produced by the same organization which uses it."⁴ The implication of this argument is, of course, that it is possible to coordinate the supply with the demand *better* "if the material is manufactured or produced by the same organization which uses it," because it is obviously possible to coordinate them to a certain extent under any circumstances. Similar arguments are frequently advanced to justify making and are almost as frequently unwarranted.

It was seen in the first part of this chapter that the first reason why the ideal quantity situation was rarely attained was the impossibility of forecasting demand accurately. On the demand side of the picture, the argument advanced here is that demand can be more accurately forecast when a company makes than when it buys. This is not necessarily true and more accurately should be stated: "When a company makes, it does a better job of forecasting than when it buys," which is quite a different thing. This means that certain companies claim as an advantage for making a set of conditions that should exist while buying. They can be truthfully claimed as resulting from making only in so far as they come into existence because the program instituted within the organization a spirit of cooperation that resulted in a better job of forecasting the demand. In this sense, it is an accidental result of making. The same results should have been attained while the company was buying. On the supply side of the picture, the argument seems to assume that the rate of manufacture can be more easily adjusted to a known demand than can the rate of purchase. As a matter of fact, in a goodly number of cases the opposite would be true. It is, for example,

¹ For a fuller description of the company's problem, see the case of Willmarth Company (A), Howard T. Lewis, *Problems of Industrial Purchasing* (2d ed., New York: McGraw-Hill Book Company, Inc., 1939), pp. 377-381.

² For text of case, see the Appendix, p. 107.

³ For text of case, see Howard T. Lewis, *op. cit.*, p. 382.

⁴ *N.A.P.A. Handbook*, Vol. I, p. 198.

easier to buy a ream of paper per month than to adjust the output of an efficient paper-making machine to that output.

An illustration of a company successfully applying the policy of giving to suppliers the advantages usually claimed when a company makes rather than buys will show the soundness of this criticism. Included in the Kirwood Company¹ case is the following paragraph describing that company's general purchasing policy:

The Kirwood Company had developed a general purchasing policy whereby it cooperated with suppliers in attempting to reduce costs by furnishing the suppliers, whenever possible, with a steady flow of orders. Because of its own fairly steady volume of work (attained partly by reason of the nature of its product, partly because of its distribution affiliation, and partly through management planning and control) the company was able to schedule most of its purchases so that its suppliers also enjoyed some of the benefits of an assured, steady volume. The Kirwood Company, of course, shared in the economies effected by its suppliers as a result of this buying policy, and the president estimated that in many instances the cost of goods purchased had thereby been reduced as much as 5%.

Small quantities justify making

Another situation in which it is claimed that making is justified and which is based on quantity considerations arises when the quantity needed is so small as to make production of the item unattractive to an outside supplier, except as a special production item. The *N.A.P.A. Handbook* comments that such instances are not common. Yet, in the course of the research work for this thesis, two instances were uncovered. The first was a case of the Corfee Company² which made production equipment for one branch of the textile industry. The company designed and was prepared to furnish almost any kind of textile machines except those commonly manufactured and installed in large numbers. Its business was wholly on special order and it never made any machines for stock. Only a small number of standard parts were made in advance. Thus, its needs for parts arose directly from orders for its machines. Since each machine was designed in part at least for one special job, frequently only

¹ For text of case, see page 58.

² Fictitious name; company's experience was not written up as a case.

one each of a large number of parts would be required. The Corfee Company had a general-purpose machine shop, manned by machinists with general skill, and through experience had reduced its setup time, overhead costs, and actual operating costs on small-order jobs to less than those of potential suppliers. The company, therefore, made its parts really because it was better equipped than any potential supplier to handle small-quantity jobs.

The other case was somewhat in the nature of a by-product. The Lillis Company,² a large manufacturer, had occasional demand for chairs and tables of an unusual design which could not be purchased except on special order. The company never needed many at any one time so the costs on special order from furniture manufacturers were much higher than for standard chairs or tables. For its manufacturing business the company had a woodworking shop principally engaged in making patterns. The woodworkers, however, possessed general skill and were willing in their spare moments to work on these chairs and tables. The men, therefore, had more steady work; the company's woodworking shop was more fully used; and the cost to the company for the furniture was less. In this case too, then, the small quantities involved made it impossible for outside suppliers to meet the company's costs.

The parts made by the Corfee Company constituted the main portion of the company's machines and accounted for about half of its total expenditures for material and supplies; the chairs in the case of the Lillis Company were, on the other hand, only an insignificant part of that company's sales. It is probable that, in most situations in which the unit demand is so small, the problems are usually relatively unimportant with respect to a company's total business. Yet these experiences do indicate that in certain real instances the need for small quantities at infrequent intervals justifies making rather than buying, because the company is better equipped to meet the special production problems arising from the small volume of work. It should be noted, however, that the final argument is actually based on cost and that, strictly speaking, the problem only arises from the peculiar quantity situation.

Self-sufficiency avoids misunderstandings

One argument also heard in favor of making is that by approaching self-sufficiency the possibility of misunderstandings with suppliers (and therefore possible interruptions of supply) is avoided. This argument requires mention only, because it assumes that the purchasing function is being carried on in such a way that serious misunderstandings can occur. We need only to presume that the purchasing official is fit to have a responsible job and the worth of the argument becomes insignificant. Some misunderstandings do, of course, arise in business dealings. But there is no more reason to believe that they will produce more serious ill effects when dealing with outside suppliers than with company units.

Furthermore, the extent of self-sufficiency must be determined. If, for example, a company using copper wire decides to "become self-sufficient" with respect to its wire requirements, that may mean that the company will do anything from installing wire-drawing equipment to buying and operating copper mines, smelters, fuel reserves, transportation facilities, etc., etc. In other words, while buying wire, the company must have an assured source of supply for wire; if it intends to draw its own wire, it needs an assured source of supply of wire bars plus the tools for making wire. Thus, self-sufficiency with respect to one product may, at the same time, bring about increased dependency with respect to a larger number of other products.

Quantity as Reason for Buying

Avoidance of new purchasing problems

Arguments in favor of buying rather than making seem principally to be restatements of those already advanced in favor of making. It is said, for instance, that purchasing from an outside supplier enables a company to avoid purchasing problems involved in obtaining the raw materials and supplies with which the product is made. The weight of this argument depends entirely on the circumstances of the case, for frequently a company can make what it has been buying without adding a single new item to those it already purchased. And again, the opposite may be true. For

instance, the Essel Company,¹ a manufacturer of envelopes, had no difficulty buying the paper stock for making its own boxes. On the other hand, the Kirwood Company² never used paper in any great quantities and the management felt some concern about the added purchasing responsibilities if it bought paper for making boxes.

Similarly, many of the other purchasing problems involved in buying rather than making may or may not be new. These include traffic, finding a source of supply, and all the other purchasing functions. Their importance may be very minor, or may be very major, depending upon the individual circumstances.

The quantity economical to make frequently exceeds the quantity needed

A final quantity consideration need only be mentioned because it is a factor that should be recognized and properly treated in cost calculations. It is the one already referred to, that the quantity to be made may not and usually will not correspond with the quantity to be bought. There are two phases to the question: (1) The total capacity of the equipment to make a product will almost invariably exceed the quantity usually purchased at one time. This gives rise to the problems of cost allocations already discussed in Chapter II. (2) The economical amount to manufacture may exceed the amount needed by the plant. In addition to bringing up the same cost allocation problem as the other part of this question, it leads to one of the most important of the broader aspects of make or buy, marketing problems.

Marketing problems

Consciously or unconsciously, it is frequently advanced as an argument for making that there are no marketing costs to be met and that, likewise, the marketing costs of suppliers will be saved. The full implications of this argument are discussed in the following chapter.³

Summary

In summary, it seems that the arguments based upon quantity are seldom so important as to jus-

¹ For text of case, see the Appendix, page 110.

² For text of case, see page 58.

³ Chapter VI, Cost in Relation to the Business as a Whole.

tify, in themselves, making rather than buying. In most instances, therefore, quantity becomes a supplementary argument to add to a list of other arguments, none of which is conclusive. There is one exception to this, and that is in the case where the quantity is so large as to make it impossible to buy, except at unreasonable prices. No examples of this situation were cited in this chapter, because it is so unusual; but the Ford Motor Company, in 1923, purchased the Glassmere plant to make its own glass, principally because the increased demand for closed cars required such large quantities of glass as to make it impossible to buy enough from suppliers.¹ In one sense this was but a temporary condition, because, if the Ford Motor Company really wanted to buy its glass, suppliers would undoubtedly have sprung up, at least with proper sponsorship on the part of the Ford Motor Company. Thus, conditions could have been changed if the company so desired.

Beyond this one and unusual situation, quantity arguments seem to favor buying. For instance, the claims that making enables a company to avoid interruptions of the flow of goods are greatly exaggerated, especially in a period characterized by rapid and satisfactory transportation and the common adoption of hand-to-mouth buying. One industrial company developed its system of filling

¹ *The Ford Industries* (Detroit: Ford Motor Company, 1924), p. 63.

orders for repair parts, for example, to such an extent that over 80% of its orders were filled the same day they were received. This is the order of business these days and a long wait for delivery is the exception rather than the rule.²

For the most part, however, quantity arguments are hardly ever complete in themselves. Almost always they eventually resolve into cost considerations, even accepting cost in the narrow sense, as previously defined. For instance, the quantity problem arising out of buying for one month's need and building a plant which will last for 20 years resolves itself into the problem of comparing the costs properly and not merely the question of which quantity should be bought: one month's supply or the potential capacity for 20 years' supply. Ultimately, of course, like all others, the quantity factor becomes, as we have seen, one of cost in the broad aspect of the word.

² At the low point of the 1933 depression, frequent complaints were heard that business organizations were running at such low levels of activity that they were unable to deliver goods to the few customers who did wish to buy. Such conditions were unfortunate, but it is debatable whether or not those companies which had their own facilities and were therefore "assured of a source of supply" were any better off than those companies which were unable to buy without long delay. The companies with their own facilities probably had extremely low volume and therefore high costs which might have been just as burdensome as the cost of waiting for delivery.

The war production program has, to some extent, rendered obsolete the statement that a long wait for delivery is the exception. Specific attention is given to this point in the footnote 2, page 88.

CHAPTER VI

COST IN RELATION TO THE BUSINESS AS A WHOLE

The Broad Concept of Cost

The adoption of the narrow concept of cost has intentionally kept out of the picture some of the most important aspects of make or buy problems. Having seen the narrow problems of cost, quality, and quantity, we are now in a position to study the effects of make or buy decisions on a business as a whole. This and the next chapter are devoted to that problem.

The broad concept of cost has already been described as including all the effects upon profit of a given business decision.¹ Such effects in any business decision, however, are practically numberless. In most cases, therefore, it is impossible for any businessman to consider every last one of the effects, and he must devote his attention to the most important ones. It is equally impossible to give attention in this thesis to all the possible aspects of the problem; we, too, must concentrate on the most important.

Selection of Important Aspects

Thus, we face exactly the same type of problem which is most difficult and most essential in actual business decisions, viz., the selection of those aspects of the problem which are important. In making this selection, it is essential that no factor of importance be overlooked and also that the importance of each factor be correctly evaluated. In order to be reasonably sure that we know all the possible effects of make or buy decisions on cost, in the broad sense, let us look at the essential functions of a business organization and see how make or buy decisions affect the cost of performing those functions. The accountants have developed a threefold functional classification of business expenses, based on the general phases of

management. These groups are as follows:

1. Production
2. Distribution
3. General administration

The *Accountants' Handbook* comments: "Thus arises the time honored division of operating expenses into factory or production costs, selling and distribution expenses, and general and administrative expense."²

All the expenses of a business may be classified in one of these three categories which represent the essential functional operations of any business organization. At the same time, these classifications offer a starting point for analyzing the effects of make or buy decisions on the cost of performing the various functions. Let us, therefore, examine the ways in which make or buy decisions might affect the cost of each of these three functions.

Production

The production function consists in preparing a company's product for market and is made up of two main tasks: (a) procurement and (b) manufacturing. Procurement includes the long-term tasks of providing machines and buildings, as well as the procurement of materials and supplies. Manufacturing has to do with the immediate production process of making a salable product by changing the physical or chemical properties of certain materials, or by changing their location or time value. Make or buy decisions definitely can affect costs in both the procurement and the manufacturing areas of production. The limitation of the subject matter of this thesis has ruled out consideration of the procurement problems involved in securing buildings and machinery, but we must consider the problems with respect to the

¹ See Chapter II, p. 7.

² W. A. Paton (Editor), *Accountants' Handbook* (2d ed., New York: The Ronald Press Company, 1934), p. 158.

materials and supplies. The effects of make or buy decisions on cost, in the broad sense, fall into two classifications — those which affect cost by changing factors external to the business and those which change factors internal to the business.

External

Probably the most important external aspect having a bearing upon cost, in the broad sense, is the effect of make or buy decisions upon supplier goodwill. Purchasing experts agree that it is an essential of good purchasing practice to cultivate the goodwill of suppliers. Countless examples are cited of unusual service rendered by a regular supplier when a customer is faced with an emergency. These examples are used to prove that such extraordinary service is only rendered by suppliers whose goodwill has been cultivated and who have a real interest in the problems of the purchaser.

Consequently, then, any action which will reduce supplier goodwill should be considered carefully. Yet, in many cases, the initiation of a make program will have a bad effect upon this goodwill. The Mills Company case states the argument thus:

... He [the purchasing officer] stated, furthermore, that if the company undertook the manufacture of the clamps, other suppliers would become apprehensive of losing the company's business. Such a belief on the part of suppliers would result in two attitudes. The larger and stronger suppliers would probably increase their prices, for in most cases they had quoted extremely low prices because of the stable and continuing character of the Mills Company's business. The smaller and weaker suppliers would be likely to cut prices to a point unprofitable to themselves in the hope of retaining the business by taking away any cost advantage that the company might obtain through manufacture in its own plants.²

It is possible, therefore, for the cost of making to extend to the cost of procuring many other articles seemingly not even remotely connected with the one under consideration. Such possibilities should be considered before an important make or buy decision is rendered. Unfortunately, it seems quite impossible to establish a rule of pro-

² Unfavorable supplier reaction may well be expressed in ways other than price. Delivery, quality, and service, for instance, might suffer. For text of case, see page 70.

cedure, and the probability of loss of supplier goodwill must be carefully appraised in each situation in the light of all the facts.³

Other external factors affecting make or buy decisions are, for the most part, of such a nature that they can only be dealt with in the light of individual conditions because they arise in very specialized circumstances. These include, for example, the effect of the purchases of a single company upon market conditions and market prices for a product; government regulation; etc.

Internal

A broad cost of making or of buying that is more tangible than those connected with external conditions is the additional purchasing expense that may be brought about indirectly by a decision to buy or to make. If a given organization is economically performing the purchasing function under one set of conditions, it is reasonable to suppose that some changes in the organization will be necessary if the conditions change. A make or buy decision changes the conditions, and it may be possible that additional purchasing costs will be encountered. For example, a company which had been buying its printing from commercial printers presumably would need a different or changed purchasing organization if the company began to do its own printing. The changes in cost of procurement are such that they would properly be omitted from the calculations of cost (in the narrow sense) of the proposed courses of action. Yet, to the business as a whole they have an important bearing on the correct decision of the make or buy problem. Three brief illustrations of actual cases should be sufficient to show the significance of such costs.

The Cosgrave Paint Company⁴ which made some of its own cans was considering abandoning the can plant and purchasing all its requirement outside. One of the arguments against the program was the expense of "paper work at both our plant and our office in ordering and paying for cans." Obviously this had nothing to do with the

³ It should be noted that through the operation of reciprocity, supplier goodwill might also affect a company's distribution costs. See the discussion of reciprocity later in this chapter.

⁴ For text of case, see the Appendix, page 107.

manufacturing cost of making cans; yet the company considered the expense of "paper work" as having an important bearing on the correct solution to the problem.

The Kirwood Company,¹ already referred to and to be studied at length presently, also thought that purchasing paper for boxes would entail added purchasing expense, principally because the problems it would involve were different than those already faced by the company and because additional purchasing help might be required.

A situation in which the adoption of a make program apparently added no appreciable expense to the cost of procurement is found in the Essel Company.² In 1931, the company began to make the paper boxes in which its product was packed. Its product, however, was paper envelopes, so the purchase of paper stock for the boxes presented no fundamentally new purchasing problems. Consequently, the additional purchasing difficulties were few, and in reality the additional cost of purchasing the material for the boxes was negligible.

On the other hand, there is no difficulty in finding examples of companies that gave this problem no thought whatsoever. The Hartkey Company,³ for example, thought little of entering upon the manufacture of parts which necessitated the purchase of crude rubber, even though the market was fluctuating, the product was a world commodity, and the company had had no experience in purchasing it. Despite the company's neglect of the subject, however, it seems certain that its purchasing function and, as a result, its purchasing costs were different after the purchase of rubber was necessary than before.

It is evident, therefore, that one of the broad costs to be considered in any make or buy problem is the effect of the decision upon the purchasing costs of the company. In some instances, as, for example, when additional purchasing help will be needed, the additional costs may be measurable in terms of dollars; in others, however, the changes in cost will be indirect and not easily determined. Nevertheless, change in purchasing cost must be considered as one of the factors having a

bearing upon the interpretation of the narrower aspects of the make or buy problem.

Not infrequently, make or buy decisions have indirect effects upon manufacturing costs. Such costs naturally are not included in the narrow cost calculations recommended in earlier chapters, but, nevertheless, are real costs of adopting a make or buy program. Consequently, make or buy decisions may be in error if such costs are ignored. We have already considered at length the case of the Horton Instrument Company,⁴ where the purchasing officer apparently disregarded numerous cost implications.

In recent years one of the manufacturing costs most commonly cited as reacting to all kinds of apparently far-removed decisions is labor. The repercussions of any management decision upon labor costs must be considered. In this respect, make or buy decisions are no exceptions. Three examples are readily available and will be presented here. Doubtless many more could be easily added to this list.

The company in which the first instance arose has already been examined. It is the Creely Company,⁵ and mention has already been made of the fact that closing the company's printing shop (directly dismissing five men) might conceivably lead to a strike in the main plant. It is altogether possible that such a strike within a short period could easily cost more than the expected savings over a number of years from closing the printing plant.

A similar argument was raised in the problem of the Van Cortlandt Chemical Company,⁶ as follows:

The vice president was also influenced in his reasoning by a long-standing precedent of the Van Cortlandt Chemical Company in not discharging any employees except for personal cause. Even though the volume of business declined during the business depression following 1929, the company had not laid off any men or cut working hours. For a short time wages were reduced 20% but full pay was subsequently restored. This policy had not been adopted for philanthropic reasons but was considered to be sound business policy. Consequently the company hesitated to expand its plant facilities unless there was assurance of sufficient volume to enable the continuance of the company's policy.

¹ For text of case, see page 58.

² For text of case, see the Appendix, page 110.

³ For text of case, see page 83.

⁴ Chapter II, page 13.

⁵ Chapter III, page 27.

⁶ For text of case, see page 80.

As a final example, with a slightly different emphasis, let us look at the reply of the president of the Graff Machine Company to the representatives of the union to which the company's machinists belonged, when they sought an increase in wages:

The president went on to say that if the men were convinced that they were not getting a fair wage, the company would look into the possibility of buying the parts from outside as the Graff company "wished no man to work for less than his due wages." Executives of the local union then hastened to request that the management let the whole matter drop.¹

One of the most important, and yet one of the least recognized, phases of the cost aspect of make or buy has to do with the manufacturing costs of the company as a whole. All too frequently the comparison of the cost of making and the cost of buying are made for the one article under consideration, with no thought being given to other possible changes in manufacturing costs. An extreme of this nature has already been dealt with in the case of the Shipton Manufacturing Company² which neglected to treat its printing problem as a whole. Instances where management gave definite consideration to the manufacturing costs of the business as a whole are surprisingly hard to find. The Kirwood Company, therefore, presents a refreshing example.

KIRWOOD COMPANY

Purchase vs. Manufacture of Boxes

The Kirwood Company used more than 18,000,000 paper-board boxes for packing its finished product in 1937, each unit of which was sold in a separate box. Early in 1938 a salesman of the Beale Machinery Company tried to persuade the board of directors of the Kirwood Company to install a Beale box-making machine.

The Kirwood Company produced a medium-quality, consumer, capital good for which there was a fairly steady demand because of repeat orders. The sales volume of the Kirwood Company was more stable than that of many of its competitors because of its close association with a large retail chain store organization that distributed its product.

The Kirwood Company had two complete operating units located in small Ohio towns, about 8 miles apart,

¹ Inclusion of this quotation should not be taken to imply that the writer agrees with the labor policy which it reveals. It is cited merely to illustrate the indirect cost effect of make or buy problems. For text of case, see the Appendix, page 111.

² Chapter III, page 25.

each unit consisting of four separate factories. In 1937, as during many previous years, the company had met its need for boxes by purchasing blanks³ and folding and assembling them at each of the factories. Because of the varying conditions at each factory with respect to available space and volume of work, some factories used hand-fed box-folding machines while others used fully automatic machines.

The average cost of all boxes used by the company in 1937 was \$21.97 per thousand. A preliminary estimate by the Beale salesman indicated that the same number of boxes could be made for \$18.25 per thousand if a Beale box-making machine was installed. The difference of \$3.72 per thousand indicated a possible annual saving of nearly \$70,000. The directors, therefore, asked the purchasing officer to make a detailed study of the situation, to verify the cost and savings estimates, and to report his findings.

The purchasing officer's investigation revealed that the preliminary estimates were substantially accurate. His estimates of the current cost of making boxes on a Beale machine, however, ranged from \$2.67 to \$3.14 per thousand less than the original estimate of the Beale salesman. The difference was accounted for principally by a higher allowance for overhead in the salesman's calculations.

The purchasing officer drew up detailed cost figures to support his estimates. These are summarized in Exhibits 1, 2, and 3. Exhibit 1 shows the cost, in 1937, of obtaining cartons by buying blanks and folding and assembling them into boxes as needed. The exhibit, which is divided into two parts, shows the costs at

EXHIBIT 1

KIRWOOD COMPANY

Actual Cost of Boxes, 1937

(Purchasing blanks and assembling boxes as needed)

| Items | Cost per thousand | |
|--|-------------------|----------------|
| | Unit A | Entire Company |
| Printed blanks | \$18.43 | \$18.43 |
| Glue | 0.30 | 0.30 |
| Labor* | 1.52 | 1.87 |
| Transportation from paper company making blanks | 0.65 | 0.65 |
| Delivery of boxes to factories which have no assembling machines | 0.10 | 0.10 |
| Insurance and maintenance .. | 0.12 | 0.12 |
| Staple cases | 0.50 | 0.50 |
| Total cost | \$21.62 | \$21.97 |
| Units produced | | |
| Per day | 37,632 | 74,592 |
| Per year | 9,408,000 | 18,648,000 |

* Weighted for hand and automatic machines.

³ Blanks were pieces of paper boxboard already cut and printed so that a finished box could be made merely by folding the box and fastening the corners.

Unit A and the costs for the two operating units combined.

Exhibit 2 shows the estimated cost of making the boxes for Unit A on a Beale box-making machine and is calculated on the basis of two different sets of conditions with respect to labor and material costs. The first column presents current conditions as of 1938, and the second presents higher costs to show the effect which future variations might have on the total cost. The higher cost figures were not arrived at by applying a constant percentage of increase to the current situation but were arbitrary figures intended to show possible future conditions resulting from increased costs.

Exhibit 3, also based on current conditions and possible future changes, shows the estimated cost of making all the company's boxes by installing a Beale machine and running it two shifts a day. Installation would be at Unit A with delivery by truck of the boxes required at Unit B.

The Beale box-making machine was a complete unit, designed to make finished boxes from paper boxboard and Kraft paper. Its installation, therefore, would make the continued use of the box-folding machines unnecessary. The Kirwood Company would suffer no capital loss, however, because it did not own the folding machines but leased them from the supplier from

whom the blanks were purchased. The space which the folding machines occupied would of course be released for other uses if the Beale machine was installed.

The rent item in Exhibits 2 and 3 was based on an annual rental of \$2,800 for the space required by the Beale box-making machine and for storage. According to the manufacturer's specifications, a Beale machine occupied 4,000 square feet of floor space, and an additional 5,300 square feet would be needed for storing both the raw materials and the finished products. The Kirwood Company's accounting system placed a value of 30 cents per square foot on that portion of the factory in which the manufacture of boxes would be carried on. The box-folding machines occupied, in total, about 4,000 square feet so that a net additional space of only 5,300 square feet would be required. These machines, however, were scattered throughout the factories so that the identical space could not be used for a Beale machine.

Unit A, at which the Beale machine would be located, had sufficient space available so that the box-making operations could be added without rearranging other machines. Unit B, however, had no unused floor space. Moreover, box-making operations with a Beale machine would occupy all the remaining available space at Unit A.

The blanks that the company was using came from the supplier complete with printing on the boxboard, no covering paper being used. The boxes made by the Beale machine would be different in that they would consist of a boxboard base with a Kraft paper covering. The printing, in this instance, would be on the paper, and the Kirwood Company proposed to buy the paper with the printing already on it. In effect, then, the company would be shifting the procurement

EXHIBIT 2
KIRWOOD COMPANY
Estimated Cost of Making Cartons for Unit A
on a Beale Box-Making Machine

| Items | Cost per thousand | |
|---|-------------------|---------------------------------------|
| | At current costs | At somewhat higher costs ¹ |
| Volume | | |
| Per day | 37,632 boxes | |
| Per year | 9,408,000 boxes | |
| Direct costs | | |
| Board | \$ 6.46† | \$ 8.21‡ |
| Paper | 2.94 | 3.44 |
| Kraft (printed) | 0.20 | 0.20 |
| Labels | 1.00 | 1.25 |
| Glue | 0.50 | 0.50 |
| Labor (see Exhibit 4) | 1.90 | 2.10 |
| Labor, stitching cases (piece rate) | 0.25 | 0.27 |
| Waste (2%) | 0.18 | 0.23 |
| Total direct costs | \$13.43 | \$16.20 |
| Indirect costs | | |
| Interest (6%) ² | \$ 0.58 | \$ 0.58 |
| Depreciation (10%) ² | 0.97 | 0.97 |
| Rent ³ | 0.30 | 0.30 |
| Trucking (see Exhibit 5) | 0.30 | 0.30 |
| Total indirect costs | \$ 2.15 | \$ 2.15 |
| Total cost | \$15.58 | \$18.35 |

† At \$37.50 per ton.

‡ At \$47.50 per ton; a \$1.00 increase in board prices adds \$0.175 per thousand boxes.

¹ Higher costs arbitrarily selected; see text, above.

² On \$91,000; see text, page 60.

³ On floor space occupied; see text, above.

EXHIBIT 3
KIRWOOD COMPANY
Estimated Cost of Making Cartons for Entire Company
on a Beale Box-Making Machine
(Operating two shifts a day)

| Items | Cost per thousand | |
|---------------------------------------|-------------------|---------------------------------------|
| | At current costs | At somewhat higher costs ¹ |
| Volume | | |
| Per day | 74,592 boxes | |
| Per year | 18,648,000 boxes | |
| Total direct costs | | |
| Same as Exhibit 2 | \$13.43 | \$16.20 |
| Indirect costs | | |
| Interest (6%) ² | \$ 0.29 | \$ 0.29 |
| Depreciation (10%) ² | 0.49 | 0.49 |
| Rent ³ | 0.15 | 0.15 |
| Trucking (see Exhibit 6) | 0.75 | 0.75 |
| Total indirect costs | \$ 1.68 | \$ 1.68 |
| Total cost | \$15.11 | \$17.88 |

¹ Higher costs arbitrarily selected; see text, above.

² On \$91,000; see text, page 60.

³ On floor space occupied; see text, above.

of its box-printing requirements from the manufacturer of the blanks to the manufacturer of the Kraft paper. The executives of the Kirwood Company saw no real difference in the acceptability of either type of box.

Although the costs of making boxes, as estimated and shown in Exhibits 2 and 3, were based upon exactly the same volume that was used by the company in 1938, an additional 10% could be produced without increasing costs materially. The purchasing officer, furthermore, foresaw no labor difficulties in operating the Beale box machine on a two-shift basis even though the company's factories operated on only one shift. Since few men would be required to operate the Beale machine, he believed that a sufficient number would be available to run a second shift.

The Beale box-making machine would cost \$91,000, f.o.b. the Beale plant, if paid for in cash, net 30 days. An alternative plan was offered whereby the Kirwood Company could pay \$30,000 down and \$3.50 for each thousand boxes manufactured. Of this amount the Beale Company would credit \$2.75 towards the purchase price of the machine, which would be entirely paid for after 22,200,000 boxes had been made. According to either plan the delivery and setup costs would amount to \$800.

The details of the more important figures included in Exhibits 2 and 3 are shown in Exhibits 4, 5, and 6.

EXHIBIT 4
KIRWOOD COMPANY
Labor Costs of Making Cartons on a Beale
Box-Making Machine

| Labor for operating one shift: | | |
|---------------------------------|------------------|----------------------|
| 2 Box machine operators | at \$25 per week | \$ 50.00 per week |
| 2 Cover machine operators | at 25 per week | 50.00 per week |
| 4 Helpers | at 20 per week | 80.00 per week |
| 4 Stackers | at 18 per week | 72.00 per week |
| | | \$252.00 per week |
| With 5 working days per week | | \$ 50.40 per day |
| 250 working days per year | | \$12,600.00 per year |
| 1 Supervisor | at \$50 per week | 2,600.00 per year |
| Total labor cost per year | | \$15,200.00 per year |
| Total production | | 9,408,000 boxes |
| Labor cost per thousand boxes | | \$1.62* |
| Labor for operating two shifts: | | |
| Twice that of above | | \$30,400.00 per year |
| Total production | | 18,648,000 boxes |
| Labor cost per thousand boxes | | \$1.63* |

* To allow for a margin of error, this was carried to Exhibits 2 and 3 as \$1.90.

As will be noted, the exact amounts calculated in these exhibits were not carried into the final calculations. In every instance a margin of error was provided. Exhibit 4 shows the details of the labor costs used in Exhibits 2 and 3. Exhibit 5 gives in detail the trucking costs if boxes were to be made for Unit A only, while Exhibit 6 shows the trucking costs if all the company's boxes were to be made.

The purchasing officer reported that the Beale

EXHIBIT 5
KIRWOOD COMPANY
Trucking Costs
(Making cartons for Unit A only)

| | |
|---|----------------------|
| Investment (Ford truck) | \$1,000 |
| Total mileage | 8,000 miles per year |
| Costs | |
| Gasoline at 8 miles per gallon, 1,000 gallons at 20 cents per gallon | \$ 200 |
| Oil, 60 gallons at 30 cents per gallon | 18 |
| Repairs | 100 |
| Greasing | 20 |
| Interest (6%) | 60 |
| Tires | 60 |
| Depreciation (33 1/3%) | 333 |
| Registration, license, insurance | 200 |
| Chauffeur's wages | 1,500 |
| Total cost | \$2,491 |
| Cost per mile | \$0.311 |
| Total production | 9,408,000 boxes |
| Trucking cost per thousand boxes | \$0.265* |

* To allow for a margin of error, this was carried to Exhibit 2 as 30 cents.

