

COST and PROFIT OUTLOOK

Alderson & Sessions—Marketing and Management Counsel

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OPERATIONS RESEARCH AND MANAGEMENT PROBLEMS

A new tool of management, known as operations research, is exciting interest in many companies. Some executives have been sufficiently convinced of the value of this new approach to set up operations research units. Others remain skeptical as to whether it really represents anything new or are genuinely perplexed as to its practical applications for them. The illustrations of the successful use of operations research seem far removed from business operations. Many of the practitioners of these new techniques have had little contact with management problems. An attempt will be made here to place operations research in a perspective compatible with a management view of operating problems. The examples of potential application will largely pertain to the marketing function. The same plan of evaluation could be extended to problems of production and finance.

It may be helpful to start out by showing how operations research in marketing is related to marketing research and statistical analysis. All endeavor to assist in solving management problems but with a difference in emphasis. The elements of problem solving are facts, findings and recommendations. Marketing research has specialized on the collection of marketing facts through surveys or other procedures. Statistics aid the analyst in deriving valid findings from the facts. His findings include estimates of market potential and measurement of the results of selling effort. Interest in operations research is focused on recommendations. Furthermore, this interest is definitely channeled by a particular conception of what a problem is and the form that a recommendation should take. A problem for the operations researcher is a question concerning efficiency or productivity in some operating system. An acceptable solution takes the form of a rule of action for getting the best results. The goal is the same as in conventional economics but the approach is different. Operations research in marketing, which might also be called operational economics, goes after numerical results which can be useful in the given situation. The methods it employs in finding these numbers are drawn from many branches of science and mathematics. Yet the resulting rule of action can often be stated and applied as simply as the rule of thumb which it replaces.

An executive with a problem is an individual responsible for decision and beset with uncertainty as to the course of action to follow. To solve a problem is to reduce uncertainty to a point that will permit a choice to be made. There are at least four levels of uncertainty which can readily be distinguished in characterizing management problems. Many of the new techniques associated with operations research can be sorted out in relation to these four types of uncertainty in management. What follows is not presented as an exhaustive review of operations research techniques. Rather, it is intended to show how some of its most characteristic methods can be utilized in the problem solving or decision making process. The elements

of uncertainty in the four broad types of management problems pertain respectively to allocation of effort, control and coordination, information and contact, competitive strategy and value theory. Each of these areas and the applications of operations research will be discussed in turn.

PROGRAMMING MARKETING ACTIVITIES

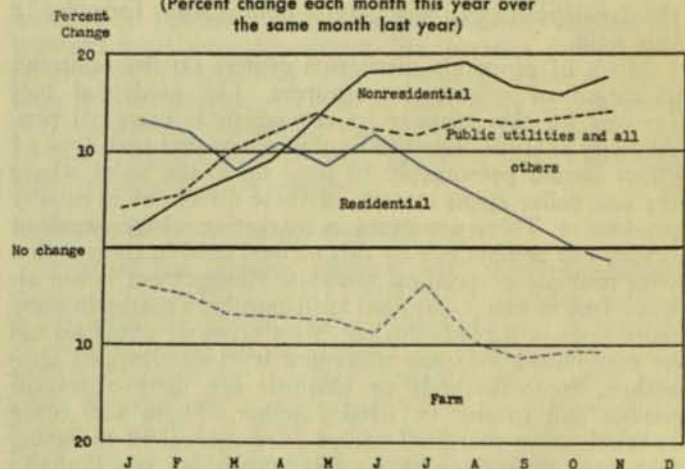
Allocating marketing effort is the same thing as selecting a marketing program. Like any other economic activity marketing can be described in terms of inputs and outputs. The desired outputs are the sales of the company's products projected over the next operating period and are often set forth in a sales budget or schedule of market forecasts. The inputs are the various kinds of marketing effort such as selling, advertising and sales promotion. In discussing the programming problem it is assumed that the market forecasts can be taken as reliable despite the possible actions of competitors. Unexpected shifts in demand are also ruled out for the time being. A further assumption is that the program, once established, will be kept under effective control and produce results as anticipated.

The point is that the programming problem remains even with all these favorable assumptions and is often exceedingly difficult. The source of the difficulty is largely the complexity of the operating processes involved. That means that there is a large number of possible programs, and the analytical task of picking the right one is formidable. The most tangible achievements to date are in physical operations such as warehousing which are the aspects

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PERCENT CHANGE IN VALUE OF NEW PRIVATE CONSTRUCTION, 1953

(Percent change each month this year over the same month last year)



Data from Construction and Building Materials Industry Reports

See Article on last page

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of marketing most closely resembling manufacturing. The warehouse expert controls costs by minimizing the movement of goods required in storage and order filling. One step in accomplishing this result is to arrange products along the assembly line in accordance with Zipf's principle of least effort. That is to say that the greater the number of pieces or pounds to be moved the closer the item is kept to the loading dock. Operational analysis in warehousing produces other benefits beyond the proper positioning of products. It prepares the way for efficient use of mechanical handling equipment and accounting machines and for the functional design of warehouses.