EXHIBIT 6
KIRWOOD COMPANY
Trucking Costs of Making Cartons for Entire Company

| | |
|--|-----------------------|
| Investment (4 Chevrolet trucks) | \$4,800 |
| Total mileage | 80,000 miles per year |
| Costs | |
| Gasoline at 8 miles per gallon, 10,000 gallons at 20 cents per gallon | \$ 2,000 |
| Oil, 600 gallons at 30 cents per gallon | 180 |
| Repairs | 400 |
| Greasing (\$2 per thousand miles) | 160 |
| Interest (6%) | 288 |
| Tires | 240 |
| Depreciation (33 1/3%) | 1,600 |
| Registration, license, insurance | 800 |
| Chauffeurs' wages | 6,000 |
| Total cost | \$11,668 |
| Cost per mile | \$0.1458 |
| Total production | 18,648,000 boxes |
| Trucking cost per thousand boxes | \$0.6256* |

* To allow for a margin of error, this was carried to Exhibit 3 as 75 cents.

Machinery Company was a well-known and reliable manufacturer who had done considerable research in box-making equipment. The machine offered to the Kirwood Company was compact and completely automatic; it had been tested in actual operation for several years. Minor improvements had been made from time to time, but the fundamental design had been in use for over five years. Installation could be completed within 60 days after the order was placed.

The Kirwood Company had developed a general purchasing policy whereby it cooperated with suppliers in attempting to reduce costs by furnishing the suppliers, whenever possible, with a steady flow of orders. Because of its own fairly steady volume of work (attained partly by reason of the nature of its product, partly because of its distribution affiliation, and partly through management planning and control), the company was able to schedule most of its purchases so that its suppliers also enjoyed some of the benefits of an assured, steady volume. The Kirwood Company, of course, shared in the economies effected by its suppliers as a result of this buying policy, and the president estimated that in many instances the costs of goods purchased had thereby been reduced as much as 5%. All box blanks had been purchased under this plan from a single supplier who had proved entirely satisfactory over a period of five years.

Upon seeing the purchasing officer's report, the operating executives of the Kirwood Company were anxious to have the company install the new box-making machine and thereby reduce expenses for cartons by a third. The company's directors, however, were reluctant to purchase the machine. This was not because of the amount of the investment, inasmuch as the company had sufficient working capital to buy on the cash basis. Their objections were based on two grounds. First, they feared obsolescence of the box-making machine, because the machine offered the company was very different from those in existence ten or even five years earlier. They doubted, therefore,

whether the estimated savings would last over a period of years. Second, the directors hesitated to start the company in a new business. They believed that the operating executives, who were well trained in doing the one job of manufacturing the company's chief product, should devote their full time and talent to that job. The board feared that the diligence of the company's employees in their regular work might suffer if unusual problems arose in connection with the box-making machine. They believed that because the Kirwood Company operated in a highly competitive field, all available skill should be devoted to making the Kirwood product well, and that other companies should devote their talents to making boxes well.

The purchasing officer believed that one further problem might arise because a new raw material would have to be added to the list of goods purchased by the Kirwood Company. The company had had little experience in buying boxboard, and a study of the market for this product would be necessary before an efficient purchasing job could be done. The company's primary raw material was a commodity with a highly fluctuating price, and its market, therefore, demanded constant attention. The addition of another primary product might raise serious problems and even require additional purchasing help.

A table of boxboard prices from 1927 to 1937 is given in Exhibit 7.

Examination of the figures of this case indicates that they were calculated rather accurately and in an honest attempt to find the cost of making boxes as compared with buying them. If we accept the exhibits as accurate (and there is no evidence to indicate that they are inaccurate), we may state the case for making boxes in terms of cost (in the narrow sense) as shown in Exhibit 8,

EXHIBIT 7
Wholesale Chip Boxboard Prices per Ton
1927-1937 (dollars)

| Month | 1927 | 1928 | 1929 | 1930 | 1931 | 1932 | 1933 | 1934 | 1935 | 1936 | 1937 |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Jan. | 41.184 | 38.709 | 33.759 | 31.284 | 26.334 | 23.859 | 23.522 | 40.847 | 33.759 | 31.284 | 37.670 |
| Feb. | 41.184 | 38.709 | 33.759 | 31.284 | 24.505 | 23.859 | 24.017 | 40.847 | 33.759 | 31.284 | 40.145 |
| Mar. | 41.184 | 38.709 | 33.759 | 31.284 | 23.859 | 24.120 | 24.512 | 40.847 | 33.759 | 32.769 | 43.362 |
| Apr. | 41.184 | 38.709 | 33.759 | 31.284 | 23.859 | 24.512 | 24.512 | 40.847 | 33.759 | 33.759 | 43.857 |
| May | 41.184 | 38.709 | 33.759 | 31.284 | 23.859 | 23.522 | 25.007 | 40.847 | 32.522 | 33.759 | 43.857 |
| June | 41.184 | 36.234 | 33.759 | 28.809 | 22.146 | 23.522 | 32.680 | 40.229 | 31.284 | 33.759 | 43.857 |
| July | 41.184 | 36.234 | 33.759 | 26.334 | 21.384 | 23.522 | 36.516 | 35.897 | 31.284 | 33.759 | 38.907 |
| Aug. | 41.184 | 36.234 | 33.759 | 26.334 | 21.384 | 23.522 | 40.352 | 35.897 | 31.284 | 33.759 | 38.907 |
| Sept. | 41.184 | 36.234 | 33.759 | 26.334 | 22.136 | 23.522 | 40.847 | 35.897 | 31.284 | 33.759 | 38.907 |
| Oct. | 41.184 | 36.234 | 33.759 | 26.334 | 22.374 | 23.522 | 40.847 | 35.897 | 31.284 | 33.759 | 38.907 |
| Nov. | 41.184 | 36.234 | 33.759 | 26.334 | 23.859 | 23.522 | 40.847 | 40.847 | 31.284 | 33.759 | 36.927 |
| Dec. | 38.995 | 36.234 | 31.581 | 26.334 | 23.859 | 23.522 | 40.847 | 34.294 | 31.284 | 34.749 | 36.432 |

Source: U. S. Bureau of Labor Statistics, *Wholesale Prices of Commodities and Wholesale Prices*, annual summaries and monthly bulletins, 1927-1937.

EXHIBIT 8
KIRWOOD COMPANY

Comparison of the Cost of Making and the Cost of Buying Boxes

| Items | Making All Boxes | | Making Boxes for A | |
|--|------------------|------------|--------------------|------------|
| | High Prices | Low Prices | High Prices | Low Prices |
| Cost of making, per thousand | | | | |
| Direct cost ¹ | \$16.20* | \$13.43* | \$16.20† | \$13.43† |
| Interest | 0.29* | 0.29* | 0.58† | 0.58† |
| Trucking | 0.75* | 0.75* | 0.30† | 0.30† |
| Total cost, per thousand | \$17.24 | \$14.47 | \$17.08 | \$14.31 |
| Boxes needed (in thousands) | 18,648* | 18,648* | 9,408† | 9,408† |
| Total cost (thousands of dollars) | \$322 | \$270 | \$161 | \$135 |
| Cost of buying (in thousands) ‡ | 410 | 410 | 203 | 203 |
| Annual saving to apply to cost of machine (in thousands) | 88 | 140 | 42 | 68 |
| Savings per month (in thousands) | 7.3 | 11.7 | 3.5 | 5.7 |
| Cost of machine (in thousands) | 91.8 | 91.8 | 91.8 | 91.8 |
| Number of months savings required to pay for machine | 12.6 | 7.8 | 26.2 | 16.1 |

* From Exhibit 3.
† From Exhibit 2.
‡ Derived from Exhibit 1.

which restates some of the figures given in the case.¹

If, therefore, the company decided to make all its boxes, it could expect to pay for the new equipment in a little more than a year, even if its least optimistic cost estimates were true. Thereafter it would have a monthly saving of over \$7,000. Yet the interesting part of the case is that the company decided not to make its own boxes. The decision was made on the basis of cost — cost in the broad sense.

The cost reasoning of the executives had two angles. First, they feared obsolescence. Secondly, even granting that the making of boxes would cost

\$70,000 per year less than buying them, they doubted that the business as a whole would attain any cost benefit in the sense that the profit of the business would be increased.

Their fear of obsolescence essentially represented a belief that the time periods shown at the bottom of Exhibit 8, during which the machine would be paid for out of savings, were not short enough. This belief was probably based upon two things. First, it is common for businessmen to be ultraconservative in accepting cost figures, and the decision of the Kirwood executives may have been based on a subconscious effort to adjust the original figures for any possible error. Examination of the exhibit (8) strengthens the presumption that conservatism explains the executives' attitude inasmuch as the least favorable calculation indicates that the machine would be paid for in a little more than two years. It hardly seems likely that a box-making machine would be completely obsolete in that length of time.

The second explanation of the executives' fear of obsolescence lies in the fact that they did not figure the costs as they are shown in Exhibit 8 but as they are shown in the case itself. Consequently, the executives were not figuring on paying for the machine out of the first savings but on writing it off over a 10-year period. It is quite conceivable that the machine would become obso-

¹ The cost of making boxes, as shown in Exhibit 8, is intended to represent the additional costs which the company would incur if it made boxes; the difference between those costs and the costs it would stop incurring if it ceased making boxes could be applied to the purchase price of the new machine. Thus, rent, which was not affected one way or the other by the decision, was omitted; interest was included because the figure given represented interest expense in connection with the purchase of the new machine; depreciation on the new machine was excluded because the exhibit was designed to show how quickly the machine could be paid for out of savings and not to show the amount of savings obtainable above an arbitrary depreciation charge for any single period.

All the costs, both of purchasing and making, are based on 1937 volume estimates which were believed to be accurate. The figures under "high prices" were intended to adjust the 1937 cost experience for changing costs after 1937. The unit cost figures presented in the various exhibits of the case were calculated from estimates of total cost and volume, the details of which are given in the case.

lete, say, at the end of five years, at which time it would be only half depreciated.

The argument, however, goes further than this. Suppose, for the moment, that the machine did become obsolete in two years. What would this mean? It would probably mean that, at the end of the second year, the cost of purchasing boxes would be less than the company's cost of making them on the Beale machine. Yet, if the machine was fully paid for (as Exhibit 8 indicates), could not the Kirwood Company scrap the machine and resume buying boxes? Theoretically this would be possible, but such a suggestion also brings up further difficulties.

It has already been noted that the accounts would not show that the machine had been paid for by savings, and there would be an accounting loss. Aside from that, however, such a program might involve further costs in at least two ways. First, the Kirwood Company might, as previously mentioned in this chapter, have lost the goodwill of its box supplier, so that after two years of making boxes it would not be in a position to receive the most favorable prices on boxes. This would mean that competitors would be able to receive better box prices than Kirwood. Secondly, there are some transition costs in changing from buying to making and back to buying. These costs are in addition to the costs of installing and scrapping the machine and similar expenses which we may assume have been properly included in the cost calculations. These costs are more intangible than those of scrapping equipment and refer to the extra purchasing costs involved in reestablishing contact with the box manufacturer, in reacquiring the skill and technique needed for buying boxes, and other intangible (but real) costs even including, perhaps, the elimination from the purchasing staff of the paper experts who may have been added at the time the machine was installed.

More important, to the executives, than these rather vague aspects of the problem was consideration of the manufacturing costs of the business as a whole. They calculated that the annual saving of \$70,000 indicated by Exhibit 2 amounted to less than $\frac{1}{2}$ cent per unit of product. Since the company was operating in a highly competi-

tive market and on low margins, plant efficiency quite easily could drop to such an extent that costs would go up more than $\frac{1}{2}$ cent per unit if some of the plant personnel became interested in the problem of box making rather than concentrating on the company's regular product. To the executives, therefore, it was not a question of whether they could save \$70,000 annually on the cost of boxes (they were willing to concede that with minor reservations), but whether the business as a whole would save \$70,000, or any amount, if the company began to make boxes. They did not believe that it would, because they were of the opinion that at least \$70,000 would be added to the expenses of the other departments of the company.

Thus, with specific arguments expressed in terms of profit, the executives of the Kirwood Company applied the adage: "Shoemaker, stick to your last!" It might be noted that such a general admonition is usually wise business advice, but the fact that it is general makes it of little help in concrete cases. For, when is a shoemaker sticking to his last? Finding an answer to this question is the purpose of this thesis. Presumably, if a businessman, following the principles developed in this thesis, adopts that course of action which enables him best to attain the objectives of procurement, he will stick quite closely to his last. Making does not always call for abandoning a last but sometimes enables a shoemaker to expand his business and thereafter stick to two lasts. Rather than follow the adage blindly, then, this thesis attempts to find the situations where "the exception proves the rule."

Distribution

The second major functional division of business organizations, as outlined above, is that of distribution. Make or buy decisions affect distribution costs in many ways. Three of the most important, going from the specific to the more general, fall into the following classifications:

- (a) Reciprocity
- (b) Scalability
- (c) Marketing problems

Brief consideration will be given to each of these.

Reciprocity

Reciprocity is being treated as an argument under distribution, rather than procurement, principally because the effects of reciprocity are typically claimed to aid the selling department of a business and not the purchasing department. Furthermore, reciprocity, when adopted as a company policy, is usually accepted, not as a desirable purchasing policy, but as a policy presumably designed to help the business as a whole by increasing sales.

Reciprocity, it would seem, would affect make or buy decisions principally in favor of continuing a buy policy in order to keep the goodwill of a supplier who was also a customer. Strangely enough, however, the only instance in which reciprocity was advanced as an important argument either for or against making was in the case of the Cosgrave Paint Company,¹ where it was cited as an argument in favor of making.

Of the 27,000,000 cans which the Cosgrave Paint Company used annually it made about 5,000,000. In January, 1939, the company was considering giving up the manufacture of these cans and purchasing all of them. Among others, one of the arguments against abandonment of the can factory was one of reciprocity. It was advanced as follows:

The loss of reciprocal advantages now had from placing our orders for tin and terne plate with manufacturers of our own selection. Can manufacturers are unwilling to have us say from whom they should buy tin plate, and some of them even have their own mills. Can manufacturers themselves do not have so large a need for our product as do tin-plate mills.

As can be readily seen from this argument, this company had completely adopted the principle of reciprocity in its purchasing. As a result, reciprocity became an important argument in the make or buy decision. From the point of view of make or buy decisions, however, it can be readily seen that the influence of reciprocity depends not so much upon the specific make or buy decision as upon the attitude of the company toward reciprocity. This, however, is a complicated problem in itself and beyond this thesis. All that can be done here, therefore, is to recognize that reciprocity can

have a very definite bearing upon make or buy decisions; what that bearing is, however, depends upon the specific company's opinion of reciprocity.

Students of purchasing will realize the full implication of the bearing of reciprocity upon make or buy decisions. It is well known that reciprocity is most deeply entrenched in those industries where variations among the products produced by the several companies are rather small or where, in other words, the product is highly standardized; thus, the product itself offers little opportunity for aggressive selling of one company's brand. Under such conditions, the price and service of competing companies tend to be equalized, and reciprocity comes in as an important selling device. Such is the condition in the paint industry and had much to do with the argument advanced in the Cosgrave Paint Company. It is because of these broad implications behind reciprocity arguments that they are not discussed in more detail and are accepted as they are discovered in any particular instance.

Salability

While salability, in general, is more properly a problem of determination of desired quality than of make or buy, there are some special instances when it becomes part of the make or buy problem. In the case of the Hauser Packing Company,² for instance, Federal government regulations made it desirable, from a sales point of view, for the company to make its own spiced ham. From an absolute point of view, there was no quality differential in favor of making; nevertheless, it was apparent that spiced ham made by Hauser could be sold more readily by Hauser than spiced ham made by an outside vendor. The peculiar reason behind this was the requirement of the food laws that every food packing establishment had to place its number upon its products. Dealers who had become aware of the law were noticing that Hauser's spiced ham did not have the number of a Hauser plant stamped on the cans. Consequently, they were skeptical of arguments that it was of typical Hauser quality.

It is quite true that the experience of the Hauser

¹ For text of case, see the Appendix, page 107.

² For text of case, see the Appendix, page 113.

Packing Company is somewhat unusual and that the number of customers affected was probably small. Yet an experience of the automobile industry is quite similar. For some time automobile manufacturers attempted to educate the public to believe that company-made parts were superior to those made by independent auto supply companies. Especially in the early days of the industry, the so-called "assembled cars" were supposed to be less desirable than those made more completely by one company. In its present position, the automobile industry seems to present a compromise between the two extremes. Most companies make their own motors and many of the major parts, either directly or through controlled subsidiaries. On the other hand, a large number of the parts going into modern automobiles are made by outside parts manufacturers, and the public has come to accept the products of these parts manufacturers as equal to, or perhaps better than, anything an automobile manufacturer could produce.

Thus we see that the argument of salability as an argument for making rather than buying is none too persuasive. In some cases it rests upon claims that may not be necessarily true — such as the supposed superiority of parts made by automobile manufacturers. In other cases, it rests upon a buyer preference deliberately created by advertising and promotion. Finally, cases similar to the experience of the Hauser Packing Company are rather rare and unusual.

Marketing problems

Of more specific interest than the point just raised is one of the arguments sometimes advanced as a reason for making: making allows a company to avoid marketing costs of its suppliers, especially since no marketing costs will be incurred by a company making for its own needs only. The principal difficulty with this argument is that, as we have already noted on several occasions, conditions change with time. More specifically, the argument should say that no marketing costs are anticipated. Yet, in a number of instances, marketing costs are later incurred as the original program is expanded. The application of this argument presents an excellent illustration of the way in which business executives

can make decisions originally based on a group of logical reasons and then take several subsequent steps which are also logical in view of the first steps but finally end up in an untenable position.

The case of the Carrigan Manufacturing Company, already presented,¹ shows how marketing problems can arise. The company originally made grinding compound for its own use only. The quality was so satisfactory, especially in comparison with what was currently available, that there appeared to be a good opportunity to profit by selling the compound to others. Executives, however, were inclined to keep the higher quality compound for the exclusive use of the Carrigan company. Consequently, a compromise sales program was adopted, whereby the compound was sold only to customers of the company. Finally, the whole effort was dropped when N.R.A. requirements would have made it necessary for the Carrigan company to join a code and help pay for its administration in order to qualify as a seller of buffing compounds.

In the Carrigan case, no particular attention is devoted to the expenses of a marketing program. It is cited merely to show how a perfectly simple beginning may lead to innumerable problems of a marketing character. None of these was contemplated at the time of the original decision to make the compound.

Likewise, in the Willmarth Company,² a move that was originally taken to give the company a source of supply, other than a competitor, for staked-base radio tubes led the company to consider entering upon an entirely new business venture, by offering the tube bases for sale to others.

It should not be implied that these cases are cited in any derogatory sense; perhaps it would be a good policy for the Willmarth Company to enter the business of making and selling staked bases for radio tubes. That is beside the point. The point at issue is that the argument condoning making because it either saves other people's marketing costs or because no marketing costs will be involved should be thoroughly checked

¹ Chapter IV, p. 34.

² See Willmarth Company (A), Howard T. Lewis, *Problems in Industrial Purchasing* (2d ed., New York: McGraw-Hill Book Company, Inc., 1939), pp. 377-381.

because experience indicates that selling to others, even though not contemplated in the beginning, frequently is a future development of a make program.

The experience of the Machias Instrument Company¹ adds another point of significance to the argument. That company began to make, for its own use, very delicate parts which it had previously imported from Europe. Success in its own production led the company to accept an order for similar parts to be sold to a noncompeting company using similar parts. The original venture, however, was extremely disappointing because sales returns were almost 100% of sales, due to a misunderstanding with respect to quality requirements, and the inability of the Machias company to meet the requirements without further experimentation. It should be mentioned in all fairness that the problems were successfully met and the account put on a profitable basis in later years.

General Administration

The third, and in many respects the most important, of the functional divisions of corporate organization has to do with general administration. The general administrative function of a business is carried out by the higher executives who establish policies, by the junior executives who put the policies into effect, and, in the accounting meaning of the term, by the general office and clerical organization required to run a modern business. The effects of make or buy decisions on administrative costs are indirect and difficult to measure and for that reason are frequently overlooked. For the very reason that they are frequently overlooked, few business situations are available to illustrate the point.

One example which shows how expensive and time-consuming such problems can be is recorded in the case of the Redman Company.² The history of that company's problem extends from 1923 through 1934, and the problem was not solved even then. Here, printing, a sideline to the com-

pany's regular business, was constantly bringing up problems that demanded executive time and attention. The lesson is even more pointed than the case relates inasmuch as the president who owned the printing plant privately for two years decided to dispose of it because he believed that the successful operation of the plant would require more of his time than he could spare away from the Redman Company.

Over the period of 12 years covered in the case, the problem, directly and indirectly, consumed much of the executives' time and obviously distracted their attention from other things. Some cost undoubtedly was connected with this executive time. The facts of the situation seem to indicate that the company was attempting to accomplish two things: (1) to make the best out of a bad situation; and (2) to attain certain intangible advantages in the form of better morale resulting from the existence of a newspaper in the town. What either of these actually contributed to the welfare of the company is doubtful and immeasurable. The facts of the case seem to indicate, however, that the costs exceeded the benefits in the period under review, since the cost of running the printing plant was constantly coming to the executives' attention. If such is the case, the company would have profited by avoiding such problems altogether.

The fact that adopting a make program may increase administrative expense is frequently recognized by businessmen in a general way. For instance, the following comment by the purchasing officer of the Creely Company was founded upon that fact: "We are in the business of manufacturing a food product, not printing."³ That was his way of saying that the problems of the printing business were so much different from those of the company's main line of endeavor that it was uneconomical for the Creely executives to try to solve them.

Firm specialization

It will be remembered that in the discussion of quality, much was said about firm specialization and departmental specialization within a firm per-

¹ For text of case, see the Appendix, page 115.

² For text of case, see Howard T. Lewis, *Problems in Industrial Purchasing* (2d ed., New York: McGraw-Hill Book Company, Inc., 1939), pp. 396-402.

³ In a personal interview with the author; for text of case, see page 27.

forming multiple functions. The argument there was directed at production specialization, whether or not the firm as a whole specialized. The argument here, however, refers to multiple functions of firms, even though the production units are specialized. It is a truth that there is a limit to the variety of executive problems that can be handled by one man, or by one staff, successfully. Where this limit is, is not always clear; and the limit varies with different men and with different staffs. Nevertheless, it is a problem of sufficient importance to demand attention. In too many instances, it is not consciously studied. In most instances, executives seem to assume that they can handle another function without difficulty. It is surprising, however, the way functions can accumulate until some one has to be neglected.

Executive problems arising

In any specific make or buy problem, therefore, attention should be devoted to the executive problems the proposed course of action will generate. In so far as possible, this requires an estimate of the new executive functions to be required, and a survey of the executive personnel to see if the present staff will be able to perform the new duties. If new executives will be needed, the interpretation of the costs, in the narrow sense, should give weight to the increased expense to be incurred by the business as a whole. No rules of procedure can be laid down for estimating the executive expense of a proposed action, because some businesses may be perfectly able to meet the new problems without additional executive help, while others may be at the point where the existing staff has just about reached the limits of ability. Nevertheless, there are several points which deserve mention.

Executive staffs, much like machines, have a maximum capacity. Unlike machines, however, this capacity is not fixed by any mechanical limits. Consequently, the capacity for short periods is greater than the maximum capacity at which maximum efficiency is obtained. In plainer language, this means that certain executives can for indeterminate periods of time handle more work than they really should, both in fairness to themselves and for the long-time benefits of the busi-

ness. As a result, the mere fact that the existing staff is physically able to take care of the increased work is not proof, in itself, that new executive help will not be needed. In the Kirwood case,¹ for example, it is not unreasonable to presume that the existing purchasing organization could, for a short time at least, purchase paper from which to make boxes. Nevertheless, the management believed that additional purchasing personnel would be needed if the company decided to make boxes.

In addition to the flexibility of the capacity of the executive staff in the way just described, there is another phase of the problem. An executive staff might have unused capacity along some lines but not along others. It was (rightly or wrongly) assumed, for example, that the chief executives of the Kirwood Company could successfully handle the additional problems of adding a box factory to the company's activities. Nevertheless, these same executives feared that additional purchasing help and additional production management help would be required if the company made boxes. A proposed action should, therefore, be examined to determine how it affects the balance of the executive staff.

Furthermore, if it is discovered that an existing staff does not possess the capacity to perform the additional functions arising out of a proposed course of action, it does not necessarily follow that an augmented staff would have the capacity. The nature of the new work must be examined carefully to see if it is adaptable to the basic organization. If the new problems are basically different from the old, it may be impossible to expand an existing staff to assume the problems. A whole new organization might be required.

In an unimportant way, the Carrigan Manufacturing Company² illustrates the point. That company simply did not have a sales organization adaptable to the problems of selling buffing compounds. The company sold the compounds for a while, but never did a good job of it. The failure to do a good job was unimportant only because the job was unimportant. Basically, however, the

¹ For text of case, see page 58.

² For text of case, see page 34.

selling of buffing compounds brought up new problems to which the existing organization was not well adapted or adaptable.

This illustrates, finally, that the importance of the make or buy problem under consideration has direct bearing upon the importance of the executive implications in the problem. In the Floss Company,¹ for example, there was little additional executive work arising out of the make or buy problems described, inasmuch as the policy of the business had definitely and successfully routinized the problems. The principal executive problems, therefore, had arisen when the general policy was formulated, and those which continued were, while important, much on a routine basis and probably could be handled without addition to the staff. Even here, however, it should be recognized that there is also a point where the addition of routine work also calls for additional executive help, because even routine requires supervision and direction.

In contradistinction to the somewhat routine problems of the Floss Company, there is the problem of the Appalachian Tanneries Corp.,² which was considering reopening a closed japanning plant. The plant had been closed for some years so that the company's organization had definitely contracted. If the plant were reopened, the total volume of work handled by the company would have noticeably increased. Under such circumstances, it is reasonable to presume that there would be some change in the amount of executive work.

These illustrations are cited primarily to show the range of problems which might arise under the executive function. The executive problems are so diverse and all-inclusive that it is impossible to derive a formula for their solution. Consequently, it is absolutely necessary that the effects of any make or buy decision be studied with a view to determining its effect upon the executive functions of the business. Any changes resulting from the proposed course of action must, of course, be given consideration in interpreting the cost (in the narrow sense) of the proposed action.

¹ For text of case, see page 20.

² For text of case, see the Appendix, page 105.

Miscellaneous

In addition to the broad cost angles of make or buy which fall into the main functional classification of business just discussed, there are other miscellaneous costs which arise in some specific instances. Consideration cannot be given to all of them, but one or two are mentioned principally to illustrate the type of costs which may be affected and to give, thereby, an indication of what should be examined in any particular situation.

Pensions

The first of these has to do with certain obligations which a company has accepted with respect to labor. Pension and thrift plans, for example, may be interfered with if workers are not kept busy, and this is sometimes advocated as a reason for making. The point is illustrated by an argument brought out by the vice president of the Mills Company.³ The complete case will be considered in the next chapter, so a brief quotation will be sufficient here:

. . . The company had actively promoted thrift plans through employee ownership of stock and old age pension plans, and when large numbers of employees were thrown out of work through lack of employment the operation of these plans was interrupted seriously.

The implication of this argument is that in the long run the costs of the company would increase if it did not give employment by making a clamp which was then being bought. Further consideration of the soundness of the argument will be found in the next chapter.

Others

Other cost considerations of this nature might include the cost of securing capital, additional accounting expense, and, in some instances, public opinion and government regulation. In any single instance, some of these arguments might be of the highest importance. Lack of space and the fact that they are not common to most make or buy problems make it undesirable to do more than mention them.

Summary

Any make or buy decision which neglected the broad aspects of costs would be made upon in-

³ For text of case, see page 70.

complete evidence. In every instance attention should be given to the following questions:

1. Will the proposed action increase the cost of administration beyond the benefits received?
2. Will procurement costs be raised unduly, especially because of loss of supplier goodwill, or by direct increase in the expense of purchasing?
3. Will manufacturing costs, especially in other departments, remain unchanged if the proposed action is adopted? Specifically, for instance, what will be the effect upon labor?

4. Are the sales effects of the proposed action beneficial to the company?

In addition to these, which have almost universal application, careful attention should be devoted to an effort to discover any other broad effects of the proposed action upon the business as a whole. A few have been mentioned: for example, pension commitments, accounting expense, capital requirements, etc. It should never be assumed that there are no such broad effects, because practically every business decision produces some results not easily predictable nor patently connected with the original action.

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CHAPTER VII

EXTERNAL CONDITIONS AFFECTING MAKE OR BUY DECISIONS

We have just analyzed the problem of make or buy as it presents to businessmen alternative courses for attaining the objectives of procurement. This has been done by examining wherein those objectives — proper quality, quantity, and cost — could be better obtained, by buying or by making. But the foregoing analysis is lacking in one important detail. It has concentrated upon the internal problems of business organizations and has not, to any great extent, considered the external conditions within which such organizations find themselves. The effect of external conditions upon make or buy problems is extremely important. In many instances it is far more difficult to get facts about external than internal conditions; yet, not infrequently, the effects of external conditions are more far-reaching than any internal conditions. Furthermore, the management of an industrial company is rarely in a position to control outside conditions with the same assurance with which it can order a company's internal affairs. It is now necessary, therefore, to consider the effect of outside conditions upon the make or buy problems of business.

The most important outside forces affecting business are:

1. Cyclical changes
2. Competitive conditions
3. Age of the business
4. Long-time trends and changes
5. Random factors, such as war, political conditions, and so forth

Each of these will be given consideration in this chapter.

Cyclical Changes

Probably the most obvious and most discussed outside factor affecting business organizations is the business cycle. All businesses are affected in

some way by business conditions, and the importance of specific business problems frequently changes with cyclical upswings and downturns of business. The problems of make or buy are no exception and appear in somewhat different light in the varying phases of the business cyclical movements.

The existence of a relationship between business conditions and make or buy problems is revealed by some of the business problems reviewed in this thesis. With relatively few exceptions the business experiences upon which the thesis is based happened after 1929 and are, therefore, set in the historical background of the 1930's. A striking example of a problem that would not have occurred (and, we might say, could hardly have been imagined) in 1929 is found in the Mills Company.

MILLS COMPANY

Procurement by Purchasing vs. Manufacturing

In November, 1930, the executives of the Mills Company, a leading manufacturer of sanitary equipment, had under consideration the advisability of manufacturing instead of purchasing a metal clamp. This was one of a number of products distributed by the company's sales organization. In the past the company had purchased its total requirements of metal clamps from the Freer Manufacturing Company.

The Mills Company manufactured all the major products it distributed. Two factories, one of which was located in St. Louis, Missouri, and the other in Boston, Massachusetts, had extensive facilities capable of producing all types of sanitary equipment and supplies of the highest quality. The company had an annual sales volume of approximately \$100,000,000. National distribution of the company's products was obtained by district sales offices located in the principal cities throughout the country. Each district had a warehouse, which maintained a stock of the standard items manufactured by the company and the allied plumbing and sanitary products and supplies which were used in conjunction with the products made by the company. These allied products were purchased from other manufacturers by the general purchasing department of the Mills Company. Annual purchases

amounted to approximately \$60,000,000, of which \$18,000,000 represented the value of fabricating parts purchased to incorporate into the products manufactured by the company and completed products bought for resale.

Prior to 1930 the company had followed a policy of manufacturing only the major items it distributed. Some exceptions to that policy had been made in cases where it had not been possible for the company to purchase products which met the high standards of quality which it required in all its products, or where suppliers quoted exorbitant prices. In many instances the company had definitely fostered other manufacturing companies in order to develop a satisfactory source of supply for fabricating parts or products purchased for resale. Long-term contracts had been made and the manufacturers assured that as long as they maintained quality, service, and reasonable prices, they would be favored with the company's business. The general purchasing department took pride in always conducting relationships with suppliers in a fair and just manner. During periods of extreme competition and price wars, the company had been known to pay higher-than-existing prices in order that its suppliers might cover production costs.

In the period from 1900 to 1929, the company's factories had had a steady and rapid growth as a result of the expanding demand for the equipment manufactured by the company. Estimates for future demand were continually revised by the company so that it might make production plans which would enable it to meet future needs and at the same time not to over-expand the facilities of the company. The estimates which were compiled during the 1930 period of depression indicated that the future rate of growth of demand for the company's products would not be so great as it had been in the past. Under the conditions of the new estimates, production facilities of the two plants were more than ample to meet the demand for the company's products for the next few years. In recognizing this situation, the executives of the company believed that in order to make use of the surplus production facilities it might be desirable to manufacture some of the items previously purchased from other companies.

The president of the company appointed a committee, composed of the vice president in charge of manufacturing, the vice president in charge of purchasing, and the general purchasing officer, and gave it the power to investigate the advisability of manufacturing some of the items previously purchased. After several meetings, the committee decided that before being considered for manufacture by the company, an item would have to be required in a large volume; be adaptable to the company's productive facilities; be produced by the company at a cost low enough to allow a saving over the price charged for the item by the supplier; and not be protected by patents to such an extent that royalties would have to be paid. The general purchasing officer was asked by the committee to study his outside purchases and suggest items which might satisfy the conditions considered necessary before manufacture was undertaken.

After surveying the products purchased from other companies, the general purchasing officer picked an item which he thought would comply with the conditions established by the committee. The item selected was a metal clamp which was used to fasten certain types of sanitary equipment. In the past, the company had purchased its total annual requirements of approximately 5,000,000 clamps from the Freer Manufacturing Company at a unit price of 45 cents.

The Freer Manufacturing Company had manufactured clamps for the Mills Company for over 15 years and had always furnished satisfactory quality and service at reasonable prices. In 1927, the Freer Manufacturing Company had installed special machinery at a cost of \$25,000 in order to produce the clamps more efficiently. A substantial part of the resulting economies in manufacture had been passed along to the Mills Company in the form of lower prices. The clamp business had approximated 20% of the total business of the Freer Manufacturing Company.

When manufacture of the metal clamp was suggested to the members of the committee, they authorized the vice president in charge of manufacturing to determine if the manufacture of the clamps could be performed with the existing productive facilities and to find out what would be the cost to manufacture. After study and investigation, the vice president in charge of manufacturing decided that production of the clamp would fit in well with the job work at the St. Louis plant, although about \$18,000 would have to be spent for new semiautomatic machinery. He estimated that after the installation of the new equipment the clamps could be produced at a cost of 37 cents each. No consideration had to be given to patents, as they had expired.

In presenting the findings, the vice president in charge of manufacturing stressed the fact that in 1929 the company had had 10,000 employees on the pay rolls in the two plants and that in the latter part of 1930 the number of employees had decreased to 7,500. He expressed the belief that the company not only owed it to the stockholders to make full use of the production facilities of the plants, but also was responsible to the employees to maintain the continuity of the work. The company had actively promoted thrift plans through employee ownership of stock and old age pension plans, and when large numbers of employees were thrown out of work through lack of employment, the operation of these plans was interrupted seriously. The vice president believed, therefore, that as long as production of the clamps was suited to the facilities of the company and they could be made at a saving, the company should manufacture instead of purchase the metal clamps. While the production of clamps would require only a small part of the surplus productive facilities, it would nevertheless be of real help and might initiate a change of company policy that would result in the manufacture of other products which previously had been purchased.

The general purchasing officer agreed that the arguments of the vice president in charge of manufacturing were sound, but he believed that there were certain

arguments against manufacturing the clamps which should be considered. He pointed out that the supplier had made many efforts to furnish the company with a satisfactory product at a reasonable price and had even installed special machinery in order to do so more efficiently. Also, the supplier had become dependent in part on the business of the Mills Company. He stated, furthermore, that if the company undertook the manufacture of the clamps, other suppliers would become apprehensive of losing the company's business. Such a belief on the part of the suppliers would result in two attitudes. The larger and stronger suppliers would probably increase their prices, for in most cases they had quoted extremely low prices because of the stable and continuing character of the Mills Company's business. The smaller and weaker suppliers would be likely to cut prices to a point unprofitable to themselves in the hope of retaining the business by taking away any cost advantage that the company might obtain through manufacture in its own plants.

During the committee discussion which followed the presentation of the two points of view, a further consideration was developed. Even though all the slack productive facilities were absorbed by the manufacture of items previously purchased, the effects of the business cycle would still be a serious consideration. In years of prosperity, the plants would increase facilities to meet the demand for products, and in years of depression there would again be the problem of idle capacity and the necessity to decrease the number of workers. The greater the percentage of company manufacture of the products distributed by the company, the greater would be the effect of the swings of the business cycle.

It can be seen that the primary reason for suggesting making in this case was the possibility of maintaining employment for labor which might otherwise be unemployed because of the cyclical downturn. It was argued that the manufacture of parts then being bought outside would enable the company to keep some of its men employed and avoid layoffs. The purchasing officer objected on grounds that were based on sound purchasing procedure. He stressed especially the maintenance of supplier goodwill. As he saw it, not only was the goodwill of the supplier of the part in question at stake, but also the goodwill of the company's other suppliers who might become apprehensive if they believed that the policy of the Mills Company was to take business away from suppliers, even though their quality, service, and prices were satisfactory. In addition, the purchasing officer argued that the company had an obligation to this particular supplier who had made special invest-

ments to take care of the Mills Company's business.

The case, as written and commented upon thus far, related to the company's position and problem at the time when immediate action was necessary. In 1940, an officer of the company reported the rest of the story. Despite the purchasing officer's objections, the executive officers of the company decided that the desire to try to help the labor force was more important than the probable ill effects which might follow upon changing a source of supply. Consequently, the company began the manufacture of the clamp in 1931. In 1940 it was still making the part.

The fact that the company never stopped making the clamp and did not resume buying when the need for helping its labor had passed brings up the question of the effectiveness of making as a means of easing the effects of cyclical fluctuations. Some company officials, like those in the Mills Company, argue that making things previously bought enables them to soften the effect of business depressions upon their business and especially upon their labor force; others argue that making, as adopted by the Mills Company, helps the general economic system, by maintaining employment. The second aspect of the argument (i.e., its general application) will be dealt with after we have examined the advantages claimed for an individual company.

If a make program is adopted with the intention of softening the impacts of a depression upon the labor force of a specific company, it is logical to expect that buying should be resumed when business improves. Otherwise, the permanent size of the company's labor supply would be increased as pre-depression business returned; the effect of any future decline in business would fall upon a greater number than before; and the problem thereby would become more serious than before. In this light, it seems, therefore, that the action of the Mills Company in continuing to make the clamp after the emergency had passed was unwise.

Further investigation revealed, however, that the clamp was a special instance. The company continued to make the clamp after business conditions had improved not because of a neglect to review the situation but because of a conviction

that the savings justified the procedure. In other words, the depression was an outside influence which called to the management's attention the possibility of saving money by making something previously bought. Presumably, then, the decision to continue manufacture of the clamp was made on the basis of principles outlined earlier in this thesis and quite different from those leading to the original decision.

At the time that the problem of the clamp first arose, the Mills Company was systematically searching for products to make in order to keep its labor force occupied. Many products were reviewed to find possibilities of making, and a large number were added to the company's production schedule. There were so many of these that the company devoted special attention to them and maintained a record of each. In most instances, the company returned to purchasing the parts after the employment emergency had passed. The company continued to make only a few items whose cost of production was substantially less than the cost of buying. The clamp was one of these items.¹

The executives of the company admitted that, as a general policy, it was desirable to resume buying when the special employment conditions leading to making had improved and that, without close supervision, their policy might prove dangerous because making might be continued after it was no longer justifiable. To avoid such dangers they watched the operation of their plan carefully and maintained special records to enable them to keep the program under control. They believed, however, that when the policy brought to their attention possibilities of substantial savings by making there was no reason why making should not be continued. Consequently, they were convinced that two substantial advantages had accrued to the company because of its decisions to aid employment by making things previously bought: (1) the company was definitely

¹ It is well to note that, once making has been adopted, there are certain "emotional" costs involved in stopping making, and unless management takes a firm stand there is great likelihood that the logical action will give place to one supported by emotion. There are many ways of rationalizing the emotional action; for instance, cost figures may easily be juggled to support almost any conclusion.

able to avoid layoffs which would have been necessary if the policy had not been adopted; (2) in specific instances great opportunities for economies had been uncovered.

In general, then, the arguments of the executives appear sound as they refer to an individual company, but final judgment should be withheld until the broader effects of such a plan are examined. It is probably impossible to comprehend all the ramifications upon the whole economic system of the actions of an individual company.² Some people, with Adam Smith, might argue that only by wise decisions on the part of individual businessmen who are seeking their own selfish interests can the community obtain the greatest economic good. On the basis of such reasoning, the decision of the Mills executives would be good, not only for the company but also for the economic system as a whole. Others might argue, on the other hand, that any disturbing influence on the economic system should be avoided at a time when production is cyclically low and society is enduring the stress wrought by depressions. They might say, therefore, that the Mills Company's action was bad for society as a whole because the Freer Manufacturing Company (the supplier who lost the company's business) would have to lay off the men then engaged in making the part for the Mills Company. In support of the Smithsonian position, it could be argued that the additional work at the Mills Company's plant would require more labor than would actually be dispensed with by the Freer Manufacturing Company; yet it might also be claimed that, contrariwise, the Freer company might dismiss more men than the Mills Company would employ. This latter condition would exist especially if the Freer company was forced out of business by the Mills policy. Thus, even the direct effects of the Mills Company's action upon total employment is unknown; its indirect effects, such as those caused by the reaction of other suppliers predicted by the purchasing officer, are almost completely unknowable. Consequently, the effect of the Mills Company's policy is a moot question and the only

² If such comprehension were possible, economists and social doctors would be currently further advanced than they are toward the solution of the problems of the business cycle.

generalization which can be safely made is that *unless* the general economic effects are obviously bad, a company is probably justified in acting for its own best interest, provided its methods are sound. The extreme of Adam Smith's position must give way to a modified position which recognizes that general economic welfare must be considered apart from the selfish interest of the individual. But, since the complete knowledge of the broad effects of any individual businessman's action is, in the present state of human knowledge, impossible, a compromise policy must be adopted whereby the businessman does not ignore the general welfare but considers it, to the best of his ability, realizing the difficulties involved but honestly trying to contribute to the welfare of society even, at times, to the apparent detriment of his own best interests.¹

Cyclical changes can also influence make or buy decisions when business is on the upswing, as well as when the movement is downward. The lesson of the Bell case, however, illustrates the significance of the effect of business conditions on make or buy problems and suggests the main points to be considered in analyzing similar situations. Specifically, a businessman should not allow current business conditions to dictate a make or buy decision without realizing the fact that those conditions are bound to change and that the changed conditions will, in all probability, call for further action. Thus, a make or buy decision designed to meet current business conditions — be they prosperity, depression, or movements in either direction between the two — is, in a sense, temporary and will probably need revision when the conditions change.

Competitive Conditions

Apart from business conditions, probably the most important force affecting every business organization is the competitive setting within which it operates. There are, of course, many aspects of the picture of the competition of a business and all of them affect make or buy problems in some

¹"Apparent detriment" was used advisedly inasmuch as there is much evidence to point to the probability that in the long run a company benefits by putting its selfish interests after the general welfare.

way or other. Three of the more important aspects will be taken up here; they are: (a) overcapacity; (b) monopoly; and (c) age of the industry within which a company is operating.

Overcapacity

Conditions of overcapacity in many instances exist because of a declining trend in the demand for a particular product. Styles may have changed; business practice may have outmoded the product; or more satisfactory substitutes may be supplanting it. Declining trends in the demand for two products, patent leather and box shooks, are of importance in two cases treated in this thesis.² In each instance, as demand fell off, excess capacity for making the products resulted and prices declined. Prices of box shooks declined so far as to make the fate of the Bell Chemical Company's box shook subsidiary a recurring problem. With the Appalachian Tanneries, the low price (plus certain internal complications) induced the company to close its japanning plant altogether and have the work done outside.

Fundamentally these two companies solved the problem facing them on the basis of cost. The Appalachian company closed its plant because the purchase price was as low as its increment costs; the Bell company kept its shook plant because the executives had a feeling that the profit of the company as a whole would not have been improved if it were abandoned. This, it may be noted, is a rough way of saying that they believed that the market price of shooks was still above the plant's increment costs.

The real lesson to be learned from these two examples at this point, however, lies in noting the effect external conditions had upon the make or buy decision. Each company, at one time or another, had decided to make. Later, conditions entirely out of the company's control arose and removed some, if not all, of the advantages originally favoring making. Under such circumstances, another make or buy problem (i.e., whether or not to continue making) arose and had to be solved,

²See, for patent leather, the Appalachian Tanneries case, the Appendix, p. 105; for box shooks, the Bell Chemical Company case, Howard T. Lewis, *Problems in Industrial Purchasing* (2d ed., New York: McGraw-Hill Book Company, Inc., 1939), pp. 382-390.

illustrating the crushing force competitive conditions can have upon the make or buy problem.

Before leaving the consideration of competitive conditions, it might be well to ask, just in passing, a rhetorical question merely to illustrate their importance: Given the current competitive conditions described in these two industries, would any chemical company decide now to make shoes, and would any leather manufacturer build a plant for japanning patent leather?

*Monopoly*¹

Just as conditions of overcapacity among potential suppliers lead to low market prices and therefore frequently become an argument against making and even at times an argument in favor of changing from making to buying, so also does the existence of a closely controlled market frequently lead to prices which appear to make making desirable. One instance of this nature is found in the experience of the Cosgrave Paint Company.² Reference has already been made to the problem of the company which had been making some of the cans which it used but buying others. The suggestion had been made that its bargaining power with can makers would be increased if it bought all the cans rather than making some. One of the arguments against such a procedure — and it is fair to say that it was considered as an important argument by the company itself — was stated as follows:

At present there are only two can suppliers located in our territory who are able to supply our needs. Consequently, competition is not great. If we abandon our own plant, we must pay the price demanded of us by can makers. As long as we keep our can plant, we can keep outside prices more nearly in line with our costs of making cans.

The case also states: "One of the executives suggested that by keeping the can plant in opera-

¹ Monopoly, as used here, refers more accurately to a condition in which a few producers, who are not strictly monopolists, are so large and so strong as to have some of the advantages and powers of monopolists. If we consider the entire economy as consisting of a few firms at the extremes of real monopoly and of pure competition and the great majority of firms arrayed between these extremes, in the field of monopolistic competition, the "monopolists" referred to here are the monopolistic competitors. It is true that, in most instances, they are nearer the extremes of monopoly rather than in the middle or near pure competition.

² For text of case, see the Appendix, page 107.

tion the company could be prepared to install equipment to produce the cans then being bought outside, if the price seemed excessive at the time the contract came up for renewal."

Another instance is found in the experience of the Minthorne Company.

MINTHORNE COMPANY

Making Nitric Acid for Company's Own Needs

For some time the Minthorne Company had purchased and used in its manufacturing process nitric acid at the rate of 5,000 tons per month. In 1923, the purchasing officer discovered that other companies using similar amounts were buying nitric acid at prices as much as 20% below the price paid by the Minthorne Company. He immediately called this to the attention of the chemical company from which he was buying the acid and asked for an adjustment in price. The supplier steadfastly refused, even though the Minthorne Company threatened to build its own nitric acid plant if the price was not changed.

When the officers of the Minthorne Company became convinced that the supplier did not intend to lower the price, they decided to build a nitric acid plant. As soon as the construction of the plant had been begun, the supplier, realizing that "its bluff had been called," offered to lower the price. The Minthorne Company, however, refused to give up its plans.

The new nitric acid plant had a capacity to produce 1,000 tons per month in excess of the amount used within the Minthorne factory. The company, therefore, began to sell the excess to factories in the vicinity at the market price. The established nitric acid producers in retaliation cut the market price by about 5%. This, however, did not affect the new Minthorne plant so seriously as it did the established producers, because the Minthorne Company had to take the cut on only 1,000 tons per month, whereas the established producers received less for their entire output. Even at the lower prices, the costs in the new plant were lower than the market price. After a price war which lasted a few months, the price structure returned to normal, and the established producers admitted that the Minthorne Company was a legitimate supplier of nitric acid.

Such a condition continued for several years with the Minthorne Company selling about 1,000 tons per month at the market rate. Then, however, the processes employed by the Minthorne Company were changed and it no longer needed nitric acid. As a result, it began to sell its entire output of 6,000 tons per month in the market and continued thereafter as a producer of nitric acid.

As is revealed in this case, the Minthorne Company had no original interest in making the nitric acid it used. Yet, when it was unable to secure what it believed to be fair treatment from its sup-

pliers, it began to make. The program appears, from the information available, to have been successful, even though the company a few years later stopped using nitric acid. In one sense the company was fortunate in that it started to make a product of standard quality the demand for which was increasing in industry as a whole.

The Minthorne Company benefited from the make program which was forced upon it by the refusal of the suppliers to meet its request, which appears to have been reasonable. It should not be forgotten, however, that the history of the Minthorne nitric acid plant was told from the point of view of the Minthorne Company, and we have no indication of the reasoning behind the action of the supplier. From the fact that the company's supplier immediately offered to lower the price when construction of the plant was begun, and also from the success of the Minthorne acid plant, it appears as if the chemical manufacturer acted rather unwisely in not granting some price reduction to the Minthorne Company in order to forestall construction of the plant.

The true weight of monopoly as an argument in a make or buy decision is difficult to evaluate. In one sense, the original shock plant of the Bell Chemical Company was built to oppose a monopoly. As will be seen shortly,¹ the program apparently was successful through part of the history of the plant, but led to trying times in its later days. The ultimate wisdom of the act can never be fully determined because it is entirely impossible to know what the monopoly would have done had the Bell company never made shocks. If no one opposes a monopoly, prices may remain at unduly high levels for a long time. If an individual company decides to oppose a monopoly by making rather than buying, that very action may break the monopoly and lower prices so much as to make the decision to make appear to have been unsound. The reaction of the monopolist can never be fully forecast, and any one who enters upon a make program to fight a monopoly position should fully realize the wide range of possible actions which the monopolist might take. In a market which is fairly competitive, for example,

future price might be forecast within reasonable limits. The future prices of a monopoly-controlled product, on the other hand, are more unpredictable. They may be dropped drastically in retaliation; or they may remain unchanged as the newcomer is accepted; or, conceivably, they might go higher, as the monopolist attempts to maintain total profit by increasing unit margin on a smaller number of units. It will be recalled, for example, that the chemical suppliers first of all cut prices in an attempt to drive out the Minthorne Company when it began to make its own nitric acid, and then later accepted the Minthorne Company as a nitric acid supplier. Presumably, this later move was made to prevent further disruption of the price structure and also, perhaps, as an acknowledgment of the original error of letting the Minthorne Company come into the picture.

Most of this discussion on making to oppose a monopoly has been based upon the assumption that a company is contemplating making something which it now buys from a monopolist. The importance of the argument is somewhat changed if we assume that a company now making something produced in large quantities by a monopolist is considering abandoning its production facilities and buying from the monopolist because of price advantages. This is the situation found in the Cosgrave Paint Company, where we saw that the defensive value of such production facilities, once they are in existence and accepted as part of the industry, may be of great bargaining value.

Age of the industry

The third factor of outside competition to be considered is the age of the industry within which a given company is operating. Historically, when new industries sprang up the original units usually were small. This resulted, in part, from uncertainties of the market; the unwillingness to assume further risk; and a lack of such essentials as financial strength, technical knowledge, or complete operating organizations. These conditions existed, for example, in the early days of the automobile industry when most companies bought parts and "assembled" automobiles. On the other hand, we have already seen the experience of the

¹ See pp. 78-79.

companies in the machine tool industry.¹ In the early days they had to make their own dies and tools because there were no other companies prepared to make them. As the industry grew, however, and parts became standardized, specialized companies sprang up to make the dies and were able to do a better job than the companies using dies. Thus, in a new industry, conditions may be such that a company is forced to make some things which might, in theory, be better purchased. In most instances, however, especially in the current stage of industrial development, companies in a new industry will find it more satisfactory to buy those things which are not peculiar to its particular company. The principal reasons for this are: (1) The risks in a new industry are already sufficiently great and capital requirements for establishing a manufacturing, executive, and selling organization are sufficiently large that a company in a new industry should avoid unnecessary risks in making things which could be bought. (2) Flexibility is extremely important because of the rapid changes which usually are made in a new industry. Commitments for making may hinder the speed with which new developments can be adopted. On the other hand, the most effective argument for making certain parts is one we have seen before, viz., that they cannot be bought.

Because a company in a young industry usually should not make what it can buy, it does not follow that conversely a company in an old industry has an added reason for making. The point to be recognized here is that the general case for or against making, as presented in this thesis, presupposed a somewhat stable industry. Therefore, if a specific problem arises in a company in a new industry, special care should be taken to evaluate the outside conditions which may change the emphasis to be placed upon certain aspects of the problem. The basic approach to a make or buy problem is the same in an old or a new industry but the relative importance of the various factors may be different. For example, the time during which current conditions of supply and demand may be expected to remain unchanged is undoubt-

edly shorter in a new industry. This does not render useless the scheme of analysis outlined in the preceding chapters of this thesis but does call for added caution in applying it.

Nevertheless, in specific instances, the fact that a company is in an old industry may lead it to make certain things in an effort to find a use for capital which would otherwise be idle or be invested at very low rates. This seems to have been one of the reasons present in some recent mergers such as the purchase by the American Optical Company of the Spencer Lens Company and the merger of the J. F. McElwain Company, a shoe manufacturer, with its retail outlet. While these are consolidations and are therefore beyond the scope of this thesis, they illustrate the point at issue.

Age of the Business

Closely akin to the effect upon make or buy of the age of the industry is the age of a particular business. Although some businessmen do not seem to realize it, businesses age and get old, and this fact frequently has some bearing upon the solutions to specific make or buy problems. It should be obvious here that "old" does not refer alone to the number of years during which a company has been in business, but more specifically to the alertness of the managerial group to the adoption of new ideas. Many companies old in years are young in progressiveness; and others, young in years, are not so young in their ideas.

It is extremely difficult to cite specific examples which actually prove the contention that companies get old in the manner described because the point is necessarily vague. Nevertheless, the Ulman Machine Company² is an example of a company making a decision as it did, partially because it was in old age. The company had capacity in excess of its current needs and hesitated to install new and modern machinery because all its old equipment was of similar construction and maintenance had come to be based on robbing parts from unused machines. Its physical facilities were old; its buildings were located in several adjacent blocks in the middle of a crowded city; and interplant transportation was

¹ See page 34.

² For text of case, see the Appendix, page 120.

poor. The company had neither railroad nor water connections, and all supplies had to be trucked in and all finished products had to be trucked out. Furthermore, the company officials were of the opinion that competitors in the Middle West were better located to serve the industry's largest markets economically. Yet they hesitated to move because the company owned the buildings which it occupied. Is it any wonder then that the company hesitated to make its own dies which required an investment of \$50,000? The company had just grown old and was afraid of taking risks of the sort which in its younger days had made it a leader in its field.

The age of a company affects make or buy decisions in other ways than predetermining, to a large extent, make or buy decisions in favor of taking the course of action requiring the least effort and apparently involving the least risk. The example of the Ulman Machine Company shows conditions as they are rather than as they should be. It illustrates how make or buy decisions are sometimes made partly because of reasons not consciously considered. There is, on the other hand, a way in which the age of a business should rightly affect a make or buy decision. Young companies, just as companies in young industries, are subject to many more risks than better established ones. Frequently their working capital is not plentiful. Any new company faces risks, many of which cannot be foreseen. There are risks of product acceptance; of failure in the manufacturing process; of countless actions and reactions by competitors, by government, and by labor; of purely accidental disasters, etc. These, in many young companies, are sufficient to make it worth while to avoid the additional risks involved in making things which can be bought.

Long-time Trends and Changes

Further outside conditions which have their effect upon make or buy problems are produced by long-time trends and changes. We have already mentioned, in connection with overcapacity, the shift from the use of wood to paper for containers; the Appalachian Tanneries Corporation case¹ reveals a downward trend in the use of patent

¹ For text of case, see the Appendix, page 105.

leather; while all the major oil companies experienced, during recent years, a shift from bulk retailing of oil to the use of tin cans. Trends such as these, based upon gradual and persistent shifts from old to new methods, brought with them changes in specific business organizations. In many instances, they introduced make or buy problems, while in others they conditioned the solution to make or buy problems which arose from other sources.

The Bell Chemical Company,² for example, had built a shook plant in 1905 in order to combat a combination of shook manufacturers. After the end of the first World War, however, the trend to bulk shipments of chemicals and other commodities and also the trend toward the use of paper cartons reduced the importance of box shook. Consequently, the ownership of the shook plant became less desirable.

Similarly, the Tillinghast Company,³ a maker of packaged food, established both its own can manufacturing plant and its own printing plant for printing labels for the cans. About 1939, however, a competitor adopted cans with labels lithographed directly on the metal, in place of cans with paper labels. The executives of the Tillinghast Company believed it was competitively necessary to follow suit and adopted lithographed cans. As a result, the company found itself not only with unused printing capacity but also with can-making equipment that could not be adapted to the production of complete lithographed cans without extensive capital expenditures. It discovered that buying the lithographed cans was cheaper than making them and was forced to operate its can plant at a greatly reduced volume, producing a few cans for a cheaper grade product still marketed in the old style cans.

The experience of these two companies does not lead to any general truths about the relationship between trends and make or buy problems. Yet it does illustrate two important aspects of the relationship which must be taken into account. First, the experiences of each company in the

² For text of case, see Howard T. Lewis, *op. cit.*, pp. 382-390.

³ Fictitious name; company's experience was not written up as a case.

later years show the troubles which may arise from the adoption of a make program which calls for substantial additions to a company's capital equipment. Secondly, it illustrates the fact that the success or failure of a plan should not be judged by its operations in a short period. The facts are not available to prove the point, but it appears as if the successful operation of the shook plant by the Bell Chemical Company during its early days and during the war years was sufficient to justify its construction. The difficulties in the later years may have been due to continuation of the original scheme too long. Sufficient details are not available to judge the early effectiveness of the company-owned can-making and printing plants of the Tillinghast Company. The difficulties of the later years when conditions changed are clearly apparent, just as in the case of the shook plant.

These two business experiences together furnish the basis for the only generalization which seems justifiable: in make or buy problems an attempt should be made to determine the long-time trend changes which might occur and their probable effects on the business.¹ Specifically, a company could outline those future conditions which should call for a review of the original make or buy decision. Thus, if the Bell Chemical Company had consciously reviewed the manufacture of shooks in 1921 as intelligently as it did in 1905, much of its later grief would have been avoided. In making these long-run forecasts, however, it should be remembered that the longer the time involved in a forecast, the more likelihood there is that the forecast will be wrong or that fortuitous events will intervene. Therefore, if long-time trends do not appear favorable, long-time commitments should not be made for the purpose of overcoming current difficulties.

Random Factors

In the nature of what might be called random factors, there are many more outside conditions

¹ Just as there are certain cost data which are too expensive to justify their collection, so also a *formal* study of long-time trends may not be necessary in some make or buy problems. Nevertheless, long-time considerations should always be recognized if only as one of a number of factors habitually affecting executive decisions.

that have their effect on make or buy problems. We shall discuss only two here, however. They are war and political situations. These were chosen because they were discussed most frequently by businessmen who contributed their practical experience to the material for this thesis. Furthermore, while talking about these two, we illustrate the type of phenomena intended to be considered as random outside factors and indicate the way in which other random outside factors might be expected to affect make or buy decisions.

War

The way in which a random factor might become almost of sole importance is illustrated by the impact of the war on America's entire productive system. Even before the United States was attacked, one of the chief effects of the war was a disruption in the source of supply of goods to be purchased. As a result, the question arose as to what substitute sources should be developed: should they be other outside suppliers, or the company's own plant?² A specific example is contained in the case of the Machias Instrument Company,³ whose supply of one part was cut off by the war. As a first alternative, the company tried to develop a domestic source of supply but found none satisfactory, particularly with respect to quality. The company's chief competitor could supply the desired quality and was willing to do so, but the Machias executives were unwilling to depend upon a competitor for supplies.⁴ Consequently, the company embarked upon a make program.

The story of the Machias Instrument Company would be incomplete if the fact were not noted that one additional reason for making was present: the company had recently adopted a general policy of expansion and of making as many parts as possible going into its finished

² This, of course, is only one of the effects of the war which brings day-to-day changes in the problems facing businessmen. Further comment on the relationship of the war and make-or-buy policies is provided in the footnotes on page 89.

³ For text of case, see the Appendix, page 115.

⁴ Comment upon the wisdom of buying from competitors is beyond the scope of this thesis, and involves many considerations about which the facts are not known in the present instance.

product. This policy had been adopted after the company had been taken over by a larger and well-established company in a similar but non-competing line of business. The new relationship gave the Machias company sufficient working capital to follow out such a program. Furthermore, the larger company for many years had operated on a policy of being as nearly self-sufficient as possible, and its ideas were filtering into the Machias organization.

Political situation

The second random factor to be discussed is the political situation. An interesting example is found in the case of the Van Cortlandt Chemical Company.

VAN CORTLANDT CHEMICAL COMPANY

Enlarging Chemical Plant to Make Products Bought Outside

Early in 1940 the Van Cortlandt Chemical Company was considering enlarging its plant facilities so that it would be in a position to make some of the products which it was then buying for resale.

The Van Cortlandt Chemical Company was an old and well-established company. By 1916 it had completed 50 years' experience in the American chemical industry. Although it had engaged in some manufacturing activities, the company until that time had functioned primarily as an importer of chemicals. In order to serve the needs of its customers, it operated warehouses at centrally located distribution points and stocked all the chemicals needed for mordanting, bleaching, and dyeing. From 1906 until the beginning of the World War, the company's volume of business had increased tenfold. Throughout this period the company had specialized to a large extent on potash and soda, America's need for which was supplied almost exclusively by imports. The war, however, from 1914 through 1916 reduced the foreign supplies available and from 1917 through 1919 cut them off almost completely. Prices, of course, rose rapidly. These conditions are well illustrated by the selected statistics given in Exhibits 1 and 2.