Operational analysis is making headway in other aspects of marketing. Requirements as to the number and size of trucks for a delivery operation have been determined by balancing the cost of movement over the road against the cost of waiting time. Principles of layout for display in retail stores rest on a balancing of the traffic created by a product against its response to traffic created by other products. Some excellent work has been done both theoretically and practically on store location and urban land values but the opportunity is wide open for the development of more precise optimization formulas in this field.

Much of economic discussion centers on the optimum allocation of effort or resources. The analytical tool favored for this purpose by economists is marginal productivity analysis. Essentially this means that each type of effort should presumably be used up to the point where the last dollar spent in each of these directions is equally productive. There are cases in marketing where excellent results can be obtained by this method used in conjunction with multiple correlation analysis. Management is not always free to make marginal adjustments in marketing any more than in manufacturing. Most types of effort should be maintained at some minimum level or dropped altogether. Some methods or channels are directly incompatible and cannot be used together. These and other restrictions on marginal analysis are equivalent to saying that many operations have a structure which sets limits to the number of feasible programs.

Here lies the opportunity for a developing aspect of operations research known as activity analysis or linear pro-

gramming. No attempt will be made to describe these methods but only to say in simple words what they are intended to do. Linear programming sets out to identify the most favorable among the feasible programs or ways of combining the possible activities or processes in a system of action. Starting with any given program the method enables the analyst to find a more productive one if it exists, then a still better one and so on. This may sound like a rather advanced form of trial and error but it is distinctly superior to informal trial and error with no reliable means of weighing one plan against another.

There are serious computational difficulties in the more complicated programming problems. However, it frequently turns out to be an aid to insight to set up the problem in this form. In this connection an attempt to apply linear programming may revitalize some of the older and more conventional analytical procedures. Sales analysis and distribution cost analysis in skillful hands can still lead to marked improvements in marketing operations. They might acquire a new significance if regarded as means for obtaining the parameters needed for carrying out linear programming. It might equally well turn out that linear programming would provide a conceptual framework giving point and direction to the older types of analysis. Operations research in its very nature embraces any existing method that can help solve a problem rather than introducing a new one purely for the sake of technical virtuosity.

CONTROL AND COORDINATION IN MARKETING SYSTEMS

In the second class of problems, as in the first, the aim of the operations researcher is to find an appropriate optimization formula. That is to say that he is offering analytical help to management in minimizing costs, maximizing results or identifying the best possible pattern of activities in a complex operation. The chief difference is that the discussion from here on must take account of further factors of uncertainty. In the first case uncertainty for management was largely the result of complexity and not of contingency with respect to control of the problem situation. In this section we drop the assumption that management is dealing with a well-oiled machine. The individuals or organization units involved in the operation are recognized to be semi-independent but are susceptible to management. That is to say that they are willing to be coordinated to the extent that there is a common interest in results. The best means of control and coordination may become the key management problem. In the view of Chester Barnard, the function of the executive in large organizations is not to engage directly in maximizing behavior but to keep the organization tuned up so that it will operate at an optimum level.

The techniques of operations research can assist management in coping with uncertainty at this level as well as in programming and allocation. This particular phase of operational analysis is called control and communication theory. In one of its versions it has been given the name cybernetics which freely translated is "steersmanship." The mathematics of the field have been developed by such diverse specialists as neurologists and electrical engineers. But while cybernetics has made a substantial contribution to an understanding of servo-mechanisms and of the nervous system, applications to operating organizations are only in the beginning stages. A central principle of control is called negative feed-back. That means that when the operation moves beyond the control limits the information is fed back along appropriate channels so that corrective action can be taken. Human systems of communication and

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control are subject to difficulties similar to those of mechanical systems. The message may be obscured by noise or interference. There is frequent danger of overloading the channel. The channel may fail because it is not a closed circuit. The feed-back may produce over-compensation so that the system oscillates further and further out of control.

None of the purely mechanical models quite comes to grips with the basic process and motivation of human cooperation. It should be readily possible to extend the theory as soon as the issues have been clearly drawn. In a cooperative setting each individual performs a specialized function on the expectation that other individuals will be performing related functions and the total program will proceed in a satisfactory manner. The performance of each participant depends in part on his confidence in the performance of others. Often one participant must have definite knowledge of the action of the other in order to proceed with his action. One may be responsible for initiation of action and another for detailed execution of action.