In order to meet the shortage in these materials resulting from war conditions, the company in 1916 began the construction of an electrolytic plant for making soda and potash.¹ The first products were made

¹"The term potash has come to include all potassium compounds although the trade still associates the term with the hydroxide and the carbonate of potassium and chemists restrict it to the oxide of potassium (K₂O). . . . Few commercial salts contain this compound; nevertheless, their potassium content is calculated in terms of equivalent K₂O, the standard basis of commercial comparison now in use for all potassium com-

EXHIBIT I
Potash (K₂O equivalent) Produced in and Imported into the United States
1905-1931
(short tons)

| Year | Imported | Produced |
|------|----------|----------|
| 1905 | 129,084 | * |
| 1906 | 155,974 | * |
| 1907 | 144,351 | * |
| 1908 | 136,057 | * |
| 1909 | 173,320 | * |
| 1910 | 279,780 | * |
| 1911 | 274,446 | * |
| 1912 | 253,678 | * |
| 1913 | 270,720 | * |
| 1914 | 207,089 | * |
| 1915 | 48,867 | 1,090 |
| 1916 | 7,885 | 9,720 |
| 1917 | 8,100 | 32,573 |
| 1918 | 7,957 | 54,803 |
| 1919 | 39,619 | 32,474 |
| 1920 | 224,792 | 48,077 |
| 1921 | 70,698 | 10,171 |
| 1922 | 201,415 | 11,714 |
| 1923 | 209,950 | 20,215 |
| 1924 | 200,365 | 22,903 |
| 1925 | 258,217 | 25,448 |
| 1926 | 266,280 | 23,366 |
| 1927 | 244,155 | 43,510 |
| 1928 | 330,493 | 59,910 |
| 1929 | 324,638 | 61,590 |
| 1930 | 342,454 | 61,270 |
| 1931 | 214,785 | 63,880 |

* Insignificant.

Source: United States Bureau of Mines, *Mineral Resources of the United States, 1916, 1921, 1927, 1931, Part II.*

pounds." (United States Bureau of Mines, *Potash*, Economic Paper 16, 1933, page 1.)

"Potassium is important primarily as a plant food and over 90% of its total consumption in the United States is in agriculture. . . .

"The nonagricultural uses of potassium and its compounds although relatively small when compared with the large tonages employed as plant food are nevertheless important and diverse. Liquid soaps, better quality glass, enamels, artificial gems, and certain explosives contain potassium. Potassium salts are also used in matches, in tanning, in dyeing, in photography, in electroplating, and in diverse processes connected with the recovery of metals from their ores." (Ibid., page 11.)

Caustic potash refers specifically to potassium hydroxide (KOH); caustic soda refers to the hydroxide of sodium (NaOH).

The reaction by which caustic soda is formed electrolytically is as follows: NaCl (common salt) in solution with H₂O (water) is broken down by electrolysis and yields NaOH (sodium hydroxide or caustic soda), Cl (chlorine gas), and H (hydrogen). The chlorine and the hydrogen are collected and used either alone or in various compounds formed by adding other chemicals such as iron, antimony, sulphur, etc.

The electrolytic production of potash is similar. The reaction is: KCl + H₂O = KOH + Cl + H.

EXHIBIT 2
Prices of Muriate of Potash¹

| Year | Dollars per short ton |
|------|-----------------------|
| 1912 | \$38.05 |
| 1913 | 38.05 |
| 1914 | 39.07 |
| 1915 | 115.00-500.00 |
| 1916 | 360.00-490.00 |
| 1917 | 325.00-450.00 |
| 1918 | 260.00-350.00 |
| 1924 | 31.095-34.55 |
| 1925 | 34.90 |
| 1926 | 36.40 |

¹ 80% KCl, 50% K₂O.
Source: United States Bureau of Mines, *Mineral Resources of the United States, 1916-1926*.

in 1918 and consisted of chlorine, caustic soda, and caustic potash. The electrolytic plant was of such a nature that the company could produce either caustic potash or caustic soda in any unit. Chlorine was produced from either process. The capacity of the plant was not large enough to supply soda and potash for all the company's regular sales. Having avoided the over-expansion so common in the chemical industries in the days of the World War, the Van Cortlandt Chemical Company, after the war, continued to operate the plant at, or near, the total capacity, making either caustic soda or caustic potash or both. Part of the products sold to the company's customers always consisted of chemicals bought by the Van Cortlandt company from other manufacturers.

In 1940 the company was still acting as a dealer in many of its transactions. Since early in 1939 the company had devoted all its production facilities to the making of caustic potash and was buying all the soda that it sold. The concentration of all its facilities on potash was primarily the result of market conditions in which a ton of potash was about three times as valuable as a ton of soda. Even operating under these conditions the company produced only 95% of its potash requirements and bought the rest. The tonnages of potash and soda sold by the Van Cortlandt company were approximately equal. The company sold many other chemicals, most of which, with the exception of the chlorine, it bought either from domestic or foreign producers.

In the years immediately preceding 1940, potash and soda prices had been steady (see Exhibit 3) and the question arose whether or not the company would be in a better competitive position if it expanded its plant facilities so as to make a greater proportion of all the potash and soda that it sold.

The vice president in charge of production estimated that additional equipment capable of manufacturing the volume of soda purchased in 1939 would cost about \$1,300,000. In 1939 the cost of the soda which the

company bought for resale averaged about 15% above the company's own cost of production when its plant was producing soda. Despite this cost differential, however, he was opposed to enlarging the company's productive capacity. He based his argument upon two external conditions. First, he thought that it would be unwise for the company to invest large amounts of money in additional fixed assets while the country was in what he called "the present unsettled domestic political condition." Secondly, he did not want the company to expand in order to meet war demands that might disappear as quickly as they appeared.

EXHIBIT 3
Prices of Caustic Soda and Caustic Potash
1932-1939

| Year | Caustic Soda | | Caustic Potash | |
|-----------------|----------------------|-----------------------------|-----------------|-----------------------------|
| | Price per 100 pounds | Index of Price (1926 = 100) | Price per pound | Index of Price (1926 = 100) |
| 1932 | \$2.609 | 81.5 | \$0.062 | 87.5 |
| 1933 | 2.762 | 86.3 | 0.069 | 97.3 |
| 1934 | 2.60 | 81.3 | 0.070 | 97.9 |
| 1935 | 2.60 | 81.3 | 0.063 | 87.7 |
| 1936 | 2.60 | 81.3 | 0.063 | 87.7 |
| 1937 | 2.479 | 77.5 | 0.063 | 87.7 |
| 1938 | 2.30 | 71.9 | 0.063 | 87.7 |
| Jan.-June, 1939 | 2.30 | 71.9 | 0.063 | 87.7 |

Source: United States Bureau of Labor Statistics, *Wholesale Prices*, monthly bulletins.

The vice president was also influenced in his reasoning by a long-standing precedent of the Van Cortlandt Chemical Company in not discharging any employees except for personal cause. Even though the volume of business declined during the business depressions following 1929, the company had not laid off any men or cut working hours. For a short time wages were reduced 20% but full pay was subsequently restored. This policy had not been adopted for philanthropic reasons but was considered to be sound business policy. Consequently the company hesitated to expand its plant facilities unless there was assurance of sufficient volume to enable the continuance of the company's policy.

Conversation with the vice president of the Van Cortlandt Chemical Company revealed that the company did not expand and that the principal reason for the decision lay in the company's dislike of the political situation. The executives of the company saw little reason to risk any money in plant facilities when the future governmental regulations were so uncertain and when any profits would be so much diminished by taxes.

Summary

By way of summary, it should be stressed that the points raised in this chapter in no way change the essential type of analysis which should be made of every make or buy problem. Make or buy problems should be attacked as already outlined in the previous chapters. The external conditions, such as those discussed in this chapter, are extremely important, yet change, at most, only the emphasis to be placed upon the various arguments. Decisions that were made solely on the basis of the external conditions would undoubtedly be based upon incomplete evidence just as would those which were made without giving any consideration whatsoever to external conditions.

The principal difficulty, therefore, in considering external conditions and their relationship to make or buy decisions is to give them their proper weight. This can best be done if they are considered, not as additional arguments, but as peculiar circumstances affecting the force of fundamental arguments. This procedure calls for keen judgment about facts the exact nature of which it is difficult to learn and the implications of which are many and far-reaching. No general rules for weighing external conditions properly can be laid down, but the following points may be culled from the cases discussed:

1. The bearing of external conditions upon the make or buy problem should be consciously rec-

ognized and given consideration. The executives of Ulman Machine Company, for example, were unaware of the fact that managerial senility had much to do with their final decision.

2. The real relationship of the external conditions should be thought through and not be allowed to affect decisions on the basis of sentimentality. In part, at least, the fear of political uncertainties in the case of the Van Cortlandt Chemical Company was based on a general dislike of the New Deal, rather than any logical analysis of future conditions.

3. Specific attention should be given to the length of time during which the external conditions will continue to exert their effect. This is particularly true of competitive conditions which may change rapidly, and which are also frequently affected by any action which a specific company may take. It is obviously unwise to take permanent steps to meet only temporary conditions.

4. Especially when a make or buy decision is made principally in an attempt to meet external conditions, such as in opposition to a monopoly, long-time forecasts should be attempted so that further action may be taken when the conditions which led to the first decision have changed. Even if accurate long-time forecasts are impossible, definition of the kind of future changes which should be met with action are possible and extremely helpful.

CHAPTER VIII

MISCELLANY

Growing out of the discussion of the problems of make or buy are several miscellaneous topics which, although they are sufficiently close to the main topic to deserve some consideration, do not fall in the main division of the subject. They form the subject matter of this chapter.

Cooperation with Supplier

In the chapter on quality, the suggestion was made that sometimes, when the desired quality could not be purchased, cooperation with the supplier rather than making was the best procedure. Such cooperation could, of course, be used as a remedy for almost any deficiency in a procurement situation. In other words, cooperation with suppliers offers a course of action whereby existing circumstances can be consciously changed. It is important to consider the possibility of such action in connection with make or buy problems because frequently "existing conditions" are advanced as demanding a make policy.

In the course of gathering the material for this thesis, three specific cases were found where companies tried cooperation with the supplier as an alternative to making when purchase conditions were not satisfactory. The fact that only one of the efforts was successful does not, in itself, rule out cooperation as a substitute for making. Cooperation is a possibility which always should be considered.

The first instance, an unsuccessful attempt, is described in the Hartkey Company case.

HARTKEY COMPANY

Making Rubber Parts to Attain Quality

The Hartkey Company was organized in 1920. During the succeeding 10 years it had built up a substantial business in the manufacture of testing and control instruments for one special kind of work. These instruments, which were sold to industrial companies, were not protected by patents. The prod-

uct was so well fitted to the particular need for which it was designed, however, and the company had served its customers so satisfactorily that the Hartkey Company had surpassed all competitors. Moreover, its product was one that modern industrial methods and, in some cases, state laws had made compulsory for certain types of operations. The company had always devoted a great deal of attention to keeping its product abreast of the latest developments, and its annual research expenditures, as a percentage of sales, exceeded those of several of the country's largest corporations which were famous for extensive research.

The product made by the Hartkey Company was a combination of metal, moulded plastic, and rubber parts, all of which had to function under difficult operating conditions. Failure of any one part frequently caused losses far in excess of, and out of proportion to, the cost of the part. Consequently, within reasonable limits, the selling price of the product was not of primary importance. One problem which the company had encountered from its beginning was the procurement of rubber parts of a quality able to stand up in use.

For the first few years of its existence the company had acted solely as a designing and selling concern. It designed its own products and then had them made to its specification by outside suppliers. As the business grew, however, a plant was constructed, and the company began in 1923 to make its own products. For the first two years its manufacturing activities were concentrated upon assembling the products made from parts which were purchased outside. Gradually the company began to make the metal and moulded plastic parts in its own shops, and by 1930 it was manufacturing all except the rubber parts, which were still being purchased from various rubber companies.

From 1920 through 1930 the company was constantly endeavoring to secure better rubber parts from the major rubber companies, but without much success. The type of service performed by the instruments was of such a nature that failure while in use was extremely costly. Most users, therefore, made regular tests of the parts to see that they were in satisfactory condition; tests were made periodically, even when the articles were not in use. These tests had revealed that the rubber parts needed replacement frequently; hence customer complaints were not uncommon, even though no better products were available from competitors of the Hartkey Company.

A study made by the president of the Hartkey Company in 1932 revealed that the rubber companies were receiving what he considered very good prices for the

parts. He compared the cost per pound of raw rubber with the cost per pound of the products the company was buying and discovered that in almost every instance the company was paying at least ten times as much per pound of rubber parts as the price per pound of crude rubber, and that in one case it was as high as 15 times. He believed that in return for such substantial margins the rubber companies should have made a product of more suitable quality than he was receiving. It was his opinion that the rubber companies were not willing to devote much attention to his demands because measured in number of tons his business was unimportant to them. He believed, however, that the rubber companies should consider it worth while to make a profit on the few pounds which, if the quality was satisfactory, the Hartkey Company was willing to buy at a good price, rather than to take losses by selling large tonnages of rubber as tires at prices under cost.

In the middle of 1933 the Hartkey Company engaged the services of Mr. Bower, a technical rubber man who had formerly worked with one of the major rubber producers from whom the company had bought some of its parts. His task was to analyze the company's rubber requirements and discover possible ways of improving quality. After Mr. Bower had been with the company for several months and had studied its needs, he was convinced that the quality of rubber desired could be attained. The president thereupon sent Mr. Bower to the rubber company from which the Hartkey Company was then buying its parts, in a final attempt to persuade that company to devote some of its research facilities to the Hartkey Company's requirements. When the rubber company refused to make any definite commitments about its research activities, Mr. Bower wired the results of his mission to the president, who immediately decided that the only alternative was for the Hartkey Company to make its own rubber parts. The sales manager of the rubber company was openly skeptical of the Hartkey Company's ability to make satisfactory rubber parts.

The president of the Hartkey Company carried out this threat, however. In the course of three weeks he had purchased and installed in available space in the factory rubber-making equipment sufficient for the

company's needs and had bought a supply of raw rubber. The Hartkey Company produced its first rubber part early in 1934, less than one month after the decision to enter the business.

The company had been able to secure in Akron secondhand rubber-making equipment, which was practically new, at about 10% of its original cost. Within a year, the company was producing rubber parts that were superior in quality to those it had been purchasing. Almost literally, cost was no object. Conversation with several customers had indicated that they would be willing to pay even twice as much for the rubber parts as they had in the past, provided that the quality was satisfactory. Nevertheless, the company's costs were never far in excess of the former purchase price, and were frequently less.

Exhibit 1 gives a cost comparison which indicates, for selected parts, the relation of the company's costs in 1937-1939 to the former purchase price. The manufacturing costs shown in the exhibit include a full allowance for the company's overhead expense. Test calculations indicated that the cost of rubber parts, as a percentage of final selling price, ranged all the way from 8% to 40.5%, but no attempt had been made to gather this information for each rubber part.

As is shown in the exhibit, the last purchase of a rubber part was made in 1934. Since that time, the Hartkey Company had asked for no more quotations on rubber parts, because its own product was entirely satisfactory. No cost figures for earlier years were available. Even though the figures in Exhibit 1 were not strictly comparable, the president believed they gave an accurate indication of the company's rubber-making success. In the course of its history, the rubber department had met successfully the company's quality requirements, and had developed some very complicated moulded rubber parts that were superior in design to those that had been obtained from the rubber companies. Life of the rubber parts in use had been considerably extended and customer complaints were practically eliminated.

The crude rubber purchases by the Hartkey Company from 1934 through 1939 are given in Exhibit 2. The increase during these years was caused not only by a larger volume of sales of the original products

EXHIBIT 1

HARTKEY COMPANY

Manufactured Costs of Selected Rubber Parts Compared with Cost When Last Purchased

| Part Number | Period during Which Part Was Purchased | While Purchased | | While Manufactured * | | | Average Number Used per Year |
|-------------|--|-------------------|------------------------------|----------------------|---------|---------|------------------------------|
| | | Average Unit Cost | Average Number Used per Year | Unit Cost | | | |
| | | | | Minimum | Maximum | Average | |
| B-747 | 1928-1930 | \$2.00 | 389 | \$0.776 | \$1.17 | \$1.00 | 440 |
| C-172 | 1932-1934 | 6.00 | 763 | 4.34 | 7.67 | 6.55 | 1,729 |
| Q-793 | 1932-1934 | 5.25 | 420 | 4.25 | 7.28 | 6.25 | 153 |
| H-023 | 1930-1932 | 0.166 | 2,167 | 0.0546 | 0.0981 | 0.071 | 5,013 |

* Data for the three-year period, 1937-1939.

but also by the introduction of new products in which rubber parts were used.

EXHIBIT 2
HARTKEY COMPANY
Crude Rubber Purchases
1934-1939

| Year | Number of Pounds |
|------------|------------------|
| 1934 | 17,257 |
| 1935 | 25,623 |
| 1936 | 34,066 |
| 1937 | 41,787 |
| 1938 | 37,538 |
| 1939 | 50,804 |

It can be seen that in the Hartkey Company the personality of the president was a dominating factor in all decisions. Once he decided to do something, things happened in a hurry. It took less than a month for a company whose experience had been in metal and plastics to produce rubber. He was an impatient man and was unwilling to "waste" time looking for someone to devote some attention to his rubber needs. From what is reported, he apparently tried to get the rubber only from the larger companies and did not try to develop satisfactory relations with smaller concerns.

We have not the facts to judge whether another man could have negotiated successfully with other sources of supply. Nor can we deny that sincere efforts at cooperation failed in this instance. Yet, this does not seem to be a severe blow to the theory of cooperation. It is unusual that a relatively small manufacturing concern assembling instruments made chiefly of metal and plastics can outdo the efficiency of the rubber companies in making rubber. It is probably also true that in the years after this company installed its own rubber-making equipment the rubber companies have recognized the possibilities of developing accounts of such a nature and have been doing a better job of specialized research than they were doing at that time.

The second instance of cooperation between a purchaser and a supplier was related by the president of the Reese Company,¹ a large shoe manu-

¹ Fictitious name; company's experience was not written up as a case.

facturer. He was unwilling to invest money in a plant for making upper leather, principally because tests showed that the shoe factory as it was then constituted could use only about 45% of the upper leather produced by an efficient tannery. Furthermore, although he watched the hide market closely, he believed that the Reese Company would be unable to compete with leather dealers in disposing of the portion of the leather which his company would be unable to use. Yet, the quality of the leather which the company was buying was unsatisfactory in several minor ways. One of these, for instance, was that the size of the hides was such as to make it impossible to prevent large amounts of waste. When he asked the leather companies to cut the hides to different sizes, he received what apparently was a typical answer in that business. They told him that what he had been buying was a standard size and that they did not intend to change it. Whereupon the president of the Reese Company went to a smaller tannery and explained his requirements. The smaller manufacturer willingly cooperated so that as a result: (1) the Reese Company was able to cut down on waste and reduce expenses; (2) the leather manufacturer developed ways of making the new sizes which were cheaper than the old and he saved money, too. This was what one of the cartoonists used to call "the beginning of a beautiful friendship," industrially speaking. Working together the two companies developed many mutually advantageous arrangements, not only with respect to the product itself, but also with respect to production schedules and delivery dates.

The third illustration comes from the Carrigan Manufacturing Company, which we have already examined in some detail.² The purchasing officer of the company had tried all sources of supply without success. An illuminating fact, however, is buried in the statement that, even after the company had developed its own method of producing a satisfactory compound, the purchasing officer did not believe that any supplier would be willing to carry sufficient stock to assure proper seasoning. This means that the type of supplier was not

² See page 34.

reliable. The relative ease with which the company produced a quality which it was unable to buy from people engaged in the manufacture of compounds sheds further light on the type of supplier with whom the company was dealing. Compound makers from whom the company had been buying were apparently small artisans who had been making compounds for years and had neither the capital nor the initiative to change their methods.

The nature of the suppliers with whom the purchasing officer of the Carrigan company was forced to attempt to cooperate explains in large measure the reason for the failure of the cooperative method of solving the company's problem. Even that, however, does not destroy all evidence that further cooperative effort would have been helpful to the company. For, at some later date, the company was able to buy grinding compounds of a satisfactory quality at apparently less cost than making them. What brought about the change in the nature of the suppliers? Could the Carrigan company have done more then it did to speed the change? We cannot answer these questions, but they do suggest lines of thought which might open up further ways in which cooperation with the supplier might have offered a better solution than making.

So far as the discussion of the Carrigan Manufacturing Company is concerned, the question of whether it should have tried further cooperation is somewhat academic. Since setting up the buffing compound department involved little expense, the company was probably well justified on a cost basis for making the compound until such time as outside suppliers became reliable.

In advocating the advantages of cooperating with suppliers or potential suppliers, one should not lose sight of the fact that such a course of action requires time and costs money. In many instances, too, its probable effects may be less predictable than the effects of making. Thus, while cooperation with suppliers has real advantages, they must not be presumed to be free of cost. The chief point to be derived from these examples is the realization that cooperation with suppliers or potential suppliers offers an alternative course of action frequently well worth investigating.

Part or All

Reference was made in the first chapter to the fact that making and buying were extremes and that in reality there were many in-between stages. Yet during the main discussion this point usually was disregarded and the arguments were presented as being for or against either making or buying. Now that we have seen these arguments, it is well to turn some attention to the in-between stages. The question arises most frequently as the problem of whether a company, once it has decided to make, should make only part or all of its requirements. The arguments can be stated briefly, and usually appear to present a dilemma. The reasoning runs somewhat as follows:

1. If a company arranges to make all of its requirements, even at peak times, it will obviously have unused capacity at off-peak periods. The result of idle capacity is usually claimed to be high costs, partly from unabsorbed burden charges during off-peak periods and partly from inefficient production under conditions of low volume of production.

2. On the other hand, if a company arranges to make only part of its requirements, it has to purchase the remainder from outside suppliers who may be none too well disposed toward a company that has invaded their field.

In general, this program can follow three different courses. These are:

- (a) The company can make less than the smallest amount ever needed,¹ and thereby continue always to buy part of its requirements and retain its contact with the market.

- (b) The company can make less than the normal amount needed.² This means that except in extremely inactive times the company will be buying some of its requirements, and thereby retain its contact with the market.

- (c) The company could make its normal requirements. Under this program the company normally would not be buying any of its require-

¹ Obviously, if at times the company's requirements are zero, it will make nothing at all under this program, and the company would have no "part or all" problem.

² By "normal" amount is meant that range of quantities used by the business when its activity is neither unusually good nor unusually bad.

ments and would enter the market only when activity is above normal.

Each of these three forms of making only part of the amount required is claimed to have serious disadvantages. The first form frequently may not allow the company to secure the real advantage sought by making, especially if the volume is so small as to make operating economies difficult to attain. The second method leads a company to desert its faithful suppliers when they need customers most, i.e., during business depressions when the company would be in a position to make all it needed. It is likewise claimed that the suppliers in retaliation may refuse to sell to the company at a later date when they may be required. The third program is claimed to lead to difficulty because, so the story goes, all suppliers, being busy just when the company wants to buy, will not be interested in the company's business because they, being grateful for past favors, will faithfully serve their regular customers. Thus, when the company needs a supply most, no supply will be available.

Specific examples

Before attempting to generalize about the problems of making or buying part or all, let us first examine some of the experiences of companies which have followed the various policies of partial making outlined above. No complete cases are available, but individual experiences will suffice.

The Frawley Company,¹ a large manufacturer, it is reported, processes about 70% of the most important material going into its finished product even though many efficient suppliers of that material are available.² The Frawley Company is, therefore, in the market for part of its requirements of processed material. This does not mean,

¹ Fictitious name; company's experience was not written up as a case.

² The company does not own the source of its materials but buys them at an earlier stage in their preparation than is common among similar organizations. The product is not commercially useful in the form in which it is bought by the company and must be further prepared for use. There are many companies in the United States specializing in the preparation of the material which is used in industries other than that in which the Frawley Company is engaged.

The product cannot be named specifically without revealing the source of the information. In order to distinguish between the two stages in which it can be bought, the material will be referred to as the unprocessed and the processed.

as might be inferred from 2b page 86, that the company is in the market for 30% of its requirements at any one time. On the contrary, it is able to draw upon its own resources at some times so that for short periods it can furnish 100% of its requirements. It uses this flexibility to help obtain the rest of its requirements at the most favorable prices. This can be accomplished in two ways. First, at times when prices from outside suppliers are high, the company attempts to be as nearly self-sufficient as possible. Conversely, it purchases freely at those times when the market is low. Secondly, the company uses its own processing costs as a standard by which to judge the fairness of prices quoted by outside suppliers.³

But what has this company done about the objection that such a company would not be able to buy at a time when everyone else is buying? The president of the Wurgess Company,¹ one of the country's largest companies engaged solely in processing the material, said that he was always glad to sell to the Frawley Company because it gave specifications early, paid promptly, and never cancelled an order. In other words, from many points of view the Frawley Company was a more desirable customer than the so-called regular customers.

On the other hand, the Marlowe Company,¹ another manufacturer in the same business as the Frawley Company, is reported to have sufficient capacity to process all of its normal requirements. The result is that the Marlowe Company does not obtain, to so great an extent as the Frawley Company, the benefits described above and, consequently, may have slightly higher material costs because of its larger capacity for making.

One great advantage not yet mentioned with respect to each of these companies is the great efficiency and the actual low-cost operations of their facilities. Both, as we have seen, process only a portion of their total requirements and consequently are able to operate their processing plants at 100% of capacity regularly. The result is that the overhead is most efficiently absorbed

³ Depending upon the ethical standards of the individual circumstances, a company's ability to make part of its requirements can be used as a "standard" to judge the fairness of prices quoted by prospective suppliers, or as a "club" to beat down the quoted prices.

by the largest possible number of units. Thus, when they say that they can produce at a cost below the price asked by an efficient independent manufacturer, they are correct. But, from an economic standpoint, the costs of the independent processor are justifiably higher because such a processor, unlike the company-owned plants, has to bear the fluctuations of volume. In fact, these fluctuations in volume are accentuated by the existence of company-owned plants like those of the Frawley and Marlowe companies because those companies make no purchases whatsoever at times when all their requirements can be produced in their own plants. It seems, therefore, that a supplier furnishing the extra material over and above a company's capacity to meet its own demands is rightfully entitled to a price higher than the costs in a plant run at 100% of capacity. The independent manufacturer is performing a service in being available to furnish the fluctuating requirements above the company's capacity. It should be paid for such services.

The nature of the product under discussion leads to one disadvantage in the program of the Frawley and Marlowe companies. The process by which it is prepared is much like the refining of petroleum where numerous end products are derived. The proportions may be varied somewhat by exact control; nevertheless, many products result. The companies, therefore, produce some grades and types of material which they cannot use. The Frawley Company gradually established new manufacturing units to make use of the other materials; the Marlowe Company sells them in the open market. Either program has possible disadvantages. The first might put a company in a manufacturing field where it is not well qualified to compete. The second puts the company in a market where it is not well trained.

A third manufacturer, the Clanford Company,¹ in the same business as these two, has not begun to process any of the materials required. The company's president commented on this fact by saying that he was not a merchant of materials but of manufactured products and that in all probability he would not be able to compete with

¹ Fictitious name; company's experience was not written up as a case.

the specialized merchants in the material market. These merchants have become accustomed to operating in a market that is notorious for its small margins. Frequently, then, for ordinary manufacturers in the business being discussed here, the loss on the sale of the by-products might easily offset any apparent saving on the cost of the main material.

Further attention should be given to the argument that companies making part of their requirements may be unable to purchase freely any additional amounts they need. The experience of the Frawley Company and its ability to purchase from the Wurgess Company do not constitute the only evidence that has come to light. It is, however, more specific than some other incidents but not fundamentally different. None of the business executives from whom information was received gave any indication that his company had experienced difficulty in buying in the open market articles which the company itself was equipped to produce.

There is little wonder that a supplier would not refuse to sell to a company that paid promptly, gave instructions in a manner calculated to lower production costs, and never cancelled contracts in a time when all too many customers acted in just the opposite manner. In fact, if it were typical for companies to pay promptly and not cancel contracts, there is little likelihood that an executive would mention that one company did these things. The mere mention of the fact proves that it was unusual. Finally, it is well to remember that there was absolutely no necessity for choosing among customers.

Would the situation be changed, however, if business activity was booming? If all companies were producing at or near capacity, would those equipped to produce part of their requirements be able to buy the remaining portion? The answer, as far as current experience is concerned, is mere speculation because during the 1930's, the period covered by cases for this analysis, such conditions did not generally exist.² For the present we can

² It is probably at this point in the argument of this thesis that the incidence of the war production program is greatest. For, in many instances, business activity has not only assumed boom proportions but has gone beyond that to the emergency stage. The problem in many companies and in many industries

only ask ourselves: "If I were a supplier who had more orders than I could fill, how would I allocate available production? Would I fill all orders from customers who had been buying from me in the past two, five, or ten years and refuse all others? Would I prorate the supply in proportion to total orders regardless of whether the orders are from old or new customers? Would I consider an old customer who frequently cancelled contracts and paid late as more desirable than a large company that would pay promptly but had not purchased

has been to expand production from a level far under normal capacity to a rate much in excess of normal capacity. Naturally, under such circumstances, there have been bottlenecks with respect to the availability of supplies. The airplane industry, for example, found it impossible to expand sufficiently its facilities for making parts and has adopted wide-spread use of subcontracting, whereby it buys rather than makes parts for a quantity reason, viz., to get parts when it needs them.

In some respects, cost has become a less important argument than would be true in more normal times. Under the extreme pressure to produce, the nation has to a certain extent adopted the attitude of: Get out the production with all possible speed regardless of cost. This, of course, is never completely acceptable. Costs are never completely disregarded, but the changing emphasis has in reality softened the insistence which is usually put upon the cost argument. There is, of course, one further explanation of the relaxation of scrutiny of costs on the part of individual businessmen. They are primarily in business for profit and in ordinary times must watch costs closely to obtain a profit. In the present emergency, however, it is the people who are demanding production and it is the government which has waived the importance of cost, inasmuch as the government buys most of the goods at a price sufficient to cover the extra costs. This statement is not intended to indicate in any way that the businessman is attempting to profit unduly from the emergency. On the contrary, it is intended to suggest that businessmen, because of their long-standing habit of watching costs carefully as a means of obtaining profits, might be less likely to relax the examination of costs than a government intent upon winning the war.

Another aspect of make or buy raised by the war program is important. The method of analysis suggested in this thesis was intended for individual businessmen meeting their own problems. The problems of national defense are necessarily on a national basis, and the use of materials throughout all industry is important. Thus, from an ordinary business point of view, there is little to affect the public interest if, for example, the Minthorne Company decided to abandon its nitric acid plant. In times of emergency, however, that change might withdraw essential materials from industries engaged in war production work. To meet such conditions, priorities are being evoked which reduce, to a large extent, the freedom of choice which has been presumed to exist for companies facing a make or buy problem. Priorities could affect a make or buy decision in either way; a company might be unable to attain materials necessary for making a specific product and therefore be forced to buy it from someone who could; or the company might be able to attain priorities for materials going into a product but not for the product itself and thereby be forced to make. Thus, in their extremes, priorities might be used by the government to force companies to make those things which the government deemed advisable.

anything recently because it made part of its own requirements?"

The other side of the argument may be summarized in the question: Would a company that was able to produce part of its requirements be better or worse off during boom days when supplies from outside sources were scarce than a company that had always bought 100% of its requirements? The implications are these: (a) would the company that was able to make part of its own requirements be able to buy additional parts; and, (b) would the company that had always bought its requirements be sure of a supply?

The supplier from whom the companies wish to buy holds the solution to these questions. As we have seen, however, his answer is very indeterminate as must needs be anything depending upon future possibilities. Raising these questions shows, however, that the problem of making part or all has a definite relationship to business activity. A source of supply for additional requirements fails to become important with most companies making part of their requirements, until business assumes boom proportions. Even then, however, the actions of suppliers are not predictable.

In all this discussion no reference has been made to price because it was assumed that the suppliers' prices would go up as demand stiffened. It is altogether conceivable that a supplier would solve the problem by raising prices high enough so as effectively to apportion the product to only those who could afford to buy it. With the recent trend of legislation enacting fair trade and price control laws, this seems a little improbable. It does, however, suggest one further comment. Is there any good reason why an individual company necessarily need expand along with the boom in general business? Perhaps the company which is equipped to produce part of its normal requirements would be better off if it did not make any heroic struggle for more supplies by paying extraordinarily high prices or by adding to its facilities, but, instead, continued along at its old (or slightly reduced) volume, making somewhat increased profits because of higher prices and keeping itself in a very satisfactory position for retrenchment when the business reaction came.

If it is true, as these experiences seem to indi-

cate, that a company's source of supply probably will not be seriously hampered by making some and buying some of its requirements, what then are the deciding factors? Fundamentally, the decision to make part or all should be made upon the basis of the same evidence as a decision to make or buy. In other words, the same arguments that suggest a make decision should also suggest an answer to the problem of whether to make all or only part of the requirements. Thus, for example, if a company decided to make a product because the proper quality could not be purchased, presumably all would have to be made. It is inconceivable that, when the Carrigan Manufacturing Company decided to make its own buffing compound because of the poor quality available elsewhere, it would make part of its requirements and continue to buy buffing compound of inferior quality. On the other hand, if quantity considerations led to a decision to make, the exact nature of the situation would govern. If, for example, by providing a reserve stock or by stimulating suppliers to do a better job, the installation of some auxiliary capacity by a using company would solve problems arising because deliveries by existing suppliers were unsatisfactory, only part might be made; while, if satisfactory delivery could not be obtained under any circumstances from existing suppliers, all would probably be made.

Finally, let us assume that cost was the main-spring of a decision to make. Then the main problem would probably center around the balancing of the cost of production against the cost of buying at various volumes. The possible reactions of suppliers might well be different at various stages of self-sufficiency on the part of the company making the decision. For example, if the loss of supplier goodwill results in the inability to buy parts when they are needed during boom times, additional costs may arise if only normal requirements are made, and it may be necessary to make all. On the other hand, if the capacity to make only part of its requirements gives a company an effective bargaining position so that suppliers' selling prices are kept in line, making all will not be necessary to attain the desired cost benefits.

Closely akin to the problem of part or all with respect to quantity, is part or all with respect to the operations performed. The Hopkins Electric Company,¹ for example, bought steel and had it fabricated by outside fabricators, rather than making or buying certain steel pins. Such half-way measures should also be solved on the basis of the fundamental arguments, as already discussed in the previous chapters. In other words, the make or buy problem is narrowed from "Shall we make or buy this pin?" to "Shall we make or buy the fabrication of the pin?" The final solution is that one which will bring the best results to the business as a whole, and that solution can be found by application of the methods already discussed.

In this connection, however, two points should be mentioned. First, as the illustration in the case of the Hopkins Electric Company brings out, the precise physical unit originally thought of and discussed is not the only unit that could be made or bought. In almost every case mentioned in this thesis, some other unit, closely akin to the one actually described, could have been the subject of the make or buy problem. For example, as an alternative to buying finished grinding compounds, the Carrigan Manufacturing Company considered buying mixed compounds and aging them itself; the Ulman Machine Company, instead of buying dies, could have furnished the steel and had the dies made therefrom; and the issue in the Kirwood case was fundamentally one of how far to go towards the manufacture of cartons. The company already had taken one step in that it bought blanks and folded its own boxes; it was contemplating buying paper and cutting its own blanks; logically, the next step would be to buy pulp and make paper. Each problem, however, should be solved on the basis of the same fundamentals already discussed, viz., quality, quantity, costs, and outside conditions.

The second point to be mentioned in connection with measures between the extremes of making and of buying is a warning with regard to the incidental problems that might arise. The Hopkins

¹ For text of case, see Howard T. Lewis, *Problems in Industrial Purchasing* (2d ed., New York: McGraw-Hill Book Company, Inc., 1939), pp. 417-423.

company found that the control of waste became much more difficult when it bought material and had it fabricated outside than when it bought fabricated parts. The moral, of course, arises from the fact that the program involved a new kind of cost which the company was unable to foresee. Consequently, the original decision was based on erroneous cost estimates. This example should serve as a notice that the difficulties of forecasting the way in which halfway measures for making will operate are greater than those encountered in the more common make or buy problems.

Executive Problems

In addition to the aspects of make or buy which have already been discussed, there are interesting and important executive problems. In many respects these executive problems are not peculiar to make or buy decisions but are common to many business decisions. For this reason, full treatment cannot be given here to the executive implications of the make or buy problems which are properly the subject of another complete study. Because of the importance of these executive problems, however, it is necessary that they should be mentioned so that their existence will not be overlooked. With reference to make or buy, the most important executive problems are:

1. How does an executive know when a problem exists?
2. Who has authority to make the necessary decisions?

How is a make or buy problem discovered?

With respect to the first question, the research for this thesis revealed that there were three common ways in which the make or buy problems came to the attention of the management. The first was accidentally; the second, through an emergency; and the third, through planning. In the Gibbs Company,¹ for example, a buyer in the company's purchasing department happened to discover that the company could buy a forged part much cheaper than it was making it; in an-

¹ For text of case, see Howard T. Lewis, *Problems in Industrial Purchasing* (2d ed., New York: McGraw-Hill Book Company, Inc., 1939), pp. 403-407.

other company, the purchasing officer happened to be walking through an operating department on a day when it was not operating to capacity and suggested that something then being bought could be made in that department. Both of these instances, and many others, were more or less accidental. On the other hand, emergencies of various degrees of importance brought the problem to the attention of the Machias Instrument Company,² the Van Cortlandt Chemical Company,³ and the Shipton Manufacturing Company;⁴ while, to some degree, planning was at the foundation of the study made by the Cosgrave Paint Company⁵ and the Ulman Machine Company.⁶ Obviously, the third method, that of planning to meet problems before they reach the emergency stage, is most desirable. The methods to be adopted, however, depend to a large extent on organization, policies, and management techniques previously established. Discussion of these is, of course, beyond our present purposes.

As a corollary of the problem of knowing when a problem exists, arises the question of how often a given make or buy decision should be reviewed. It will be noted that make or buy problems almost always are in the nature of a review of a previous decision. Sometimes that previous decision may have been made without conscious thought having been given to it. Nevertheless, in almost every case a previous decision to make or to buy had been made. In all the instances cited with reference to the discovery of make or buy problems in the previous paragraph, only one, the Ulman Machine Company, did not involve a review of a previous decision.

Fundamentally the problem of reviewing decisions is similar to the one of discovering when make or buy problems exist, and any routine that is established for bringing up previous decisions for review should fit in with the general executive scheme and organization. It should be clearly recognized that except in unusual instances a decision to make or to buy does not establish any

² For text of case, see the Appendix, page 115.

³ For text of case, see page 80.

⁴ For text of case, see page 25.

⁵ For text of case, see the Appendix, page 107.

⁶ For text of case, see the Appendix, page 120.

time limits or other automatic signal to call attention to the fact that the original decision should be reviewed. Consequently, any rule-of-thumb method — especially one based on the expiration of a predetermined amount of time — for bringing decisions up for review could not be completely satisfactory. In general, the best method is probably a periodic review of the results obtained as compared with the objectives sought at the time the original decision was made.¹

Apart from the technique of how the decisions will come up for review, however, there is one important fact to note *before* any decision is made: once a decision has been made, adoption of another course of action becomes harder. This is especially true after a decision to make has become effective, as is illustrated by the Creely Company.² The purchasing officer of that company admitted that the company had continued to do its own printing long after the facts warranted, principally because of a sentimental attachment to the idea.

Who has authority to make the necessary decisions?

The second executive problem outlined above was the question of who has authority to make the necessary decisions. It is likewise unnecessary in this thesis to give a precise answer to that question because we are interested principally in *how* the decisions should be made, not *by whom*. It is sufficient to mention, therefore, that make or buy decisions, by their very nature, deal with three functions of a business: namely, procuring materials, working upon them, and the broader executive problem of establishing the scope within which a particular business is to operate. It would appear, therefore, that none but senior officers would possess the broad authority required. It might be argued, therefore, that either a committee of the interested executives or one higher coordinating executive would be responsible for make or buy decisions. This would imply that in most instances a purchasing officer alone would not have authority to make the decision.

¹ Once again it is well to note that such comparisons must be made carefully to avoid the rationalization that can easily be accomplished by adjusting cost figures.

² For text of case, see page 27.

This thesis has not entered upon a complete discussion of the question of who should make the decisions because that problem is more directly linked with problems of executive responsibilities, business organization, and policy formation than with the issues of make or buy. Before dismissing the topic, however, two observations might be made. First, like all management problems, make or buy problems may be broken down into parts and authority delegated among various executives. Obviously the committee of executives or one coordinating executive, as suggested above, would be required only when fundamental make or buy issues are being decided; many of the more routine decisions may well be made by individual executives in the lower ranks provided those decisions are within broad general limits set up by higher executive authority. Secondly, as in any problem of organization, personalities are extremely important. Consequently, any generalizations must be interpreted in terms of the man who will be acting and who will, in one sense, be making the generalizations real. For example, some purchasing officers are extremely able and forceful men; such men may well assume coordinating executive duties frequently not associated with their position and thus be the logical ones to reach make or buy decisions. On the other hand, some men with the title of purchasing officer may be little more than order clerks. As such, they may not even be consulted about matters of policy, such as make or buy problems.

Company's General Attitude toward Make or Buy

Just as businessmen should recognize that reversal of decisions once made is difficult, so also should they realize that their own general attitude toward making or buying may condition the decision that will be arrived at. All the arguments listed for or against making in the previous chapters were based upon the assumption that the reasoning would be purely objective, and that each case should be decided upon its merits. The point to be noted here, however, is that such is not always true. The Shipton company,³ for instance, had adopted a policy of making everything that it

³ For text of case, see page 25.

could, while the Mills Company¹ "had followed a policy of manufacturing only the major items it distributed." Consequently, such companies adopt an attitude that *unless* it can be proved that the policy should be changed in particular instances the established policy will prevail. That is what actually happens in many instances. In this thesis, however, we are more concerned with what *should* happen rather than with what *does* happen, and it is for this reason that we must recognize as a factor, to be considered in specific make or buy problems, the predisposition to make or to buy.

Mention of the fact that some companies are predisposed toward making or toward buying does not necessarily indicate that their basic policy is wrong. It only means that such companies *may* be inclined to overlook certain arguments, either consciously or unconsciously, as a result of having the policy. If the basic policy was adopted after reasoned thought had been given to the subject, it is very probable that much of the basic work necessary for solving make or buy decisions had been done and that, as a result, the additional analysis of each specific problem could be much less extensive than it would otherwise be. On the other hand, if the policy was adopted on emotional grounds, such as to satisfy someone's pride so that he could claim that the company was practically self-sufficient, the specific decision which is affected by the policy might be, and probably would be, based on false premises.

General Economic Effects

No discussion of miscellany in connection with make or buy would be complete without mention of an argument that is frequently raised in theoretical discussion, but is rarely used in any specific company's problem. The *N.A.P.A. Handbook*, for instance, lists as one of the arguments against making:

A somewhat intangible but probably important effect upon the general economic situation which, after all, is one of interdependence. It is doubtful in some cases, at least, whether interference with the profits of other companies which are potential vendors does not, in the long run, react upon the profits of the customer company. Certainly, if we carry this policy to any such

logical but impossible conclusion as to have each company entirely independent of all vendors and entirely self-sustaining, we should have a marked effect upon the volume of trade generally which could not help but be inimical to the prosperity of all.²

The argument as stated seems to be based on either or both of the following premises:

1. Trade, in itself, is of benefit to society.
2. A make policy eliminates profits which are desirable to business in general.

Both seem to be false; or, at most, not necessarily true. Trade is merely a method of exchanging goods among people who have excesses of one kind of goods and deficiencies of others. Trade is accomplished by buying and selling. When there was no specialization and every family was self-sufficient, there was no necessity for buying and selling. For, as Sumner Slichter puts it, buying and selling is the method by which many specialized individuals cooperate with each other in producing useful articles.³ A man (or a factory) which makes only welts for shoes must cooperate with others who make shoes. Rather than having the cooperation regulated by omniscient laws, it is brought about by trade. Yet there is nothing inherently necessary in trade if firm specialization is eliminated. So, in a large measure, the normal volume of trade is dependent upon the extent to which firm specialization is current. The volume of trade as it is affected by the volume of production is an important indicator of economic well-being. But, the volume of trade as it is affected by the extent of specialization is not an indicator of economic conditions because production, not trade, is the fundamental cause of economic good.

This does not mean that there may not be certain indirect effects of such a move that would have other results. One of the most important of these is the second premise noted above: namely, that a make policy eliminates profits which are desirable to general business. Before coming to any conclusion about the value of this argument, it is necessary to distinguish between excess profits

² *N.A.P.A. Handbook*, Vol. I, p. 200.

³ "The way in which the unconscious cooperation among specialists is created is by buying and selling." Sumner H. Slichter, *Modern Economic Society* (New York: Henry Holt and Co., 1931), p. 106.

¹ For text of case, see page 70.

and fair profits. This could lead quickly to a theoretical discussion of the nature of profits, fine distinctions between fair and excess profits, and endless haggling about the meaning of terms. This, however, is unnecessary. The only point of importance is that *all* profit, as the businessman sees it, is not (or at least should not be) eliminated by adopting a make policy. For in arriving at a business decision to make rather than to buy, an executive ought to plan on making a fair profit on the money invested to carry out that decision. Otherwise the money might better be left idle or used elsewhere. Successful business consists in the weighing of many possible courses of action, and taking the most profitable.¹ Therefore, if by making an article rather than buying it a manufacturer eliminates *profit*, he is defeating his own purpose.

What is usually meant is that the manufacturer is eliminating *excess* profits. Now it does not seem likely that any one is willing to justify excess profits. If not, the argument comes down to whether or not it is justifiable to transfer the profit from one company to another. In the interest of preserving a stability, such a transfer may not be desirable. But from the usual business point of view, the business world is so dynamic that some shifting is necessarily inescapable, so the effect of such transfers usually is not serious to the economic system as a whole. True, it may be hard on certain individuals or firms, but the difficulty is not in the principle of transferring profits from one firm to another but in the lack of flexibility of the company which loses the business.

The adaptability of individual firms to change is never instantaneous. Thus, even though the ultimate economic effects are desirable, there is no certainty that there may not be some hardships on individuals while the change is being accomplished. The conclusion, therefore, is that *per se* there is nothing undesirable about either a smaller volume of trade or transfer of profits from one company to another. The hardships attendant with the transition period, however, may be such that the change is undesirable. Dealing as we are with individual businesses and their problems, it seems that this theoretical objection is so indeterminate as to be unimportant in a business-

man's decision, except where the results are very clearly observable.¹

The Status Quo

The objection that adoption of a make policy by a company injures trade, like so many arguments about business policies and economic activities, seems to be based upon an unconscious worship of the *status quo*. Those who say a make program eliminates profit see one firm which now has a profitable business lose part of it and perhaps, as a result, go out of business. And because that changes a peaceful existence (as far as that one concern is concerned), such a change must be bad. But what about the reason for that concern's existence? In all probability, the conditions which justified a firm's original existence have changed; maybe it is no longer right, economically at least, for it to remain in existence. Skepticism, therefore, seems to be the proper attitude toward any argument based upon the theory that change is bad. Change is inevitable. The businessman's real job, therefore, is to study all the facts available, to determine *what* change should take place, and to act as wisely as possible in view of the actual facts. The *status quo*, as such, can have no inherent merits. Its merits must be proved, just as much as the merits of any proposed change must be proved.

One point, which softens the above argument, ought to be added. Throughout this paper the viewpoint in most instances has been that of the individual businessman and his problem of keeping his company on the most profitable basis. Recent years have shown only too well that such a motive may at times conflict, or seem to conflict, with what is called the general welfare or the interests of society. It may be true, therefore, that for some such reason as preventing further unemployment at a time when a community morale is low, the above generalities may not apply. Thus, businessmen should not be insensible to the needs

¹ There is some possibility that the argument as stated in the *Handbook* was not intended to carry the meaning assigned to it above. The limitation "doubtful in some cases at least" may have been intended to refer to those cases where a company begins to make a product under uneconomic conditions and thereby does destroy profit and eliminate economically useful trade. If this latter meaning was intended, the criticism does not apply and the original argument is sound.

of society which should be one of the factors included in their analyses. Nor should they, however, presume that the preservation of the *status quo* has any merit in itself.

Special Conditions

One final word must be added about the innumerable special conditions that arise in specific make or buy problems. It is impossible to cover them all in a general discussion for the simple reason that they are special instances. Even quick reference to the cases cited throughout this thesis and in the Appendix will reveal many striking examples. For instance, in the Cosgrave Paint Company case¹ it is reported that the standard contract between the company and the can manufacturer required that can prices were to be adjusted automatically whenever tin plate prices changed. This fact, coupled with the physical impossibility of storing large amounts of cans in anticipation of price increases, made the company helpless in avoiding increased costs by purchasing when prices were low.

Again, too, in the case of the Hauser Packing Company,² even though the quality of the ham which was sold under the company's name but made by someone else was actually equal to the company's standards, food dealers, realizing that it was not made by the company, were skeptical about accepting the product.

Since such cases are peculiar to the specific conditions in which they arise, they must be met as the occasion demands. No general rule can be made, and they are mentioned here only to show that specific situations will produce certain circumstances peculiar to themselves and solvable only in the light of the immediate problem.

Summary

The value of the points raised in this chapter lies principally in clarifying some of the peripheral parts of the make or buy problem. Cooperation with the supplier, for instance, is in one sense

¹ For text of case, see the Appendix, page 107.

² For text of case, see the Appendix, page 113.

not a part of the make or buy problem but one of general procurement. In other words, it suggests that maybe the procurement function can be better performed than in the past and that, as a result, the make or buy problem will disappear.

The second point merely shows that the problem of whether to make part or all is, in reality, not another problem but essentially a part of the whole make or buy problem and should be solved on the same fundamental foundation as the whole problem.

Presentation of the executive problem is made, not with any intention of solving it, but merely to call attention to its importance. Little effort would be required to produce several examples of friction among executives arising out of make or buy problems. Prevention of this friction, however, is a psychological and organizational problem which need not be solved here.

Then is presented another factor — the existence of predetermined policies — which in many cases does, but frequently should not be allowed to, affect make or buy decisions. Mention is made of the possible effect of predetermined policies only so that prejudiced thinking will be avoided.

A theoretical argument against making was discussed, principally because it seems to be based on unsound premises and offers a type of argument that is found in many walks of life. Many corporations continue practices merely because they are habit; many changes are opposed, merely because they are changes. The point was discussed to emphasize that the merits of such arguments should be determined by following them through to their foundation, to see if change is bad, as assumed, or if, perchance, change might be desirable. It could be that the existing methods were based upon erroneous foundations and that, therefore, new ones are necessary.

Finally, mention is made of only two of many possible unusual circumstances that will be peculiar to specific problems and, therefore, out of place in a general discussion. When they arise, however, they must be dealt with as logically as possible.

CHAPTER IX

GENERALIZATIONS

The purpose of this thesis, as outlined in Chapter I, was, first, "to develop a group of working principles which would be of assistance to business management in solving one of its important problems," and, coincidental thereto, "an evaluation of the make or buy decisions" which came to our attention.

How to Analyze a Make or Buy Problem — a Summary

Since generalizations concerning business problems must, of necessity, depend upon specific evidence, much of the research behind this thesis was devoted to the understanding of the problems of individual business organizations in an attempt to build up a group of working principles applicable to the make or buy problems of other businesses. This research indicated that a businessman, in arriving at a make or buy decision, should consider certain definite things. The exact procedure in any case must be adapted to the circumstances, and common sense is the only safe guide in determining the extent to which each suggested approach should be followed in solving an actual business problem. Yet, in general, the businessman, faced with a make or buy problem, should proceed somewhat as follows:

1. He should, as in all procurement procedure, determine the quality that is needed and describe it accurately.
2. He should, so far as possible, determine the quantity needed.
3. Then, he should compare the cost of making (in the narrow sense, as defined) with the cost of buying.
4. Finally, with the above information as the starting point, the cost to the business as a whole should be determined and the cheaper course of action be adopted.

Following the above program in any specific instance is, however, beset with many difficulties, and special care should be taken with respect to the following:

1. In each step, time should be given special consideration, inasmuch as there is a limit to the time during which "desired quality" remains unchanged; time has its effects upon quantity, not only with respect to the total number needed but also with respect to the rate of use; and time, likewise, definitely affects costs.
2. In figuring the costs, in the narrow sense, the procedure outlined in the text should be followed, selecting the method of calculating cost which is most likely to give correct results. The principal features to be remembered are:
 - a. Other things should be equal (e.g., quantity and quality). If they are not equal and adjustments in the figures cannot be made, this fact should be considered in interpreting costs (see point 3, below).
 - b. The cost figures should cover the proper area, i.e., the actual area to be affected by the decision.
 - c. The cost figures should cover the proper time.
 - d. Unit costs should, in most instances, be avoided as the basis for calculations and should, in all instances, be used with caution.
 - e. The assumptions which lay behind the cost figures should be discovered and their soundness verified.
3. In determining the cost to the business as a whole, the businessman should begin with the narrow cost figures and interpret them in the light of the business as a whole. The

principal points to be given consideration in this interpretation are:

- a. The effects of the make or buy decision on costs not directly connected with the product under consideration. Some of the areas which may be affected are:
 - i. Production.
 - ii. Distribution.
 - iii. General administration.
- b. Outside conditions within which the company is operating, but over which it has little control.
 - i. Cyclical changes.
 - ii. Competitive conditions among suppliers, such as overcapacity, monopoly, and the age of the industry.
 - iii. Age of the business.
 - iv. Long-time trends and changes.
 - v. Random factors which may be important at the time, such as war, political situation, etc.
- c. Other possible solutions to the problem.
 - i. Cooperation with suppliers.
 - ii. Halfway measures.
- d. Miscellaneous sources of possible trouble.
 - i. Executive problems.
 - ii. Effects of changing *status quo*.
 - iii. General economic effects.
4. In the entire analysis, conscious effort should be made to avoid prejudices which may unknowingly exist. Examples discovered were:
 - a. Instances where a company's policy determined the decisions apart from the more specific arguments.
 - b. Instances where advantages for one or the other courses of action were claimed as arguments in favor of that action, even though such advantages were obtainable by other means. The argument that making allows for better coordination than buying is of this nature.
5. Special conditions with respect to specific problems must be treated logically in view of all the above.

Specifically, it should be noted that the above method is equally applicable to the three types of

make or buy problems described in Chapter I, viz., (1) those where a product is being procured for the first time; (2) those where procurement has been by buying; and (3) those where procurement has been by making.

In general, it can safely be said that only in rare instances will any one argument or combination of arguments be so conclusive as to dictate the decision. Consequently, in most cases the solution will be a compromise based on judgment — judgment as to which course of action is most conducive to the company's best interest. The above procedure is not offered as a formula designed to produce only correct answers; it is offered as a logical method of arranging the arguments, pro and con, in order to make it easier to arrive at a wise decision. Certain errors which could lead to an unwise decision were pointed out; and certain methods of analysis which might lead to erroneous conclusions were commented upon. Unfortunately, however, there can be no guaranteed results. It is only hoped that use of the suggested method of analysis would increase the percentage of wise decisions.

Probable Weight of the Evidence

Logically, generalizations about the preferability of making or buying would flow from the application of the method of analysis suggested in this thesis to a large number of specific problems. This cannot be done, however, except by businessmen themselves, partly because they alone have authority to make actual decisions, and partly because the number of business experiences which can be reviewed, even in case form, is limited to a small sample. The next best thing seems to be an attempt to answer the question: "If businessmen did follow the method of analysis suggested, what would be the usual procedure — make or buy?" In more common terms, it may be asked: "Which is preferable, make or buy?"

The concluding paragraphs will be devoted to interpretation of the evidence presented throughout the thesis. One prefatory remark is necessary, however. Up to this point, presentation of the argument has been, wherever possible, in an impersonal way. This, however, is not adaptable to

the generalizations. Impersonal presentation of the generalizations is impracticable because, by their very nature, they are opinions — the author's opinions — of what *would* be done *if* make or buy decisions were based on the type of analysis suggested in this thesis. Therefore, in order to avoid any implication that these generalities flow without possibility of contradiction from the foregoing discussion, they are presented in the first person.

In a very real sense, the correct answer to the question: "Which is preferable, make or buy?" is "It depends upon the circumstances." Nevertheless, as a result of the research for this thesis, I have come to certain general conclusions. I fully realize the number of instances in which they will be wrong, and, yet, I believe that it will be more useful to state them, knowing their inadequacies, than to keep them to myself because of fear of objections.

In general, my answer to the question, "Make or buy?" is, "Buy." The answer is based upon a feeling which cannot be proved but only illustrated. It comes from an approach to the problem from two points of view, in retrospect and in prospect. First, looking in review at the make or buy decisions already made by businessmen, I have attempted to discover what they reveal. Secondly, looking ahead, I have attempted to forecast what decision ought to be arrived at most frequently as a solution to future make or buy problems. Both points of view, I believe, indicate "Buy."

In retrospect

In the experiences examined in the preparation of this thesis, most of the arguments *for* making appeared to me to be weaker than those *for* buying. They appeared weaker because in many instances they seemed to smack of rationalization. The argument, for example, that the impossibility of buying necessitates making was rarely used as a current argument but only in explanation of previous decisions to make. And quite frequently the conditions which were claimed to have rendered buying impossible changed with embarrassing rapidity. In other words, I believe that the number of instances in which a company *had* to make was small.

My conclusion also implies that in many instances where corporations began making, not because they had to but because they wanted to, the decision was wrong and that those corporations would be better off if they bought certain things now being made. While the limited research makes proof of this point impossible, I believe that it is true. My feeling is based on the following grounds:

First of all, make or buy problems are considered as unusual by many business executives, even though every purchase and every manufacturing schedule implies a decision to buy or to make. In other words, any executive machinery for discovering make or buy decisions is practically nonexistent. Consequently, the only make or buy problems ordinarily to receive any attention are those that come to management's attention by way of an accident, an emergency, or as the result of the addition of an entirely new final product to the company's line, such as was done by the Ulman Machine Company. The basis for most current actions of making or buying is, therefore, not a current decision but either a decision consciously made some time in the past or a decision flowing unconsciously out of previously established practices or habits. Unless we are willing to admit that decisions made after conscious thought about the problem are no more likely to be right than those that just "happen," it seems logical to conclude that a goodly number of make or buy decisions which just happen are probably wrong.

Closely allied to the failure to recognize make or buy problems was the failure to review decisions once they were made. Companies were especially lax in reviewing those decisions which had led to the adoption of a make program. The Hartkey Company,¹ for example, after starting to make its own rubber parts in 1932, never again, so far as is known, checked either the price or quality available from outside manufacturers; and this, despite the facts that recent years have seen many rubber companies devoting much time and money to rubber research and that the company's own quantity requirements have increased considerably.

Another fact contributing to my feeling about

¹ Chap. VIII, page 83.

make or buy is the almost complete lack of attention to other possible solutions to the problem. One company, for example, claimed that it was unable to buy the quality needed. Yet, its procurement efforts were devoted almost entirely to negotiations with one large supplier, despite the fact that there were several well-equipped prospective suppliers that, in appearance at least, were only too anxious to work on the kind of technical problems faced by the company. In that instance, failure to secure from one supplier what was wanted offered an excuse for following a course of action already desired by the company. I believe that the real reasons were based principally upon the management's pride and desire to boast of the large number and variety of products which the company made.

Finally, relatively few companies seem to give any attention to the change in their organization which will be caused by the addition of something new. The Kirwood Company¹ was one of the few which I found that did, and it rejected a make program that from many angles looked very attractive, principally because the executives feared that the operating efficiency in the regular production lines would suffer. It is interesting to note, too, that the company's production men favored the new program, believing that they would be able to meet all the problems without loss of efficiency in their regular jobs.

This last fact is a dramatic comment upon the narrow point of view many people take with respect to limitations in their own ability. The same fact is frequently overlooked by executives themselves when they keep adding new functions to their portion of the business, with little thought to the possibility that their efforts might be less effective. Even though the costs arising from lowered executive efficiency are more difficult to measure than the production inefficiencies feared by the Kirwood Company, they are, nonetheless, real and also contribute to my favoring buying.

Further illustration of this point is found in the Bell Chemical Company case.² Once again, I cannot prove my contentions, but in the light of other research I think they are accurate. I have

little doubt but that the shook plant was a good investment for the Bell Chemical Company when it was first built and again during the first World War. There is just as little doubt, however, that it was not of value in 1932. Consequently, if the management had been as alert to the possibilities of getting rid of an undesirable investment, as it was of making a good one, it should have disposed of the shook plant when the trend of the company's requirements started downward and over-capacity began to appear in the industry. The reason that the company first went into the shook business was to overcome the results of a competitive situation in the box shook industry. Is not an exactly opposite competitive situation reason enough for getting out? I admit that there were problems of labor, organization, invested capital, etc. But, I ask, "Was the original decision correct for all time?" Furthermore, the seriousness of these other problems was increased by the delay in facing the real problem. If the benefits of resuming buying had been recognized and acted upon as quickly as the benefits of making had been, the difficulties would not have become so formidable and a sounder solution could have been worked out.

In retrospect, therefore, looking at the limited evidence available, I think that, in general, buying is preferable to making. This opinion was not arrived at by any exact process such as counting the number of cases where I thought making was the correct solution and comparing them with those where I thought buying was better. Furthermore, there were specific cases where I agreed with a company's decision to make (for example, the Mills Company³ which began to make a metal clamp to aid employment at the beginning of a depression) and others where I questioned the company's decision to buy (the Ulman Machine Company,⁴ for instance). Yet I believe that, by and large, the evidence shows that buying is preferable to making.

In prospect

Looking ahead at decisions which are yet to be made and attempting to look with perspective at

¹ Chap. VI, page 58.

² Referred to, principally, in Chap. IV, page 44.

³ Chap. VII, page 70.

⁴ Referred to, principally, in Chap. IV, page 43.

the arguments for and against making, without reference to the specific problems of any individual business organization, I find my opinion strengthened. Reviewing the arguments presented in this thesis, I find two which undoubtedly call for making. These are: (1) inability to buy the proper quality; and (2) inability to locate a source of supply. In one sense, these are different ways of saying the same thing; for, given a broad interpretation of quality, lack of a source of supply means inability to buy the quality wanted. Since, however, inability to locate a source of supply may be primarily a reflection of poor delivery service and other quantity considerations, these two arguments may be considered separately.

I think that the inability to buy outside will not justify making in very many cases because, first of all, with the current advanced stage of development in manufacturing technique, the situation will arise only infrequently; secondly, when it does arise there will oftentimes be ways for meeting it other than making. One of the most obvious alternative solutions is the development, by an honest examination of the article specified, of a substitute which can be readily attained. This procedure involves, of course, changing the quality specified but need not harm and may even improve the finished product.¹ A second method is that of cooperation with prospective suppliers to help develop a source of supply outside the company.

Another set of circumstances which I believe might well justify making is similar to the situation described specifically in the Ulman company. In that case, it will be recalled, a type of product (dies) never before produced by the company was required for the first time; the manufacturing technique and the materials required closely resembled those for the company's chief product; and the product itself was in no way foreign to the company's business. I criticized the company for not making its dies, and my stated objection

¹One example which came to light was brought about by the shortage of aluminum resulting from the national defense program. A company developed a method of using copper (which had previously been thought unsatisfactory) where aluminum had been used. Quality did not suffer and costs were reduced by salvaging material previously discarded.

was that the decision to buy was based on false reasoning and unconscious prejudices. I believe that the Ulman company should have been able to make its dies successfully and profitably because the process was one essentially similar to others used by the company. A modern business cannot expect to make profits by avoiding all risks by passing them on to someone else; it should take those risks that it is equipped to manage.²

In general, however, reviewing the arguments for and against making gives me the impression that the merits of making must be established before a company embarks upon a make program. Probably the factors contributing most to this concept are (1) the changes wrought by time, even in short periods, and (2) the great difficulty of reversing a make policy once it is established. I believe that businessmen cannot, in most instances, judge the changes that will take place accurately enough to justify making. Consequently, looking forward to the future problems of having the equipment, the personnel, and the organization to make something which can be bought cheaper, or even which the company no longer needs, I say that in most instances buying is preferable.

Most of the arguments thus far have stressed the disadvantages of making. In addition to objecting to making, however, I believe that buying most frequently will serve the best interests of a company. In some respects, the reasons favoring buying are just a restatement of those disfavoring making. There are, however, some positive reasons in favor of buying. One has already been mentioned. Manufacturing technique has advanced far and the ability of outside suppliers to meet almost any requirement of quality is better today than ever before; moreover, transportation

²In the type of analysis suggested in this thesis, the argument that the Ulman company should have made its dies would not have been stated with the emphasis on the concept that the making of dies was a proper function for the company to take on. On the contrary, the argument would have been expressed in terms of cost.

Furthermore, it is well to recognize that, accepting the condition of the Ulman company as it was, the type of analysis suggested would probably endorse buying the dies. My objection to the decision was based on the idea that there was something fundamentally wrong with the company and that, therefore, existing conditions should not have been accepted as the starting point for a make or buy decision.

facilities are keyed to speed in meeting delivery requirements. Thus, many of the objections to buying outside are removed by the improvement in the ability of outside suppliers to give good quality and good service.

Contributing also to the arguments for buying are the improvements in the art of buying. The old order-clerk type purchasing agent is fast giving way to the modern purchasing officer who realizes, perhaps better than many other business executives, that low price is not an end in itself. Better buying, better methods of locating sources of supply, better specifications — in general, better purchasing — all offer a sound reason for buying rather than making.¹

Closely akin to the development of better purchasing is the fact that the companies which have wide production advantages are not so numerous as they once were. Consequently, the opportunities for profit in the modern business world lie more in developing economies in the fields of purchasing, merchandising, and marketing than in production. Thus it is that flexibility is extremely important. Making things which can be bought lessens flexibility, lessens adaptability to change, and may prevent a company from meeting new conditions as quickly as it should.

A Warning and a Challenge

Advocacy of making or of buying should not be carried to extremes. One extreme would result

¹ Even under the pressure of war, there are many advantages to buying. The entire watchword of the war effort is to get things done. This means that many materials and supplies are needed in a hurry and that making and buying offer alternative methods of getting them. In many instances a good purchasing officer could probably find or develop an outside source of supply quicker and better than a company could bring its own facilities into efficient productive activity. Sensible purchasing by industrial companies could, in effect, mobilize the country's productive resources and thereby bring about a more economic use of the nation's facilities.

For the individual firm, buying may offer one further advantage by removing the necessity of adding capital equipment the life of which may far exceed the life of the demand for its product.

in a few large companies selling only to the ultimate consumers of their products and making everything that was needed in the manufacturing process including raw materials, production equipment, buildings, supplies, etc. The other extreme would, if taken literally, find the world with absolutely no production taking place and all companies trying to buy but not to make. Both extremes are obviously absurd. We are striving not for extremes, but for a sensible balance — a balance which can be attained, not automatically by using all-inclusive formulae, but rather, rationally, by using common sense and tempered judgment. Likewise, it is well to remember that my preference for buying is based upon evidence collected for the most part during 1939 and 1940 and that conditions in other times might call for a different conclusion. For surely no generalizations about the wisdom of making or of buying should stand without being reviewed, any more than a specific make or buy decision should be considered as correct for all time. Consequently, changing business conditions might call for a revision of this conclusion, just as they call for revision of the make or buy decisions of business organizations. Arriving at a conclusion at any given time, however, can be facilitated by using the method of analysis which has been followed here. The validity of that analytical approach is most affected by the changing conditions under which it is used.

Finally, even though the limited evidence available makes it impossible for me to prove conclusively that buying is generally preferable to making, I am sure that businessmen could prove it. They have the information to check up on the universality of the evidence revealed in the cases which we examined and the authority to act as the evidence would suggest. Furthermore, I am convinced that impartial analyses by businessmen themselves would not only prove my point but also reveal to them surprising opportunities for profit.

APPENDIX

APPENDIX

APPALACHIAN TANNERIES CORPORATION

Reopening a Closed Japanning Plant

The Appalachian Tanneries Corporation closed its plant for japanning patent leather¹ in 1936, and thereafter had its japanning done by an outside company. In the summer of 1939 the company's purchasing officer began an investigation to determine whether or not conditions warranted reopening the japanning plant.

The Appalachian Tanneries Corporation had been founded early in the twentieth century by combining several small tanneries into one large corporation. Patent leather had always been among the company's products. The consumption of patent leather in the United States had reached its heights between 1924 and 1927 and thereafter declined, primarily as a result of a change in style demands. The production of patent leather from cattle hides for the years 1921 through 1931 was as shown in Exhibit 1. Along with the general decline in the demand for patent leather, its production by the Appalachian Tanneries Corporation was reduced, so that in 1935 the japanning plant was operating at only 10% to 15% of its capacity of 6,000,000 square feet per year.

Costs of japanning were high in the Appalachian plant not only because of its low volume of operation but also because of its ineffective use of labor and equipment, resulting primarily from poor management. The physical equipment was well maintained and in good condition. The japanning plant was favorably located near one of the company's tanneries, which was its source of raw material, and was likewise not far from the center of the consuming area.

The inefficiencies in the operation of the japanning plant reflected the serious condition of the entire company prior to 1927. In that year new management was installed by the dissatisfied owners. The problems of the japanning plant were not the immediate concern

¹Patent leather was a term used to describe a kind of leather that had been finished by covering the surface of splits with coats of varnish or lacquer. The best usage restricted the term to shoe leather so finished, the bulk of which was made from cattle hides. Since the raw material required for patent leather was of comparatively lower quality than for most other types of shoe leather, the finishing process added considerably to its value.

Japanning referred to the process of applying the varnish or lacquer. Great care was required in drying each successive coat.

of the new management, however, because the general difficulties of the company demanded prior attention. In 1936, when the executive, selling, and major producing departments had been reorganized and the company's more important difficulties worked out, the problems of the japanning plant were then studied.

Exhibit 1
Appalachian Tanneries Corporation
Patent Leather Production, 1921-1931
(Total for the United States)

| Year | Cattle Sides |
|------------|--------------|
| 1921 | 2,277,607 |
| 1922 | 6,472,289 |
| 1923 | 5,655,530 |
| 1924 | 8,853,986 |
| 1925 | 8,628,323 |
| 1926 | 7,459,393 |
| 1927 | 8,388,467 |
| 1928 | 7,830,561 |
| 1929 | 5,953,557 |
| 1930 | 4,626,470 |
| 1931 | 4,501,413 |

Source: U. S. Department of Commerce, Press Release, Production of Leather (Annual Summary), 1922-1931.

In the middle 1920's the production of patent leather by the Appalachian Tanneries Corporation had been almost equal to the plant's full capacity of 6,000,000 square feet and the cost per foot had averaged about 4½ cents. In 1931, however, production had declined to about 750,000 square feet, and costs had risen to almost 9 cents a foot. By 1935 conditions were still worse. Costs were slightly in excess of 9 cents, and volume had declined to about 500,000 square feet. A summary of costs in 1930, 1931, and 1935 is given in Exhibit 2, page 106.

In 1936 the Appalachian Tanneries Corporation was able to have its japanning done for 3¼ cents a foot by an independent concern that had a good reputation for quality and sufficient capacity to take care of the company's requirements. The Appalachian Tanneries Corporation therefore closed its japanning plant and had the work done outside. The price of 3¼ cents reflected the need of work by japanning companies in general and was an unusually low price. With the improvement in business conditions in 1937, the price

Exhibit 2
Appalachian Tanneries Corporation
 Costs of Japanning, 1930, 1931, and 1935

| Items | 1930 | 1931 | 1935 |
|---------------------|----------------------|--------------------|--------------------|
| Labor | \$31,438 | \$38,208 | \$22,907 |
| Material | 13,196 | 16,417 | 9,498 |
| Overhead | 18,900 | 23,400 | 13,400 |
| Total | \$63,534 | \$78,025 | \$45,805 |
| Production | 1,031,912 sq. ft. | 891,725 sq. ft. | 508,416 sq. ft. |
| Cost per foot | 6.16¢ | 8.75¢ | 9.01¢ |

was raised to 3¾ cents, which the purchasing officer of the Appalachian company believed was more normal.

When the question of reopening the japanning plant was reviewed early in 1939, data for 1938 showed that the Appalachian Tanneries Corporation had made and sold 1,000,000 square feet of patent leather. The japanning had been done by the same outside concern for 4 cents a foot. Appalachian Tanneries Corporation was well satisfied with the work, which in some respects was superior to that performed in the company's own plant before it had been closed.

The company followed the practice of not depreciating the equipment or investment in a closed plant. Accordingly, its books showed that the only expenses of keeping the japanning shop closed were the cash expenditures for taxes, insurance, maintenance, and the like. The plant was maintained in working condition and could be put back in operation upon short notice. The shutdown costs recorded on the books during 1938 were about \$6,000. This was close to the normal amount, but if major repairs were needed in any one year, the total might increase to as much as \$10,000.

The plant and equipment were carried on the books at \$250,000. Against this there was a reserve for depreciation of \$62,000, giving a net book value of \$188,000. Annual depreciation charges, if the plant was reopened, would be approximately \$6,000. Although there was no way of checking the accuracy of the figures, inasmuch as previous experience had not been recent or under efficient conditions, the executives estimated that for the production of 1,100,000 feet the cost of operating the japanning plant during 1940 would be as follows:

| | |
|---|----------|
| Labor | \$22,000 |
| Material | 9,200 |
| Overhead (including depreciation) | 15,800 |
| | \$47,000 |

Because of the decline in the demand for patent leather, Appalachian Tanneries Corporation had made several changes in its use of hides. Some splits, for example, that had formerly been made into patent leather were made into other products. The company consequently was in a position to continue its patent leather business as an outlet for some of its raw material and also to use the entire hide to best advantage. It was estimated that for the next few years the company could sell approximately 1,000,000 square feet of patent leather a year. Variations above or below this figure might be caused by changing business conditions but probably would not be large. Company officials did not expect that the volume would increase substantially unless style changes should cause patent leather to regain its previous importance.

Several executives of the Appalachian Tanneries Corporation maintained that the plant should be reopened, inasmuch as the company would actually spend more than \$47,000 on japanning in 1940, when both the cost of having the work done outside and the cost of carrying the closed plant were considered. Furthermore, no depreciation on the plant was being earned while it was closed. The purchasing officer, however, favored the continuance of the company's policy of having the work done outside because of the diminished demand for patent leather and the satisfactory quality of the purchased work. He also expressed some doubt about the accuracy of the estimated cost figures for 1940. Since no supervisory force had been maintained at the japanning plant, he believed difficult production problems might arise and bring about increased costs.

One further influence that had an important bearing upon the problem was the competitive situation in the patent leather industry. The decline in the demand for patent leather had resulted in large overcapacity of the industry. Several competitors of the Appalachian company had taken advantage of the situation by offering companies that specialized in japanning large contracts at prices sufficient to pay operating expenses but insufficient to cover fixed costs. Many japanning companies had been willing to accept such contracts because these arrangements enabled them to continue in business, and they expected that demand would eventually improve. The anticipated improvement did not occur, however, and one by one these japanning companies went out of business as their equipment wore out and no funds were available to finance replacements.

Despite the number of companies that failed, there

was still overcapacity in the industry and still more than one japanning company willing to accept orders at prices that covered only operating costs. The most successful of Appalachian's competitors who had been following the procedure of giving contracts to embarrassed companies in fact extended operations by purchasing a japanning plant that was being liquidated. Although the plant was in fairly good physical condition and had a capacity about one-half that of the Appalachian plant, its price was less than 10% of the book value of the Appalachian plant.

The purchasing officer of the Appalachian company

contended that so long as such competitors were in the business, Appalachian Tanneries Corporation should not reopen its plant. Although the actions of competitors undoubtedly had a depressing effect on the market price for japanning and consequently on the price that Appalachian had to pay, it was the policy of Appalachian Tanneries Corporation to pay a fair price and thus assure its supplier some security and profit. The purchasing officer believed, therefore, that this same source of supply would be satisfactory for several years to come, especially since the industry as a whole still had unused capacity.

COSGRAVE PAINT COMPANY

Purchase vs. Manufacture of Cans by Paint Manufacturer

In January, 1939, one of the executives of the Cosgrave Paint Company suggested that the company abandon its can-making plant and purchase its entire requirement of cans from outside manufacturers. In order to obtain sufficient data on which to base a decision, the purchasing officer immediately began an analysis of the company's problem of can procurement.

The plant of the Cosgrave company, a large manufacturer of paint and chemicals, was located in a Middle Western town. Two of the major can manufacturing companies had near-by plants capable of furnishing the company's requirements. One of the can plants was located in a city about 100 miles north of the Cosgrave company's plant, while the other was about the same distance east. There was no other can plant within 500 miles except one operated by a manufacturing company for its own needs.

The number of cans used by the Cosgrave Paint Company had been increasing rapidly. In 1935 the company used approximately 16,000,000 cans, and in 1938, 27,000,000. This rate of increase was not expected to continue, but company officials estimated that within five years the company might use a maximum of 32,000,000 cans in one year. Of the 27,000,000 cans used in 1938, the company bought 22,000,000 and made 5,000,000. Those purchased were all of one small standard size while those made by the company included nearly 50 different varieties. Ten of the varieties accounted for 80% of the volume of cans made, while the remaining 20% were made in quantities ranging from 85,000 to less than 1,000 annually. The executives of the Cosgrave company had never contemplated making the 22,000,000 standard-size cans

because they always had been able to buy them from reliable suppliers at a very favorable price. The executives were of the opinion, however, that the company was making the nonstandard sizes more cheaply than it could buy them.

In order to decide whether this opinion was justified, the purchasing officer asked the can-making division of the company to compile a complete list of the specifications of the cans being made, together with its cost of making them. He then submitted the specifications to five container manufacturers and requested their bids for making the cans. While waiting for an answer from these requests, he outlined the following points which called for consideration.¹

(1) At present there are only two can suppliers located in our territory who are able to supply our needs. Consequently, competition is not great. If we abandon our own plant, we must pay the price demanded of us by can makers. As long as we keep our can plant, we can keep outside prices more nearly in line with our costs of making cans.

(2) The following additional expenses, nonexistent when cans are made in our own factory, would have to be met.

(a) Additional freight on cans from the can factory to our plant. This would amount to approximately \$13,000.

(b) Unloading and stocking cans at our factory. Approximately \$3,500.

(c) Cost of paper and labor for wrapping and tying cans in bundles.

¹ These points are quoted from an interoffice memorandum dated January 23, 1939.

- (d) Cost of miscellaneous supplies.
- (e) Labor and expense at outside can plant and its paper work in handling shipments to us.
- (f) Paper work at both our plant and our office in ordering and paying for cans.

(3) The loss of reciprocal advantages now had from placing our orders for tin and terne plate with manufacturers of our own selection. Can manufacturers are unwilling to have us say from whom they should buy tin plate, and some of them even have their own mills. Can manufacturers themselves do not have so large a need for our product as do tin-plate mills.

(4) Can prices are subject to adjustment quarterly if there is any change in the price of tin plate. Our only protection would be to order in advance, after increased plate prices had been announced, as many cans as we could stock. Even then, however, if the can manufacturer could not ship all we had ordered by the effective date of the increase, the new higher price would automatically apply on the unshipped balance. Outside can manufacturers are also permitted to adjust prices if freight rates are changed. By manufacturing our own cans, we can stock up on a much greater quantity of tin plate in the flat than we could in completed cans.

(5) For cans purchased outside there would be an extra expense of stamping numbers, etc., on them.

(6) There would also be the storage problem, although our present plant could be used for that purpose.

On February 3, 1939, the purchasing officer was able to summarize the results of the study. He did so in a memorandum to the president, parts of which are quoted below.

Only one can manufacturer of the two which have plants near-by is able to furnish all styles of cans which we now make or is in a position to quote prices that compare favorably with our manufacturing costs. One other manufacturer, however, would be willing to construct a plant in our territory if he were assured of the business of making the cans which we now make in our own plant. A summary of the quotations submitted by those companies whose prices are not excessive is shown in Exhibit 1 together with our manufacturing costs. Several other can manufacturers submitted bids on certain sizes but only those manufacturers shown in Exhibit 1 quoted on all our requirements. The delivered prices quoted by other can manufacturers whose plants are distant were also very high because of freight costs.

Each of the manufacturers A, B, and D ¹ has offered to buy our can-making equipment at its book value of about \$50,000. The equipment is 10 years old but still operates efficiently and no major replacements are considered necessary within the next few years.

Exhibit 1
Cosgrave Paint Company
Summary of Bids Submitted by Can Manufacturers for
5,000,000 Cans Now Made in Our Own Plant Compared
with Our Own Manufacturing Costs

| | | |
|---------------------------------------|-----------|-----------|
| Can Manufacturer A ¹ | \$419,562 | |
| Unloading and Storage | 3,525 | |
| Total | | \$423,087 |
| Can Manufacturer B ² | \$425,325 | |
| Unloading and Storage | 3,525 | |
| Total | | \$428,850 |
| Lowest Combination Bid ³ | | |
| Can Manufacturer A | \$287,074 | |
| Can Manufacturer B | 111,198 | |
| Can Manufacturer C ⁴ | 16,112 | |
| | \$414,384 | |
| Unloading and Storage | 3,525 | |
| Total | | \$417,909 |
| Our Own Manufacturing Costs | | \$458,227 |

¹ Plant of major manufacturer located 100 miles north.

² This company has no plant in our territory but is willing to construct one if it receives our order for the 5,000,000 cans.

³ Assuming that the lowest quotation for individual items was accepted and that the order was divided among the manufacturers submitting the lowest prices.

⁴ This plant is owned by a local manufacturing company and is used primarily to fulfill its own needs. It is not in a position to fill all our requirements. Manufacturers A and B would be willing, I believe, to meet the prices of those items on which Manufacturer C is low.

One of the major can manufacturers reported that important developments in can-making technique might be expected within the next five years. Such developments, it was expected, would not only reduce the cost of cans but would also result in drastically changed can designs.

As the general contract of the Cosgrave Paint Company for the 22,000,000 cans which it purchased annually was to expire at the end of 1940, the company did not wish to take any action that would jeopardize its bargaining position at that time. Although can contracts were usually made for a period of three years, the price was subject to quarterly adjustment, as the purchasing officer had noted in his first memorandum. Expansion of its line and selling to chain stores had doubled the company's use of cans since 1935, and the

¹ Manufacturer D is the plant of the other major can manufacturer located in the city 100 miles east. Its quotations were incomplete and the prices on many items were high and therefore were not included in Exhibit 1.

purchasing officer was of the opinion that its business would be sought eagerly by can manufacturers when the existing contract expired.

When the vice president in charge of manufacturing saw the purchasing officer's memorandum of February 13, he commented upon the fact that no account had been taken of the costs which were currently absorbed by the can plant but which would continue even if the can-making plant was abandoned. He estimated that this amount would be approximately \$48,000. No breakdown of this figure was available, but it consisted primarily of overhead.

There were two labor considerations which did not and could not show in the cost comparisons. In the first place, the company had always enjoyed cordial labor relations and it did not wish to upset its labor morale by dismissing the employees in its can plant. The town in which the company was located did not have many industries and there would be few openings for the employees of the can-manufacturing plant if they were dismissed. Secondly, the men working in the can plant were not so skilled as, or were skilled in different ways from, the other employees of the company. Consequently, transfer from can making to other jobs in the company would be difficult even if jobs were available in the main plant. On the other hand, some executives believed that the operations of the can plant presented a latent source of labor trouble, because the wages paid to workers in the can factory were on the whole not so high as those in the regular departments of the company.

One of the executives suggested that by keeping the can plant in operation the company could be prepared to install equipment to produce the cans then being bought outside, if the price seemed excessive at the time the contract came up for renewal. One objection to the manufacture by the company of all its own cans arose from the possible difficulty in obtaining efficient filling and closing equipment. The Cosgrave company was currently using machines designed, built, and leased to it by the can company from which it was purchasing its standard cans. If, however, it severed all connection with can manufacturers, the equipment made by an independent machinery company would be the only kind available for closing and filling. The production manager believed that the use of inefficient equipment could quickly offset any savings made possible by lower can prices.

The report of the purchasing officer also revealed

that irrespective of whether the 5,000,000 cans were made or bought there would be a saving if a round can were substituted for an odd-shaped can then being made for packing certain products. Quotations from suppliers indicated an annual saving of \$50,000 if the company discontinued making the odd-shaped cans and bought round cans. A later survey showed that an investment of about \$32,000 would enable the company to obtain similar annual savings by making the round cans in its own factory. If round cans were adopted, the cost comparisons already summarized by the purchasing officer in Exhibit 1 would become as shown in Exhibit 2. Further savings, not estimated, would result from the increased filling speed made possible by the use of round cans.

Exhibit 2

Cosgrave Paint Company

Summary of Can Manufacturers' Bids and Company Costs on 5,000,000 Cans, on Assumption that Round Cans Are Substituted for Odd-Shaped Cans

| | | |
|----------------------------------|-----------|------------|
| Can Manufacturer A | \$370,170 | |
| Unloading and Storage | 3,525 | |
| Total | | \$373,695 |
| Can Manufacturer B | \$366,457 | |
| Unloading and Storage | 3,525 | |
| Total | | \$369,982 |
| Lowest Combination Bid | | |
| Can Manufacturer A | \$237,682 | |
| Can Manufacturer B | 111,198 | |
| Can Manufacturer C | 16,112 | |
| Total | \$364,992 | |
| Unloading and Storage | 3,525 | |
| Total | | \$368,517 |
| Our Own Manufacturing Costs | | \$407,109* |

* In order to attain this manufacturing cost, an additional capital expenditure of \$32,000 would be required for equipment to make the round cans.

Although the decision of whether or not round cans should be adopted was theoretically independent of the major problem of the operation of a company-owned plant, the two problems were closely connected because odd-shaped cans accounted for nearly half the volume of the company's can plant. If round cans were purchased and the can plant retained, the cost of making the remaining cans would undoubtedly increase somewhat. No estimates had been made of the exact amount of these increased expenses.

ESSEL COMPANY

Purchase vs. Manufacture of Boxes by Envelope Manufacturer

In 1931 the Essel Company had purchased some machines for making cardboard boxes in which it packed the envelopes which were its chief product. Early in 1940, the purchasing officer reviewed the company's experience with these machines, in order to decide whether he should accept an offer from a local box manufacturer to furnish the company's boxes.

The Essel Company was located in Woonsocket, Rhode Island, and had direct sales representatives in ten of the larger New England cities. The company did not make fancy envelopes for social correspondence, but concentrated on the production of industrial envelopes which were used by business organizations. Annual sales averaged about a third of a million dollars. In 1939, the company used about 250,000 boxes, 80% of which were made in standard sizes and 20% in special. The boxes were of simple construction, being cut from light cardboard, folded, and pasted at the corners with adhesive paper. Slipover covers for the boxes were made in the same way. No covering material was used on the cardboard and the only additional operation was placing a label on the box.

The machinery used by the Essel Company in making the boxes was semiautomatic and not complicated. It consisted of one machine for cutting and scoring the cardboard; one for staying the blank; and another that put the adhesive paper on the corners. The machines were secondhand ones, purchased at bargain prices during the business depression. The total original investment amounted to about \$1,500, which was being written off over a period of 12 years. All the work of making the boxes was done by one man and two girls. Their combined annual wage did not exceed \$2,300 and the labor expense of making the boxes was even less than that amount, because when these employees were not making boxes they were given work elsewhere in the factory and their time was not charged to boxmaking. The man, for instance, did janitorial work.

Examination of the record of the company's box-making activities showed the purchasing officer that in 1939 the boxes had been made at an average cost of about \$27 per thousand; this figure included labor, material, and an allowance for overhead. A local manufacturer, with whom the company had dealt in the past and who was considered to be reliable with

respect to both quality and service, offered to sell boxes to the company at \$20 per thousand for standard sizes and \$30 per thousand for special sizes. The standard boxes would have to be ordered in lots of 1,000 while the special sizes could be ordered in lots of 250. The purchasing officer had not asked for other bids, but he was certain that other reliable suppliers would be willing to quote prices and terms approximately equal to those received.

Application of these quotations to the number of boxes used in 1939 showed that the total purchase price would have been about \$5,500. The company's unit cost figures indicated that the total cost of making boxes in that year was about \$6,750. Nevertheless, the purchasing officer was of the opinion that the company had acted wisely in deciding to make its boxes and that it should continue to do so. He based his conclusion on the following arguments:

(1) While making its own boxes, the company did not have to store finished boxes but could make them as needed.

(2) The storage cost of the paper needed to make boxes was smaller than the cost of storing boxes for two reasons: first, the paper took less room, and secondly, it was of less value because it did not include the extra labor expense of boxmaking.

(3) The raw material for all the boxes used by the company was exactly the same and no variety was needed. Consequently, the amount of paper necessary to give the company a reserve supply for boxes of all sizes was less than would be required if a similar reserve supply of the various sizes of boxes was on hand.

(4) Not only was the cost of the special boxes less but the service was much better than an outside supplier could give. The company made all its boxes as they were needed and could turn out almost any order within a few hours. In one sense, therefore, the company had no special sizes, inasmuch as all sizes were made as required. Outside suppliers, however, would demand two or three days for filling an order for those sizes which the trade called nonstandard; hence, the Essel Company could protect itself against possible delay only by maintaining a large inventory of special sizes.

(5) The company was able to use "special" sizes to advantage when it made its own boxes. For example,

airmail envelopes were not so thick as regular envelopes, but the accepted practice in the industry was to pack 500 envelopes to a box. Since 500 airmail envelopes could be packed in a shorter box than 500 regular envelopes, the company made shorter boxes and saved raw material. If it were buying boxes, a standard one would have to be used because of the high cost of special boxes.

(6) The company could well use for other purposes

the storage space that would be required for storing finished boxes.

The purchasing officer placed most emphasis upon the service argument, believing the company had saved much money by being able to have boxes, especially nonstandard sizes, when they were needed without carrying a large inventory of finished boxes and without ordering in minimum quantities that might be above immediate needs.

GRAFF MACHINE COMPANY

Manufacturing or Buying Machine Bearings

The Graff Machine Company, which had annual sales of \$1,000,000, manufactured metal turning equipment of a wide variety of types and sizes. Until 1938 the company had manufactured nearly all the bearings¹ for the machines in its own bearing shop. Early in that year, however, a leading manufacturer of bearings quoted a price on finished bearings which would enable the Graff company to purchase nearly half its total requirements of bearings for less than its own costs for direct labor and materials.

The Graff company, which competed with three large machine tool builders, owed its success to its line of small-capacity lathes. Each of these lathes required two bronze bearings which were of a special design developed by the Graff company. The company purchased rough bronze castings made of a commercial bronze suitable for use as a heavy-duty bearing surface. These castings were machined and finished in the company's own bearing shop.

Late in 1936 the workers in the company's bearing shop began to complain that hourly earnings for some operations were too low. (See Exhibit 1.) Most of the workers were members of a local union, whose executives conferred with the president of the Graff company. The union leaders believed that average hourly earnings for men working on these bearings should be increased to approximately \$1. The management, on the other hand, reasoned that wages for this work were already too high and should be reduced. The management stated that two of the eight operations were out of line, particularly since one of these, though still highly skilled, was entirely bench work requiring somewhat less skill than all the other operations. The president went on to say that, if the men were convinced

¹Each bearing consisted of two halves bolted together around the shaft.

that they were not getting a fair wage, the company would look into the possibility of buying the parts from outside as the Graff company "wished no man to work for less than his due wages." Executives of the local union then hastened to request that the management let the whole matter drop.

The president of the Graff company, however, requested the purchasing officer to investigate the possibility of buying the bearings from outside sources. In seeking quotations the purchasing officer did not hesitate to specify quantities of 1,500 to 2,000 bearings. Normal annual consumption, including both new work and replacement parts, was 2,500, although in 1937 the company had used less than 1,800 bearings. It had often been the company's custom to buy from one to three years in advance of requirements. The president was convinced that, in many instances, his company was paying less than its largest competitors. In the case of the bearings the company believed that it was not taking much inventory risk in carrying a year's supply in stock. Even if alterations in the line of lathes in which these bearings were used should necessitate a change in the specifications of the bearings, over a

Exhibit 1

Graff Machine Company

Standard Direct Labor Hours for 1,800 Bearings in 1937

| Operation | Hours | Dollars | Earnings per Hour |
|----------------------|-------|----------|-------------------|
| 1. Milling | 180 | \$162.00 | \$0.90 |
| 2. Drill & Tap | 90 | 81.00 | 0.90 |
| 3. File & Fit | 180 | 162.00 | 0.90 |
| 4. Bore & Ream | 180 | 171.00 | 0.95 |
| 5. Turn | 603 | 567.00 | 0.94 |
| 6. Assemble | 729 | 729.00 | 1.00 |
| 7. Spline | 126 | 129.00 | 1.03 |
| 8. Inspection | 99 | 68.50 | 0.69 |

three-year period the company could still sell about 2,000 bearings of the old type. These bearings would be used as replacement parts for the lathes which were already in the hands of customers. In 1938 the Graff company finally selected the offer of one of the leading manufacturers in the bearing industry. This offer is given in the letter shown in Exhibit 2.

With definite information available in regard to the cost of purchasing the bearings, the president of the Graff company proceeded to analyze the entire problem. On the basis of the information given in Exhibit 3, he wished to determine the actual cost to the Graff company of manufacturing the bearings. The president discovered that the cost of reamers should be added to the costs given in Exhibit 3. These reamers were purchased for \$18 apiece, but the president was unable to find the actual cost of reamers per lot of bearings, as all expenditures for tools were charged to a general tool account. The available evidence, however, seemed to show that at least one new reamer was purchased for each lot of 200 bearings. In addition, it was neces-

sary continually to sharpen the reamers; the exact amount which this operation would add to the cost of manufacturing the bearings was not known. As a partial offset to the expense of a reamer, the company received a return from the scrap resulting from the manufacture of the bearings, which in 1937 amounted to \$19.

In addition to the direct costs of labor and materials, the president considered the problem of factory burden. Factory burden throughout the plant was figured at 150% of direct labor. On this basis the bearings absorbed somewhat over \$3,000 of factory overhead in 1937. The president saw no chance of using the equipment in the bearing shop for other purposes and, unless business in 1938 improved greatly, saw little possibility of increasing the consumption of the company's other types of bearings. A portion of the equipment in the bearing shop would, therefore, be idle if the bearings were purchased from outside sources.

The president was interested in the \$300 tool cost which was indicated in the letter given in Exhibit 2. This tool cost was largely for dies, reamers, and cutters that were not readily transferable from one supplier to another. The Graff company, therefore, would probably have to pay a similar cost for tools should it shift suppliers. The pattern, of course, remained the property of the Graff company.

Until the end of 1937 the Graff company had been able to operate close to its normal work week of 40 hours. In January, 1938, business prospects other than government and navy orders were not encouraging, and the president of the Graff company expected that it would be necessary to continue to operate on a 36-hour week if actual layoffs were to be avoided. During 1937, three men had manufactured the bearings which the company was considering buying from an outside source. Worker A had completed operations 1 and 2; worker B, operations 3, 6, and 7; and worker C, operations 4 and 5. If these bearings were purchased, it appeared unlikely that the company could find sufficient work to keep these men, particularly B and C, employed throughout the year. Like nearly all the factory employees, these men, particularly B and C, were highly skilled and had been employed by the Graff company for over 10 years with only infrequent and short layoffs. It was probable that any of these men could find some employment if they were laid off, but the president of the Graff company pointed out that their long association with the company made them more valuable to that concern than to any other employer. Should any of the three men enter the em-

Exhibit 2
Graff Machine Company

A.B.C. BRONZE COMPANY
Philadelphia, Pennsylvania

January 4, 1938

Graff Machine Company
Graff
Connecticut

Gentlemen: Attention Mr. Smith, Purchasing Agent

This is in reply to your letter of December 29 which acknowledged our quotations of the 23d. Mr. Brown¹ has also written us fully and has sent us the sample bearing for examination. In the larger quantities mentioned by you, our prices are:

| Part Number | 1,500 | 1,000 | Per |
|--------------------|--------|--------|------|
| B-2486-upper | \$1.17 | \$1.15 | Half |
| B-2486-lower | 1.16 | 1.14 | Half |

F.O.B. Philadelphia. Terms Net.

In Mr. Brown's report he mentions that you have a plated pattern, four halves to the plate, which you can let us use. Based on this pattern being supplied, that portion of our equipment quotation of December 23 covering pattern cost can be waived so that total equipment cost will be \$300 for the tools.

Another point raised by Mr. Brown was that of possible advances in price should we get together in this proposition at the present time. We believe that the proposition in the next paragraph covers this matter fully for the current year, 1938, but, of course, future quotations will depend upon material and wage conditions at the time negotiations occur.

We will accept your blanket order for 2,000 complete bearings with your guarantee to take delivery of the entire lot within one year from date of order, and with the understanding that all releases will be for lots of not less than 500 complete bearings. On this basis prices are fixed at \$1.15 and \$1.14 per half and include setting up with the necessary screws.

Yours truly,

Assistant Sales Manager

¹ An engineer of the Graff company.

ploy of another company, he would probably have to accept some reduction in hourly rate of pay even if he was employed at a job essentially similar to his work at the Graff company.

If the bearings were purchased from an outside source, B and C would probably have to be laid off for at least a portion of the year. The president disliked laying off employees who had worked hard and faithfully for the company over a long period of time, because of the hardships which the layoffs forced upon them. Also, in 1937 the company's sales had been only slightly in excess of \$1,000,000, whereas in exceedingly good years the company's sales had amounted to

between \$1,500,000 and \$2,000,000. Should these conditions return, the company could use the services of workers B and C, if not in the bearing shop, at least in some other department. Nearly all the workers of the Graff company were so trained that they could readily shift jobs with little or no decline in efficiency. Throughout the depression following 1931, the Graff company had been able to avoid extensive layoffs through the transfer of jobs and the staggering of work. Though recognizing the savings that would probably result from buying the bearings, the president of the Graff company disliked to lay off two satisfactory workers.

Exhibit 3

Graff Machine Company

Cost of Completed Bearings, 1937-1938

| Date ¹ | Production Order Number | Quantity Ordered | Rough Castings | | Completed Bearings | | | |
|------------------------|-------------------------|------------------|---------------------|---------------------------|--------------------|------------------------------|----------------------|--------------|
| | | | Unit Purchase Price | Total Purchase Price Paid | No. O.K. | Rejects ² (scrap) | Direct Cost per Unit | |
| | | | | | | | Materials | Direct Labor |
| 12/4/36-3/2/37 | 8215 | 200 | \$1.31 | \$262.00 | 193 | 7 | \$1.36 | \$1.16 |
| 12/30/36-4/9/37 | 8630 | 200 | 1.35 | 270.00 | 199 | 1 | 1.35 | 1.16 |
| 2/15/37-5/12/37 | 9216 | 200 | 1.30 | 259.38 | 197 | 3 | 1.32 | 1.15 |
| 3/30/37-6/24/37 | 92 | 200 | 1.49 | 298.00 | 197 | 3 | 1.51 | 1.17 |
| 4/23/37-7/31/37 | 541 | 200 | 1.49 | 298.00 | 200 | 0 | 1.49 | 1.19 |
| 6/15/37-9/10/37 | 1908 | 200 | 1.48 | 295.02 | 198 | 2 | 1.49 | 1.20 |
| 7/30/37-10/6/37 | 2735 | 200 | 1.48 | 296.51 | 197 | 3 | 1.51 | 1.20 |
| 9/13/37-12/27/37 | 3250 | 200 | 1.49 | 298.00 | 195 | 5 | 1.53 | 1.22 |
| 10/18/37-1/6/38 | 3712 | 200 | 1.47 | 293.53 | 197 | 3 | 1.49 | 1.22 |
| 12/28/37-2/15/38 | 4575 | 200 | 1.42 | 283.14 | 196 | 4 | 1.45 | 1.19 |
| 1/26/38-3/10/38 | 4936 | 200 | 1.42 | 284.00 | 198 | 2 | 1.43 | 1.21 |
| 2/16/38-4/7/38 | 5186 | 200 | 1.42 | 284.00 | 200 | 0 | 1.42 | 1.19 |
| 3/14/38-5/9/38 | 5611 | 200 | 1.41 | 282.58 | 198 | 2 | 1.43 | 1.19 |

¹ First figure is date of beginning of order; second figure is date order was completed.

² Consisting of bearings rejected because of faulty castings or faulty machining and bearings damaged in handling or mislaid.

HAUSER PACKING COMPANY

The Hauser Packing Company was engaged in the manufacture and sale of hams, bacon, smoked meats, bologna, frankfurters, sausages, tongue, lard, and allied meat products. All products which could be branded were marketed under the Hauser Packing Company brand name. The company did not sell any branded products of other manufacturers. Sales, which were made to retailers, hotels, restaurants, and to other large users, amounted to approximately \$2,000,000 a year. There were several hundred items in the company's line, most of which were manufactured in the company's own plant. The Hauser Packing Company, however, purchased some of its prod-

ucts from other manufacturers of meat products because it was not equipped to produce them or could not make them so cheaply. Among the products which were being purchased from outside manufacturers was spiced ham packed in six-pound tins. This product was made according to a Hauser formula and carried the Hauser Packing Company brand name, but the company did not supervise its manufacture and therefore had no control over its actual production. The Hauser Packing Company purchased and sold about 100,000 pounds of the product annually. In 1936 cost estimates indicated that the company could produce the six-pound tins of spiced ham more cheaply than it

could purchase them, and company executives considered manufacturing the product in the Hauser Packing Company plant.

On April 15, 1936, the price of the spiced ham packed and delivered to the Hauser Packing Company was \$24.50 a hundred pounds. This price was subject to change without notice since ordinarily the price of spiced ham varied with the price of the raw materials of which it was made. Executives of the Hauser Packing Company believed that the price which the company was paying for the spiced ham in April, 1936, was so low that the manufacturer from whom it was being purchased could be making little, if any, profit. The low price, they thought, came about because the capacity of meat product manufacturers so greatly exceeded the current demand for their products that competition among them was very keen.

The executives considered the source from which the Hauser Packing Company secured its six-pound tins of spiced ham to be thoroughly reliable; and they had no reason to expect that the company would not be able to obtain adequate supplies from that source in the future. The quality of the product delivered had been satisfactory to the Hauser Packing Company, and there had been no complaints about quality from consumers. The Company purchased no other products from this source.

In spite of the satisfactory relations that the Hauser Packing Company had with its source of supply for spiced ham, the executives were contemplating manufacture of the product in their own plant. They believed that they would have better control over quality if the product was prepared under their own supervision. Each manufacturer of meat products was assigned a number by the food inspection division of the United States Department of Agriculture. Manufacturers were required by law to stamp their numbers on all cans prepared in their plants. Retailers who had gradually become aware of this fact were beginning to notice the numbers on the cans in order to discover whether the meat products which they purchased were manufactured by the company from which they purchased them or by other manufacturers. Since many retailers had noticed that the Hauser Packing Company did not produce in its own plant the six-pound tins of spiced ham, it was becoming increasingly difficult for the company's salesmen to stress the high quality of the product. Executives of the company believed that this inability to stress quality made it impossible for the company to obtain as high a price as it desired for the product. It was the company's policy, in marketing products under the Hauser Pack-

ing Company brand, to keep prices at the highest levels at which satisfactory sales volume could be obtained. By stressing quality, the company was often able to obtain higher prices for its products than were charged for similar products of competing manufacturers.

The sales manager reported that his salesmen seemed to sell products manufactured by the company more aggressively than those which the company purchased from outside sources for resale. He expressed the opinion that the company would be able to sell its six-pound tins of spiced ham in greater volume if they were produced in the company's own plant.

If the Hauser Packing Company decided to manufacture the product at its plant, it would be necessary to purchase a new vacuum mixer. The mixer, which would cost \$1,100, would improve the quality of the product because of the elimination of air holes. The new vacuum mixer was the latest advance in a series of improvements in equipment used in the manufacture of spiced hams which had been extended over a period of several years. Company officials recognized the possibility of some further improvements in the machinery, but they did not believe that the possibility of rapid obsolescence of the new mixer would be serious. Even if improvements were made, the executives believed that the machine could still be used for the manufacture of other products although they had made no detailed study of such a possibility. There was plenty of space available in the department for the new equipment.

An estimate prepared by the company's cost accountant indicated that the company could manufacture its own spiced ham in six-pound tins for \$24 a hundred pounds. This estimate was based on raw material prices existing on April 15, 1939, and on a volume assumption of 100,000 pounds a year. The cost of \$24 a hundred pounds was made up as follows:

| | |
|----------------------|---------|
| Materials | \$21.00 |
| Labor | 1.50 |
| Factory Burden | 1.50 |
| | <hr/> |
| | \$24.00 |

The factory burden of \$1.50 a hundred pounds included an allocation of 60 cents a hundred pounds for general factory burden, which was distributed as a percentage of direct labor, and the remaining 90 cents represented overhead expenses incurred in the manufacturing department where the spiced ham would be manufactured. These departmental expenses, which were also allocated as a percentage of direct labor,

included allowance for supervision, inspection, and other general expenses. In addition they included the rental cost of canning equipment which it would be necessary for the company to install if it manufactured the spiced ham. Rent for this equipment would be \$350 a year. A depreciation allowance of \$200 a year for the vacuum mixer which the company would purchase if it decided to manufacture the spiced ham was also included in the overhead expenses.

The sales manager stated that the lower cost of the

spiced ham, if the company manufactured it, would allow the company to compete with other manufacturers in selling large orders to restaurants and hotels. He believed also that the lower cost would put the company in a better position to compete for the large volume of export business available. The Hauser Packing Company sold many of its products to customers of this character, but had never been able to offer them low enough prices on the six-pound tins of spiced ham to obtain their orders for this product.

MACHIAS INSTRUMENT COMPANY

New Source of Supply for Part Purchased Abroad

The outbreak of the war in Europe in September, 1939, had made it impossible for the Machias Instrument Company to get the B-2 parts¹ which it had been buying in France and Germany. The company therefore was faced with the problem of developing another source of supply, either in its own plant or from an outside company.

The Machias Instrument Company was a manufacturer of precision instruments. B parts, one of the main types of parts used in all the company's instruments, were made of a resinous plastic which was first molded and then finished to exact measurements by grinding and polishing. The work required such accuracy that it had always been done by hand in the Machias factory. The finished instruments were assembled by selective assembly methods whereby the individual parts were tried until one was found that gave a perfect fit. Because the quality of the finer work constituted the principal basis for the company's reputation as a producer of high-quality precision instruments, B-1 parts had always been made in the Machias factory. Some of the instruments contained certain B parts which were fundamentally the same but not of such high quality as most of the instrument parts. Of these parts, those designated as B-2 had

¹ Because it is impossible to mention the name of this particular part without revealing the identity of the company, the part will be referred to as B. The addition of figures designates the quality of the part. Quality considerations are important, because parts of the same type are produced in various degrees of quality, each one of which is perfectly suited to the use to which the part is put. B-1 is the highest quality and is used for the most delicate parts in precision instruments. B-2 is the next highest quality and is used in less important parts of precision instruments, and in certain other high-quality products which do not compete with precision instruments. B-3 is a commonly accepted quality which, even though it is inferior to the other two, is nevertheless, when compared with most manufactured parts, a rather delicately fashioned part.

usually been bought in Europe, because the price of the finished imported product had generally approximated the cost of the raw material only in the United States.

Early in 1937 the Machias Instrument Company had been taken over by the Starbird Company, a large manufacturing company whose principal product was closely akin to that of the Machias Company. The products of the Starbird Company did not require the same extremely high degree of accuracy, however, because they were not used in precision instruments but were employed in less delicate work. The market served by the Starbird Company was much larger than the field for precision instruments, and in the course of many years the Starbird Company had developed automatic machines for producing a part, B-3, which corresponded closely to the B-2 part being bought abroad by the Machias Company.

The business of the Starbird Company had about reached its peak with respect to both its marketing and its production facilities. The company, therefore, had available large amounts of working capital which were not urgently needed in its own business. Control of the Machias Instrument Company gave it an opportunity to use some of its funds and at the same time to find new uses for its production technique.

Shortly after the Starbird Company had taken over the Machias Instrument Company, it sent a small machine to the latter company for experimentation in producing the B part. At the request of Machias executives, an engineer was also sent to aid in adapting the Starbird machine to Machias products. About January 1, 1939, after some months of experimentation, the engineer, Mr. Miller, believed that he was ready to attempt the production of some of the parts needed by the Machias Instrument Company. The

first one tried was a B-2 part, selected because its quality requirements were closest to the work which the machine had done successfully at the Starbird plant. The Machias company used many B-2 parts, but made most of them by hand in its own factory; those selected for trial by Mr. Miller were used in four sizes and had been purchased from outside manufacturers, usually in Europe. Mr. Miller chose the two small sizes, for which the company's annual requirements were 1,000 of each. The purchase price for these parts had been 48 cents apiece for the smaller of the two and 72 cents for the larger. The cost of making these parts, as estimated by Mr. Miller, was 59 cents for each size. This figure was broken down as follows: labor, 17 cents; material, 25 cents; and overhead, 17 cents.

These costs were exclusive of any provision for amortization of the investment in the machine on which the work would be done. The machine had cost \$2,200 but could be used on other work, although no other products were currently adaptable to immediate production. Mechanically the machine had a life of more than 20 years, but the company, according to its regular practice, was writing it off in 10 years. In addition, \$580 would be required to make the tools necessary for the production of the parts. Mr. Miller estimated that these tools would last three years. Calculations showed that the machine could produce 50 parts a day of either size, so that the entire year's supply of both sizes could be produced in slightly less than two months.

The Machias company started to make the two small sizes of the B-2 part for the following reasons:

(1) For some time the Starbird Company had operated on the policy of being almost self-sufficient and its executives thought that the Machias company should do likewise.

(2) Executives of the Starbird Company believed that the Machias Instrument Company had good possibilities of broadening its markets and were looking forward to the time when B-2 parts might be sold to other companies making noncompeting products.

(3) The Machias Instrument Company, anticipating difficulty in importing B-2 parts, in 1938 had experimented with domestic sources of supply and found none very satisfactory. Not only was the wearing quality of the domestic parts poor, but also their inaccurate dimensions increased assembly costs. Manufacture of the parts by the company itself was thought to be the best means of assuring a source of supply of satisfactory quality. The company's chief competitor made B-2 parts of satisfactory quality which it was

willing to sell, but executives of the Machias company did not want to be dependent upon a competitor for parts.

(4) The decision was also made as part of a larger program to substitute mass production methods with closer tolerances for the methods then in use. In the past, each part had had to be fitted in place in the completed instrument, and the exact size had varied from part to part. It was hoped that the machine-made parts would be uniform mechanically and that consequently all parts of a given size would be interchangeable. The result would be the elimination of many fitting and assembly problems that had proved costly.

(5) In equipment sold to the United States Government, American-made parts were required by specification. Up until the time of this problem the company had done but little government work; it was planning, however, to try to increase its sales to the government.

The production of the selected B-2 parts by machine proved to be an engineering success. Consequently, the Machias company invested an additional \$40,000 in machines and increased its productive capacity to about 1,000 parts a day. In line with its newly established policy, the company, in March, 1939, accepted an order to make 150,000 B-2 parts for a manufacturer in a noncompeting business. During the first months after the order was accepted, there were some misunderstandings about what constituted acceptable quality. On questions of quality the Machias company did not argue with the customer, but allowed him to return whatever he deemed unsatisfactory. Partly as a result of these rejections, and partly because of production difficulties in attaining the quality demanded, the Machias costs were about twice the estimates. By the end of 1939, however, these problems had been solved. The machine had been developed to a point where the products were superior to any costing up to twice as much, and the selling price of the Machias company was slightly in excess of its unit costs, including overhead and tool amortization.

According to Mr. Miller, the amount of equipment installed to produce the B-2 parts had been based upon estimates of the needs for the near future of the company only, and the outside business was not necessary to help carry the cost. The regular business of the company was expanding rapidly. This expansion was attributed in part to an improvement in the quality of the finished product resulting from improved designs and also in part to the broadening of the company's line made possible by the added working capital. Mr.

Miller expected, therefore, that additional equipment would soon be needed for producing by machine for the company's own use the other B-2 parts which currently were being made by hand. The outside business was, of course, helpful in absorbing some of the excess capacity of increased production facilities which had to be added in relatively large units.

Meanwhile the company still continued to obtain its supply of the two large sizes of the purchased B-2 parts from Germany and France. When hostilities broke out in Europe in September, 1939, this supply was shut off. The company had anticipated such difficulties and purchased ahead so that about a year's supply was on hand. Nevertheless, the company had to make some provision for meeting its needs at the end of that time. About 1,500 of these parts were used

annually. During 1939 the average price had been about \$1.10 apiece. The quality of these parts, with respect to mechanical operation, dimensional accuracy, and wearing qualities, had been entirely satisfactory. Investigation revealed that in the United States the material alone would cost \$1.16 a unit. Labor and overhead, equally divided, would cost another 54 cents. The equipment already being used for making the smaller sizes and the outside orders could be used for the larger sizes, but an additional investment of \$428 would be necessary for tools. These tools, like the others, would last at least three years.

Both the company's chief competitor and the company from which it had received the poor-quality, smaller sizes of this B-2 part were in a position to furnish the parts at about \$1.50 apiece.

RENICK APPLIANCE COMPANY

Manufacturing or Buying Motor Mounts

The Renick Appliance Company manufactured electric refrigerators, washing machines, mangles, and oil burners. Throughout the 80-year history of the company, the management had followed a policy of manufacturing in so far as possible all parts from which the products were assembled. In the fall of 1938, idle capacity in the company's pressroom caused the factory superintendent to consider the advisability of manufacturing the electric motor mounts for washing machines. Up to this time, these mounts had been purchased from outside suppliers.

The motor mounts were made of sheet steel on a punch press. The Renick company's normal requirements were 18,000 mounts a year. In 1938 the company paid 10 cents a mount to its two outside sources of supply. For over 10 years, the Renick company had maintained satisfactory relations with both concerns. The quality of the product and the reliability of the firms were of the highest order while the prices asked were as low as those of any other potential source. The motor mounts were, however, the only parts which the Renick company was buying currently from either of these two sources of supply.

In the fall of 1938, when the Renick company's pressroom was not operating at capacity, the factory superintendent examined the list of parts procured from outside sources and concluded that the motor mounts were the type of item which could most readily be produced in the pressroom. The mounts could be shaped on the regular equipment in the pressroom and

no special skill on the part of the workers was required. About 100 workers normally were employed in the pressroom. The cost of direct labor and materials, plus two-thirds of the normal overhead allocated to such work, would amount to only \$7.68 per 100 pieces. Arbitrarily charging two-thirds of the normal overhead was the usual custom when the management was considering the alternative of making or buying parts which could be manufactured on otherwise idle equipment. In the case of the motor mounts, the 18,000 pieces would keep one worker and one press busy for about 10 days. Because of the setup cost, the entire quantity would be made at one time. About 2,000 mounts were needed almost at once.

The factory superintendent found, however, that the dies being used by the outside suppliers could not be adapted readily to the Renick company's presses. These dies cost about \$750 and already were owned by the Renick company which had paid for them through the medium of the extra charge for tools added to the unit cost of each mount. Dies to fit the company's presses would cost \$411.

All dies used in the company's plant were made in its own toolroom. The total capacity of this room was \$100,000 worth of work a year; half of this amount was tied up in repairing and remaking tools used regularly in the company's manufacturing operations. The remainder, or about \$1,000 a week, was available for the production of new dies and tools. In the fall of 1938, the toolroom had \$8,000 worth of new tools, or

eight weeks' work, ahead of it. The normal working day at the company's plant was eight hours, with time and a half for overtime. Time and a half increased the cost of manufacturing tools by about 15%. A total of 16.4 man-hours was required to complete the dies. The dies would probably cost \$600 if bought from an outside die shop.

The factory superintendent believed that there was some question whether the company would continue to use for longer than one more year the ¼-h.p. motor for which the mounts were designed. He knew from rumors in the trade that competing washing machine

companies were considering the use of a ½-h.p. motor on their 1940 models in the belief that the washing machines would perform more satisfactorily. The factory superintendent knew that the design engineers of his company were not contemplating any immediate change, and he was not sure that any change would be made in the future. The design engineers did not know exactly how much better the washing machine would perform its function if powered by the larger motor. In addition, doubling the horsepower of the motor would necessarily increase the cost of operation.

SPERRY COMPANY

The Sperry Company began manufacturing fountain pens in 1922. Prior to that year the company had made metal stampings of all sorts, but had specialized principally in the manufacture of metal parts for fountain pens, among which were included pen points, pocket clips, and ink levers. When it undertook the production of fountain pens, the Sperry Company continued to manufacture these metal parts for its own pens, but purchased from outside producers the pen holders, the caps, and the rubber ink holders. The company still carried on its metal stamping operations and sold metal parts to other fountain pen manufacturers in addition to its production of stampings on individual order, but the growth in sales of its own fountain pens was so great that the stamping operations became a progressively less important part of the company's business. In 1928 the Sperry Company sold approximately 560,000 fountain pens. By March, 1929, sales had increased to such an extent that officials of the company believed the volume of sales for that year would be close to 600,000 pens.

During this period of rapid growth of sales, the company had maintained its original policy of buying from outside producers all parts except stampings. Some executives of the company had suggested from time to time that the other parts might also be produced and that increased savings might result from such a venture, but the president had contended that the sales volume was not sufficiently well established. He had been unwilling to undertake the risk of the increased investment to produce parts which the Sperry Company was not particularly qualified, from the nature of its experience, to produce. In 1929, however, when sales for the year were expected to approximate 600,000 fountain pens, the president concluded that sales had reached such a volume that the

production of some other parts might safely be undertaken.

The first part chosen for production was the pen cap. There were several reasons for this selection. In preceding years the pen caps had been of uncertain quality, being peculiarly subject to cracking. Complaints concerning this defect always had been a source of trouble to the company, and criticisms had been growing more numerous with the increased sales of the pens. It was important that the company should secure better control over the quality of these caps.

The production of caps would not necessitate any additions to existing plant building or require a large investment of capital. The pen caps without the pocket clips would be produced under contract by outside manufacturers with molds furnished by the Sperry Company. One mold costing \$3,000 was sufficient to produce 600,000 caps per year. It was assumed that the mold would last one year only. The pocket clips could be fastened on the pen caps by a new machine which the Sperry Company could purchase for \$3,000, and which it was estimated would last five years. There was sufficient space in the plant to house this new machine.

The production of the pen caps was expected to reduce the costs of producing fountain pens. Hand labor previously had been necessary to insert the clips in the caps, and the expense of this operation had been partly responsible for the price of 40 cents per pen cap charged by the cap manufacturers. The installation by the Sperry Company of the new machine to insert the clips automatically was expected to cut the labor cost to such an extent that the total cost of the operation would be reduced. Furthermore in producing its own caps the Sperry Company would not pay a profit to an outside agency. Against this saving would

be offset the loss to the Sperry Company of the profit which it received from the sale of pocket clips to the company from which it purchased the pen caps. No net reduction in the number of pocket clips produced was expected, because the Sperry Company would use the clips instead of selling them and because the other customers for clips would continue their established practice of purchasing Sperry clips.

On the basis of an annual production volume of 600,000 pen caps, the anticipated cost per cap to the Sperry Company was as follows:

| | |
|--|------------|
| Bakelite cap | 10.0 cents |
| Clip | 12.0 |
| Labor | 0.8 |
| Mold amortization | 0.5 |
| Depreciation on machine | 0.1 |
| Overhead* | 2.7 |
| Inspection | 0.3 |
| Material loss | 0.3 |
| Repairs | 0.4 |
| Power | 0.1 |
| Rent | 0.3 |
| <hr/> | |
| Total cost produced | 27.5 cents |
| Cost purchased | 40.0 |
| Gross saving by own production .. | 12.5 |
| Profit on sale of clip to outsiders .. | 1.0 |
| Net saving by own production ... | 11.5 |

* Including general supervision, allocation of executive salaries, and insurance.

With the prospect of better control over quality than formerly, with little further capital investment necessary, and with anticipated savings of \$69,000 annually, the Sperry Company undertook the production of the pen caps. When the results of the first year of operation were reviewed, it was discovered that the total cost per finished pen cap, after some small initial difficulties had been overcome and regular production had been established, were remarkably close to the original estimates. The small variations in the individual items offset one another so that the difference in the total cost was only a fraction of a cent.

Situation in 1932

Sales of Sperry fountain pens for 1932, on the basis of sales for the first three months of that year, were estimated at 150,000. The suggestion was advanced that, in order to increase the production of caps, an attempt be made to sell them to competing manufac-

turers of fountain pens. The sales manager pointed out, however, that the Sperry Company had no contacts with these manufacturers, that it would be entering into competition with its own customers, that new molds would be required, and that the automatic insertion of clips would be more expensive if the machine had to be adjusted to different caps. Because of the objections of the sales manager, the suggestion was not considered further. As a result, a production estimate of 150,000 caps was accepted as final.

Assuming a volume of 150,000, the cost of manufacturing each pen cap would be as follows:

| | |
|-------------------------------|------------|
| Bakelite cap | 9.5 cents |
| Clip | 10.4 |
| Labor | 0.6 |
| Mold amortization | 1.5 |
| Depreciation on machine | 0.4 |
| Overhead | 2.7 |
| Inspection | 0.3 |
| Material loss | 0.3 |
| Repairs | 0.3 |
| Power | 0.1 |
| Rent | 0.3 |
| <hr/> | |
| | 26.4 cents |

Outside manufacturers had reduced the price of pen caps from 40 cents in 1929 to 25 cents in 1932, and had made the quality of their caps as high and as certain as that of the Sperry product. Although the cost per cap to the Sperry Company was nearly the same in both those years, and the cost in 1932 was higher than the price at which the caps could have been purchased from outside producers, the president determined to continue the production of pen caps. In computing the total cost of the fountain pen, however, he used a figure of 21.5 cents for the cost of the pen cap. This figure for the cost per cap was the total cost shown above minus the charges for mold amortization, depreciation on the machine, overhead expense, and rent.

Did the Sperry Company make a correct analysis of the cost of producing pen caps at the time it prepared its estimates of "the anticipated cost per cap?"

In 1932, was the president's "computed cost" based on correct analysis for the purpose of determining whether to continue to produce or to buy from outside sources?

In 1932, was the president's decision to continue to produce a sound one?

ULMAN MACHINE COMPANY

Manufacture or Purchase of Dies for New Product

The Ulman Machine Company, a large manufacturer of specialized metal products, developed in 1936 an improvement in one of its standard products. Production of the new line would require the use of special small-size dies, the designs for which had been developed in the company's own machine shop. The executives were considering, however, whether to make or buy those dies necessary for the production of the new product.

The principal item made by the Ulman Machine Company was a standardized metal product of low unit value, used in large quantities by most industrial companies and by many individuals in home workshops. A large number of manufacturers in the United States made products practically identical with the standard product of the Ulman company. The new product, however, was a patented improvement developed by an inventor who had given the Ulman company complete control of the patents.

Although the new product would partially supplant the regular line; the executives believed that it would not completely take the place of the company's old product. It did not perform the essential function for which it was designed any better than the standard product, but it did have some desirable features that made it easier to use. Tests which had been run in plants of large users indicated that the new product saved time and therefore reduced labor costs. Frequently spoilage was reduced and in some cases the finished product was slightly improved in appearance or quality.

The new product was to be priced about 10% above the standard one, but the advantages, especially for industrial users would more than offset the additional

costs. The product also required a special tool which added somewhat to the cost of using it at first but not over a long period of time. Individual users, it was believed, were likely to be more influenced by original cost and probably would be less interested in saving time in using the product. For this reason executives were of the opinion that the industrial field probably would constitute the principal market for the new product.

Because of the uncertainty of the market for the new product, the company had no accurate knowledge of the number of dies that would be required over a period of years. In order to have sufficient stock of the new product on hand and to have the necessary variety of sizes to be able to fill all orders, the president estimated that 50,000 dies would be needed during the first year. If the product met with the approval that was expected, approximately 50,000 dies would be needed each year for the next three or four years. Forecasting beyond that time was exceptionally difficult because wide acceptance of the product might require many more dies, while a small volume of sales might lead to discontinuing the product altogether.

The company, through its experimental and development work, had gained much experience in designing and making the dies. A sufficient number had been made to give an accurate indication of the cost. Exhibit 1 shows the company's cost of making each of the six sizes of dies which would be required. It was estimated that it would be necessary to have approximately the same number of each size die. All the costs are for lots of 100. Tests indicated that this was the most economical lot size, considering both storage costs and operating efficiency.

Exhibit 1

Ulman Machine Company

Average Cost of Making Dies for New Product, in Company's Shop
(per 100 dies)

| Items | Size 1 | Size 2 | Size 3 | Size 4 | Size 5 | Size 6 |
|---------------------------------|---------|---------|---------|----------|----------|----------|
| Labor ¹ | \$ 3.61 | \$ 3.74 | \$ 3.89 | \$ 17.60 | \$ 17.73 | \$ 17.88 |
| Material | 11.52 | 11.96 | 12.93 | 22.60 | 23.04 | 24.01 |
| Overhead ² | 37.83 | 39.25 | 42.05 | 100.50 | 101.92 | 104.72 |
| Outside work ³ | 9.04 | 9.05 | 9.13 | 10.30 | 10.31 | 10.39 |
| | \$62.00 | \$64.00 | \$68.00 | \$151.00 | \$153.00 | \$157.00 |

¹ Labor costs were figured at the standard rate, plus 20% allowance for safety.

² Overhead is charged at the rate of 250% of labor and material.

³ Certain operations in making the dies were to be done outside the company's shop. The cost represented the price paid, plus 20% for handling.

After the developmental work was finished and the company was ready to produce the new product, the factory manager reported that the company's machine shop did not have sufficient capacity to add the production of these dies to its schedule without additional capital expenditures. He estimated that the machines necessary to make the required dies would cost approximately \$50,000. Although these machines would probably have a useful life of about 15 years, the company followed the practice of writing off such equipment in 6 years.

The factory manager stated that 50% of the additional investment for machines would be for special-purpose equipment not well adapted to other uses. The remaining 50% would be for general-purpose equipment that could be used easily for much of the work currently being done in the machine shop. Such machines, however, were not necessary for the volume of work currently being done in the machine shop. Since the company's business had not grown rapidly for some years, the new machines probably would not be needed for work on products other than the new one until existing equipment wore out, and certainly not within the next three years.

The cost figures included an allowance of 250% for overhead. This was a departmental figure that was calculated and revised, if necessary, once a year. The figure was also checked at the end of each month and rarely varied more than 2% or 3% from actual. The head of the cost accounting department stated that there would be no decrease in such departmental burden if new machines were purchased and that the amortization of the new investment would constitute an additional expense.

With the company's position clearly in mind, the purchasing officer of the Ulman company investigated outside sources of supply. The most favorable proposal was received from the Lakefield Company which offered to make the dies at the Ulman company's costs as summarized in Exhibit 1, if an order for at least 50,000 dies was placed with the company. The Lakefield Company was a large manufacturer of dies with which the Ulman company had had previous experience. It was located about 15 miles from the Ulman plant and had always proved to be a reliable supplier. The quality of its product was satisfactory, and its deliveries prompt. The making of the exact type of die which the Ulman company needed, however, would be somewhat different from the usual work done by the Lakefield Company; hence, an investment of \$18,000 would be necessary before the dies could be produced. Executives of the Lakefield Company stated that the

company would be willing to make the investment if it was given the initial order for 50,000. The proposed terms stipulated that the Lakefield Company would be allowed to bid on future work but no agreement was required that would make it a permanent exclusive source of supply for the Ulman company. Beyond the quantity stated in the original order, no future work was to be demanded. Deliveries were to be spread throughout the year, so, in effect, the prices submitted by Lakefield Company were for a year's production of a minimum of 50,000 dies.

It was understood between the two companies that if the Lakefield proposal was accepted, prices could be reviewed after the 50,000 dies had been delivered, and could be revised either upward or downward as the Lakefield Company saw fit. The Ulman company would, of course, retain the right to seek other suppliers or to make the dies in its own plant. There did not seem to be any companies that could produce the dies immediately upon receipt of an order. All potential suppliers, like the Lakefield Company, would need to invest in additional equipment in order to make the dies.

The fact that the Ulman Machine Company's new product had not been introduced on the market lessened any need for urgent action. Beyond the desirability of earning some return on the large amount invested in research on the new product there was no pressing reason for starting production immediately. The Lakefield Company's proposal, therefore, offered no advantage or disadvantage with respect to initial delivery promises. Since the members of the Ulman staff had had some experience in making dies, the company should have some advantages until an outside supplier became familiar with the problems.

The purchasing officer realized that, since the supplier was quoting prices exactly equal to the company's costs, there would be no saving directly attributable to buying the dies rather than making them. He believed, however, that the Ulman company's estimated costs of making were perhaps incomplete because they did not allow sufficiently for spoiled material. The material costs included in the estimates allowed for normal scrap and waste, based upon the relation of the weight of the finished product to the weight of the material required to make it, but a high degree of accuracy was demanded in these dies and an error in one of the advanced operations might render a whole die useless. This would cause loss not only of the material but also of the cost of labor put upon it up to that point. In its experimental work, the company had found that it was fortunate if 80% of its production of dies was of acceptable quality.

VAN DYKE RADIO CORPORATION¹

Manufacturing conditions in the radio and auxiliary industries caused the Van Dyke Radio Corporation to consider in 1936 the extent and direction of its future efforts relative to the production of parts, materials, supplies and accessories, utilized in the manufacture of its product, the Van Dyke radio receiver. The Van Dyke Radio Corporation, with a large plant and ample resources, was well established to carry on any type of quantity production.

Van Dyke radio sets and parts were sold through distributors who supplied dealers in their respective territories. While such distributors were self-financed and self-managed, the Van Dyke company exercised rigid control over the stock inventory and maintained close touch with consumer demand throughout the country. It was often found advisable to transfer stock from one distributor to another. The company engaged in extensive advertising designed to stimulate the demand for radio in general and the Van Dyke set in particular.

As the business expanded, licenses covering complete receiving sets were secured from three large patent holding corporations. Prior to 1926 the company had purchased a number of subassemblies from part manufacturers. The number of parts manufactured by the company increased until, in 1929, virtually a complete apparatus was manufactured within the Van Dyke plant.

The reasons underlying the decision to buy or make the several parts which make up a radio set varied with the type of part. In the case of coils the decision to manufacture was based largely on the advantages accruing from a close control over the quality of the part.

The coils were of major importance to the effective performance of a receiving set. The presence of an undesirable "hum" and the inability of the set to "stand up" in use were often traceable to a lack of synchronism in the coils and condensers. Correct turns and spacing in the design of a coil were essential to high quality; the amount of labor and skill involved to insure quality was considerable. Furthermore, major changes in the design of the set necessitated a redesigning of coils. The number of concerns engaged in the manufacture of coils was limited, thereby decreasing the assurance of supply during peak production periods.

Coil production involved many manufacturing prob-

lems. The wires had to be carefully selected; special equipment was necessary for the winding operation; a ready supply of girl workers was required and had to be trained; and careful inspection was imperative. Constant development in design and methods of economical manufacture necessitated continuous research. Because of these problems, some companies in the industry preferred to buy the part, particularly in the case of power coils which were often purchased as a complete power unit.

While the Van Dyke company was able to manufacture successfully its entire requirements in all types of coils, it did not wish to lose the advantage of keeping in touch with the improvements in design and production methods initiated by the coil manufacturers. Therefore, the company adopted the policy of purchasing from 1% to 10% of its needs, the percentage depending upon the extent to which the particular coil was standardized. This policy had the additional advantage of keeping the coil department of the Van Dyke plant in a competitive position with the usual incentive to improvement. Past experience indicated that the department was at least on a par with outside manufacturers.

Tubes were an exception to the policy of manufacturing parts of importance to the quality and performance of a radio receiving set. The manufacture of vacuum tubes involved processes and methods strikingly dissimilar to those of other parts. Patents were closely held by several corporations, necessitating licenses and cross licenses for production purposes. In addition there were a number of large tube manufacturing companies which were selling direct to the radio distributors and dealers tubes of specifications common to a number of sets. In a few instances only, therefore, were tubes manufactured for a particular apparatus. The Van Dyke company had not engaged in the manufacture of tubes.

The decision to buy or make cabinets embraced many factors. The number of large manufacturers of radio apparatus was approximately evenly divided between those buying and making cabinets. In the first place, the type and style of cabinet were of extreme importance in the sale of a receiving set. For this reason it was desirable to maintain control over the design and quality of the cabinet. The cost of the cabinet was a large proportion of the total cost of a radio set and manufacturers were interested in reducing costs in so far as was consistent with the maintenance of quality.

¹ Fictitious name.

On the other hand, cabinet manufacture on a large scale necessitated a relatively large plant investment. Furthermore, the production of the radio cabinets was extremely seasonal and this investment could not be profitably utilized during the entire year. The seasonal nature of radio sales also rendered the cabinet design subject to rather abrupt changes in style which in a measure prevented advanced production. Successful manufacture demanded the production of other lines of furniture as a complement to radio cabinets. A further disadvantage was that the manufacturing policies were essentially different from the assembly of radio parts, in that long experience and craftsmanship on the part of the worker were required.

The Van Dyke Radio Corporation had followed the practice of buying its entire cabinet requirements from outside sources. It depended upon close relations with its suppliers for the necessary control over cabinet production. These relations with cabinet manufacturers differed from those commonly present between purchaser and vendor in that contracts, while competitively awarded, were quite similar to "submanufacturer production." The Van Dyke company provided definite specifications for the product and maintained a research department to keep abreast of the trends in cabinet design and the developments and improvements in the methods employed in furniture production both in other radio companies and other industries.

Contracts for the supply of cabinets were made annually with a number of manufacturers advantageously located with respect to the national market. These manufacturers delivered cabinets direct to the dealer. Shipment of cabinets and receiving apparatus as separate units brought savings in freight charges which were passed on to the distributor as an advantage in competition. Savings were possible because the radio apparatus carried a high freight tariff, a 50% premium over first class, whereas the cabinet was carried as second class freight merchandise.

Past relations with cabinet suppliers had been entirely satisfactory. The manufacturers had been able to produce a high quality cabinet at a relatively low price. Complete and up-to-date information as to the future production plans of the Van Dyke Radio Corporation and its cabinet suppliers was exchanged, and care taken to avoid unusual demands and layoffs in production.

Annual requirements in paper boxes for shipping containers approximated 3,000 tons in quantity and \$200,000 in value, a supply in excess of the production of the paper box factory of average size. Paper

box manufacture, in contrast to cabinet manufacture, was one in which the Van Dyke company could easily engage if it so desired. The processes were not complicated, the equipment was well developed and the labor requirements were less technical. While no investigation had been made, it was quite possible that the Van Dyke company, considering its volume of use could reduce the costs of this supply by entering into production on its own account.

The importance of the supply lay largely in the correlation of requirements and delivery. A lack of shipping containers might have serious consequences in the manufacture and sale of the Van Dyke product. An oversupply, however, tied up valuable manufacturing space.

The paper box had little effect upon the prestige of the product. The volume of profit in this production was not comparable to that in the manufacture of radio apparatus. The industry was quite widely decentralized with little chance of monopoly. Prices on the product were quite competitive but subject to little change from year to year.

To protect its interest in the cost and delivery of this supply the Van Dyke company had adopted the following policies and procedure. Contracts were awarded for annual requirements on the basis of a study of the manufacturers' facilities to produce at a certain cost rather than on a quoted price. The company had found it possible to know what each supplier could do and never attempted to bargain for a price lower than that which permitted a reasonable profit to the paper box manufacturer. A realization on the part of the supplier that the Van Dyke business was good business was an important factor in insuring prompt delivery. Specifications were worked out in conjunction with the suppliers to make sure that nothing was being required unnecessarily which might increase the costs or difficulties of production. Deliveries were scheduled very closely, even to the train upon which a carload of containers would be shipped. Every precaution was taken to assure a continuity of supply; manufacturers were immediately informed of any changes in the rate of Van Dyke production and its effect upon the demand for containers. Occasionally, the Van Dyke company had been able to shift its rate of delivery among the sources to meet special requests for an increase or decrease in the rate of delivery which would be advantageous to the manufacturing program of a particular supplier. The company had always purchased its entire requirements.

Continuous relations between the company and the suppliers of containers over a number of years was an

indication of the successful operation of this policy in the purchase of its paper box requirements.

The Van Dyke company purchased annually approximately 3,000,000 pounds of copper wire at a cost of about \$1,000,000. The sizes of wire used in radio manufacture were relatively small and required enamel for insulation. The supply was obtained from concerns engaged in the enameling of wire which had been drawn in the mills of other companies. There were only a few firms producing the enameled wire, a standard product. Assurance of a supply of this primary material at a reasonable cost was important. The limited number of suppliers presented the possibility of a restricted supply and even a price monopoly.

A thorough investigation of the copper wire situation in 1929 convinced the Van Dyke company that it should prepare to manufacture this material. By introducing the necessary equipment, the company could produce insulated wire for its purposes as economically as its suppliers; with large volume, even greater economies could be obtained. The investigation was limited to the enameling process: the drawing of wire was an age-old proposition with a number of well-established companies in the business. Enameling processing merely required facilities for successive baths of the wire in lacquer solutions with intermittent intervals of drying.

Increased requirements on the part of other radio manufacturers and the limited number of suppliers had resulted in increased prices for copper wire. To safeguard the supply and to keep the cost down, the company decided to install the equipment necessary for experimental production of enameled copper wire. From this nucleus, in the event of a shortage, the company was in a position, therefore, to step up the amount of wire enameled in its own plant in 1930 and ultimately, if necessary, to produce the entire requirements.

Bakelite was used in large quantities by the company as sheet in the panels, frames, and bases, and as molding material for the working parts such as dials. The supply of bakelite was largely controlled by one company, the Bakelite Corporation, by virtue of patents held in the processing of this synthetic material: To produce bakelite necessitated licenses and royalties to the Bakelite Corporation. Because of the large volume of its requirements the Van Dyke company had obtained a license to the foundry processes for molding the material to suit its needs for the smaller radio parts. Bakelite sheet, however, had been purchased from suppliers licensed to manufacture it.

The costs of this material were high because of the control exercised by the Bakelite Corporation.

The policy of the company prior to 1930 may be summarized as follows:

(1) To make all parts of major importance in relation to the quality and performance of the Van Dyke radio receiving set;

(2) To buy such parts, materials, and supplies, other than the above, as were manufactured by outside concerns at an advantage in quality and cost or at a profit margin less than that obtainable in radio assembly;

(3) To buy or make parts, materials, and supplies in sufficient proportions to minimize the risks of suspended delivery, control of supply, or failure to keep abreast of improvements in design and method of production.

The situation in 1930 presented some additional factors that required consideration. Since 1927 a few large companies had become increasingly aggressive in radio manufacture; the prospects of a greater share of the market had resulted in increased schedules of production and keener competition. Such concerns were either engaging in the production of parts, materials, and supplies, or were actively bidding for the supply of the regular manufacturing sources.

After the break in the stock market in October, 1929, the demand for radios fell off precipitately and within a short time it was apparent that overproduction for the holiday season was present in an alarming degree. In order to prevent overstocking of its distributors and a glutted market for its product at the time of announcing its new model for the 1930 season the Van Dyke company made a radical curtailment in its rate of production. Other companies made similar decisions. As a result, the firms engaging in supplying parts, materials and supplies for radio assembly, several of which had added new equipment and plant facilities in 1929, were in a position to quote lower prices for the lesser volume of requirements.

The supply of enameled copper wire in 1930, for example, would evidently exceed the demand. Under these conditions it was likely that the prices obtainable on this material from outside sources might be lower than the cost of production at the Van Dyke plant. Furthermore, the risk of a control over supply was minimized. In a similar way cabinet manufacturers, equipped to produce on the large scale program of 1929, would likely be in a position during 1930 to furnish cabinets at a reduced cost.

In the bakelite industry the expiration of patents

held by the Bakelite Corporation opened the manufacture of this product to other companies. It was evident that the new patent situation would provide greater competition and probably lower prices. The degree of success obtained by the new companies, however, was dependent somewhat upon their ability to compete with the new production facilities of the Bakelite Corporation;¹ the Bakelite Corporation had already begun to manufacture the product. There was a possibility that the supply would remain practically controlled by the one company. The volume of bakelite sheet required by the Van Dyke company was sufficient to justify production savings unless there was stiff competition. Experience in bakelite molding and laboratory experi-

ments in the making of bakelite sheet indicated that the material could be made by the company with success.

In July, 1929, it was reported that leaders in the paper box industry were considering a number of mergers which would place control of the industry largely in the hands of the Container Corporation. The industry had been somewhat demoralized by conditions, the chief of which was the fact that continuous 24-hour operation had lowered cost tremendously. This had given rise to a sales policy aimed more at gross volume of production than any consideration of price. As a result, overproduction and price slashing were present.

WILLMARTH COMPANY (B)

Manufacture of a Fabricated Part in Excess of Production Requirements for Purpose of Sale to Competitors

The Willmarth Company was the second largest producer of radio tubes in the United States. In 1934, after it had manufactured its own radio tube bases for nearly a year, the company investigated the advisability of increasing its base-making facilities for the purpose of selling bases to other radio tube manufacturers. Total production of radio tubes in the United States for 1934 was expected to be somewhat over 60,000,000 as compared with the 1933 total of 57,042,409.

In the latter part of 1933 the company had installed, in each of its plants, facilities for production of its own requirements of radio tube bases. The company's bases were produced by the staking process as were those of the Electronic Corporation.² In October, 1934, the difference between the Willmarth Company's cost of producing bases and the price at which the Electronic Corporation sold them seemed large enough to indicate that the Willmarth Company might wisely increase its base-making facilities for the purpose of selling bases to other tube manufacturers. The Willmarth Company's costs for this type of base and the Electronic Corporation prices at that time were as shown in Exhibit 1, page 126.³

¹ The Bakelite Corporation purchased a manufacturing site in Bound Brook, N. J. in August, 1929, at which time plans were made for bakelite production.

² For a fuller description, see the case of Willmarth Company (A), Howard T. Lewis, *Problems of Industrial Purchasing* (2d ed., New York: McGraw-Hill Book Company, Inc., 1939), pp. 377-381.

³ The actual figures in this case have been disguised, but the ratios are substantially accurate.

The Willmarth Company's management believed that manufacturers of radio tubes would welcome an opportunity to purchase staked bases from another supplier. At the time, the only competition which the Electronic Corporation had was that of bakelite manufacturers. Bases sold by the latter were made by the molding process and were inferior to staked bases. Although molded bases were obtainable at about a 10% saving as compared with staked bases, they were satisfactory only to the manufacturers who sold radio tubes on a price basis; even to these manufacturers the staked bases were more desirable except for the price differential.

Base-staking machinery of the type used by the Willmarth Company had been developed and patented by the Allen Brass Company, the company's chief supplier of pins. Relations between the two companies had been very satisfactory, and the Allen Brass Company was willing to give the Willmarth Company exclusive rights to the use of its staking machinery for the privilege of supplying it with the bulk of its pins. Although it was doubtful whether the patents held by the Allen Brass Company offered much protection against development of other machines, the exclusive rights were of value. Because the other tube manufacturers were small in size it was improbable that they or the pin suppliers would develop another machine.

During the 10 months the company had been staking its own bases, company officials had become convinced that a little more attention to inspection would raise the quality of the bases to a level comparable

Exhibit 1
Willmarth Company (B)

Cost of Staked Bases
(per thousand)

| Items | Small | | | |
|---------------------------------------|----------------|----------------|----------------|----------------|
| | 4 Prong | 5 Prong | 6 Prong | 7 Prong |
| Shell | \$ 6.00 | \$ 6.00 | \$ 6.00 | \$ 6.00 |
| Pins | 4.63 | 5.20 | 6.24 | 7.28 |
| Labor and Manufacturing Expense | 3.06 | 3.06 | 3.06 | 3.06 |
| Total Cost | \$13.69 | \$14.26 | \$15.30 | \$16.34 |
| Electronic Corporation Price | 17.52 | 18.24 | 19.56 | 22.68 |
| Items | Large | | | |
| | 4 Prong | 5 Prong | 6 Prong | 7 Prong |
| Shell | \$ 8.40 | \$ 8.40 | \$ 8.40 | \$ 8.40 |
| Pins | 4.63 | 5.20 | 6.24 | 7.28 |
| Labor and Manufacturing Expense | 3.06 | 3.06 | 3.06 | 3.06 |
| Total Cost | \$16.09 | \$16.66 | \$17.70 | \$18.74 |
| Electronic Corporation Price | 19.92 | 21.24 | 23.16 | 24.48 |

with that of the bases sold by the Electronic Corporation. In the early months of production, quality defects of two kinds had been encountered by the company. They were (1) defects in bases due to faulty staking and (2) defects due to the imperfect shells supplied by the two bakelite manufacturers patronized by the company. Defective staking had resulted in a lack of uniformity in the length of the pins; in loose, crooked, and missing pins; and in air leaks around poorly riveted pins. These defects had been satisfactorily corrected by minor improvements made by the Willmarth Company in the staking machines. Defects in bases due to imperfect shells had not been entirely corrected. Complaints made to the company's shell suppliers had reduced to some extent the principal defects such as imperfect rounding of the shells, lack of luster in the bakelite, and imperfect material content, but entirely satisfactory shells had not been obtained.

The shell manufacturers had originally supplied the Willmarth Company with shells at a margin of profit somewhat below their normal margin. They had been willing to do this because the Willmarth Company's purchases added an element of stability to their otherwise fluctuating production. The increased attention required to produce shells of higher quality had made it necessary for them to raise their original prices from \$5.40 to \$6.00 a thousand for small shells and from \$7.20 to \$8.40 for the larger size. Subsequent negotiations by the Willmarth Company indicated that the higher prices might be reduced somewhat. Since the

quality of shells was still not entirely satisfactory, however, the company did not plan on reduced prices but favored more attention to quality, for which it was willing to sacrifice possible price advantages.

The Willmarth Company's officers believed that the company would have no trouble in selling to each tube manufacturer a part of its requirement of bases at the same price that the Electronic Corporation sold them. They did believe, however, that at these prices the bulk of each manufacturer's bases would be bought from the Electronic Corporation because it had in the past been a satisfactory source and because of that company's prestige in the industry. In their opinion the obtaining of any substantial volume of business would necessitate offering either a price advantage or an advantage in the characteristics of the base. Since at its best the company could only hope to offer a base of quality equal to that produced by the Electronic Corporation, underselling the larger concern would be the only competitive advantage.

The company's officials did not know the Electronic Corporation's cost of production of radio tube bases. They were aware, however, that the corporation was not operating its base-making facilities at full capacity of 50,000,000 bases a year. There was the possibility, therefore, that if the Willmarth Company sought to undermine the larger company's market through price cutting, the Electronic Corporation might resort to lowering its price.

A sales organization for selling the prospective radio

tube bases would not raise a problem of any importance since the market would be limited to less than 10 possible customers. One man, possibly an executive of the company, would be able to give adequate attention to the sale of bases.

For the purpose of securing definite information concerning the cost of manufacturing additional quantities of radio tube bases, an executive of the cost department was asked to prepare a report on the advisability from the cost standpoint of the company's manufacturing for sale a volume of bases equal to its own requirements. Company executives believed that outside sales of this volume could be obtained as a result of the price at which the company could sell bases. Excerpts from the report are shown in Exhibit 2.

Exhibit 2

Willmarth Company (B)

Report on Staking Bases for Sale
November, 1934

This report covering the estimate of our costs of staking Bases is based on the following assumptions:

1. That the Total Yearly Requirements would be 30,000,000 bases, 50% for our own consumption and 50% to be sold to other Manufacturers.
2. That all Staking Production be done in one Department.
3. That the Total Production by Types of Bases would be the same for Type Distribution as our own Production.

Cost Factors to be taken into consideration would be:

1. Base Mold Requirements

It is assumed that the Daily 24 Hours Base Shell Production per Mold on Small Shells is 20,000 Per Day and for Large Shells, 10,000 Per Day. On the basis of these assumptions, 7 additional molds would be required at a cost of \$10,500.

2. Additional Staking Machines Required

To stake an additional quantity of 1,250,000 Bases per month, theoretically 2.9 machines would be necessary. To allow a safe margin, however, 4 additional Base Staking Machines would be required.

3. Investment in Staking Machines and Molds

Our own Mold investment may be ignored as being amortized.

The new Mold investment of \$10,500 should be charged off in six months and the total Base Staking Machine Investment of 9 Machines, including 5 now on hand plus 4 additional Machines required amounting to \$22,500 should be absorbed in Cost on a one-year basis. This would involve per thousand bases a machine depreciation charge of 75 cents and a mold amortization charge of 70 cents.

4. Estimated Labor and Manufacturing Expenses

Production 2,500,000 Bases per Month
Production 100,000 Bases per Day
Working Time 2 6-hour shifts per Day

To ascertain the monthly cost of Base Staking, a detailed analysis of all items of cost was made in the light of our experience during the past year. The total expense for these items would be \$8,150 per month, which would indicate that the labor and manufacturing cost per thousand on the basis of 2,500,000 bases per month would be \$3.26.¹

5. Estimated Type Costs per Thousand

| | 4 Prong | 5 Prong | 6 Prong | 7 Prong |
|--------------------------------|---------|---------|---------|---------|
| Shell | \$ 6.00 | \$ 6.00 | \$ 6.00 | \$ 6.00 |
| Pins | 4.63 | 5.20 | 6.24 | 7.28 |
| Labor and Mfg. Expense | 3.26 | 3.26 | 3.26 | 3.26 |
| Estimated Mfg. Cost | \$13.89 | \$14.46 | \$15.50 | \$16.54 |
| Electronic Corporation Price . | 17.52 | 18.24 | 19.56 | 22.68 |
| Gross Margin | 3.63 | 3.78 | 4.06 | 6.14 |
| | Large | | | |
| Shell | \$ 8.40 | \$ 8.40 | \$ 8.40 | \$ 8.40 |
| Pins | 4.63 | 5.20 | 6.24 | 7.28 |
| Labor and Mfg. Expense | 3.26 | 3.26 | 3.26 | 3.26 |
| Estimated Mfg. Cost | \$16.29 | \$16.86 | \$17.90 | \$18.94 |
| Electronic Corporation Price . | 19.92 | 21.24 | 23.16 | 24.48 |
| Gross Margin | 3.63 | 4.38 | 5.26 | 5.54 |

6. Sales Value and Gross Margin

| | Amounts | Per Thousand |
|---|-----------|-----------------|
| Gross Sales Value of 30,000,000 Bases per year at Electronic Corp. Prices | \$605,700 | \$20.19 |
| Gross Sales Value of 30,000,000 Bases per year at Electronic Corp. Prices, less 10% . | 545,100 | 18.17 |
| Our Manufacturing Cost | 478,800 | 15.96 |
| Gross Margin | 66,300 | 2.21 |
| Gross Margin less 5% for Returns | 63,000 | 2.10 |
| Gross Profit from outside sales — 50% | 31,500 | |

COMMENTS

In the foregoing cost estimates, the cost items included would seem to be sufficient to cover actual requirements.

Writing off the new mold investment in six months and the investment in Machines in one year would seem to be conservative.

It is believed that the other items are likewise conservative. The Cost of Shells and Pins was not reduced, even though there are prospects of price decreases.

Regarding the Staking of all Bases in one department, this would seem to be necessary in case we sell to other manufacturers. With Production controlled by a Department separate from our Tube Factories, service would be impartial and the quality of the product would no doubt improve. I have assumed, in the Cost Estimate, that more quality attention would be required.

¹ It will be noted that this figure does not agree with the \$3.06 for the same items indicated in Exhibit 1. The estimate of \$3.26 includes a somewhat greater allowance for inspection and for depreciation on machinery.

ALPHABETICAL LIST OF CASES AND EXAMPLES

| CLASSI- FICA- TION * | NAME | SOURCE | | BULLETIN PAGE |
|----------------------------|-------------------------------------|--------------|------|--|
| | | REFERENCE ** | PAGE | |
| 5 | American Optical Company | R | ... | 50; 77 |
| 5 | American Woolen Company | R | ... | 42 |
| 1 | Appalachian Tanneries Corporation . | A | 105 | 68; 74; 78 |
| 5 | Armour and Company | R | ... | 34; 37 |
| 4 | Atlantis River Company | H | 236 | 48 |
| 4 | Bell Chemical Company | L | 382 | 44, f; 45; 51; 74; 76; 78; 79; 99 |
| 5 | Campbell Soup Company | R | ... | 4 |
| 5 | Carborundum Company | R | ... | 41 |
| 4 | Carrigan Manufacturing Company . . | T | 34 | 34, ff; 39; 41; 42; 65; 67; 85, f; 90 |
| 5 | Clanford Company | F | ... | 88 |
| 5 | Continental Can Company | R | ... | 4 |
| 5 | Corewell Company | F | ... | 8, f; 30 |
| 5 | Corfee Company | F | ... | 52 |
| 1 | Cosgrave Paint Company | A | 107 | 45; 51; 56; 64; 75; 76; 91; 95 |
| 1 | Creely Company | T | 27 | 27, ff; 31; 45; 49; 57; 66; 92 |
| 1 | Essel Company | A | 110 | 53; 57 |
| 1 | Floss Company | T | 20 | 20, ff; 31; 68 |
| 5 | Ford Motor Company | R | ... | 34; 37; 54 |
| 5 | Frawley Company | F | ... | 87, f |
| 4 | Gibbs Company | L | 403 | 91 |
| 4 | Graff Machine Company | A | 111 | 58 |
| 1 | Hartkey Company | T | 83 | 57; 83, ff; 98 |
| 4 | Hauser Packing Company | A | 113 | 64, f; 95 |
| 4 | Hopkins Electric Company (A) . . . | L | 417 | } 90, f |
| 4 | Hopkins Electric Company (B) . . . | L | 421 | |
| 3 | Horton Instrument Company | T | 13 | 13, ff; 18, f; 20; 24; 57 |
| 1 | Kirwood Company | T | 58 | 18, f; 52; 53; 57; 58, ff; 67; 90; 99 |
| 5 | Lillis Company | F | ... | 52 |
| 1 | Machias Instrument Company | A | 115 | 66; 79, f; 91 |
| 5 | Marlowe Company | F | ... | 87, f |
| 5 | McElwain, J. F., Company | R | ... | 77 |
| 4 | Mills Company | T | 70 | 56; 68; 70, ff; 93; 99 |
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* Key to classification:

- 1 — Case prepared by author; edited for use in the Industrial Procurement course; and released by company for use by the Graduate School of Business Administration, Harvard University.
- 2 — Case prepared by author; released by company for use in this thesis.
- 3 — Case revised by author from case already released by company for use by the Graduate School of Business Administration, Harvard University.
- 4 — Case not prepared by author but taken from file of cases released by companies for use by the Graduate School of Business Administration, Harvard University.
- 5 — Examples gathered by author in personal interviews with executives of company or from published sources.

** Key to source reference:

- A — Appendix of this bulletin.
- F — Fictitious name of a real company whose experience was not written up as a case.
- H — *Harvard Business Review*, January, 1928.
- L — Lewis, Howard T., *Problems in Industrial Purchasing*, 2d ed., New York: McGraw-Hill Book Company, Inc., 1939.
- R — Real name of a company whose experience was not written up as a case.
- T — Case appears in text of this bulletin.

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