The elementary model of cooperation would consist of two participants with the action of each conditioned in some degree by a feedback of information about actions taken by the other. The study of such models might be extended step by step to take account of larger cooperative systems. That type of model has already been employed in studies of the inventory problem. The coordination of any sequence of steps or the balancing of production and selling activities is a problem of this general character. After the parameters of control have been established by operations research it may be possible to design electronic devices or other mechanical means to facilitate coordination.

Another type of study in this area is that directed toward improving an organization structure to permit more effective cooperation. One of the techniques of operations research is the operational experiment. This means setting up a probability model which has a structure paralleling an actual or potential operation and then putting it through an operating cycle. Thus, in a situation involving a waiting line of units to be serviced, the arrival of units on a random basis over time can be simulated by pulling numbers from a table of random numbers. The capacity required to maintain a given standard of service can be estimated in this way. Because of the relatively low cost of securing data by these so-called Monte Carlo methods it will be possible to try out several alternative patterns of operation on paper before putting any one plan to the final test of action. One of the side advantages of such a procedure is that of minimizing the number of adjustments which have to be made after a plan is put into effect and which can have a very adverse effect on morale. One important field of application would appear to be in the management of marketing channels. Any new policy may tend to favor one type of customer to the dissatisfaction of others, so that damage is done either by changing it or by attempting to hold the line. There is a high premium in such cases on being approximately right the first time, a result which might be achieved more readily by using operational models.

SEARCH THEORY AND THE PROBLEM OF CLOSURE

The first section proceeds on the assumption that the operation to be programmed is fully controlled. The second section drops this assumption to take account of cases in which the problem of control is crucial to the system of action. In this third section we drop the assumption that management is dealing initially with a closed system. The

crucial problem then becomes that of achieving a sufficient degree of closure to permit an operation to be completed. A supplier searching for customers is able to market his goods only to the extent that he makes successful contact. A buyer searching for goods is similarly seeking to effect the closure in the system which is necessary to the continuity of the processes in which the goods are to be used. Problems of control and of programming may remain to be solved but they are naturally subordinated in many cases to the primary problem of contact and closure.

The probability models required for this phase of operational analysis can be derived from what is known as search theory. To do this the analyst must proceed in terms of basic conceptions and not rely on superficial analogies. In physical terms there is very little resemblance between a plane sweeping over miles of ocean looking for submarines and a consumer examining retail assortments looking for a dress. The basic similarity is that both must be guided by some sort of a priori estimates of the probabilities of finding what they want. These probability estimates may undergo change in the course of the search, but from moment to moment may affect decisions as to where to look and whether to break off the search or continue. Work now being done on consumer shopping behavior is making use of such probability models and appears to be yielding significant results. The study of actual shopping trips in turn has led to the development of psychological tests having the same probability structure as shopping. In these tests it is possible to control and to modify the parameters and to gather data much more rapidly and economically than could be done through collecting further data on actual shopping trips.

In seeking to establish contact with customers the marketing organization is trying to reduce uncertainty by achieving operating closure. This function can be performed with greater assurance if the seller takes account of the dimensions of uncertainty confronting the buyer. One objective of every supplier is to induce a certain number of customers to buy with confidence and to regard him as their regular source of supply. At the same time the supplier who endeavors to expand his position in the market must attract some customers who are habitually buying from his competitors. To do this he may undertake to plant doubts in their minds and may be said to be increasing the degree of uncertainty they experience. However, if he has a legitimate claim upon their attention he may simply be making them aware of actual hazards in their situation and suggesting that his product can help solve their problems. There is no necessary conflict of interests here since consumers, like persons playing any other economic role, may have to be made aware of problems before they can undertake to solve them. It is believed that operational analysis of this type can have an impact on many aspects of marketing, including advertising and retail assortments and display.

PROBLEMS OF COMPETITION AND CONFLICT

In all of the previous sections, with their varying assumptions as to closure or control, the discussion pertains to an operating system in which there is some community of interest among the participants. In this final section the reality of conflicting interests is recognized. Conflict may exist between organizations or within an organization. External conflict is typified by competition among large scale enterprises. It is among large companies that management can conceive of marketing strategies and in turn must take account of the strategies of their competitors.

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An effective strategy often takes advantage of some special character of the firm which employs it and may be difficult to counter in precisely the same terms. Competitors may not have a good answer available and are able only to choose strategies which tend to minimize the degree of competitive injury suffered. A firm may be forced to employ purely defensive means for some time until it finally matures a plan of counter attack which makes use of its own natural advantages. In intensively competitive industries there may be observed an ebb and flow of competitive advantage not unlike a succession of military battles or campaigns.

The division of operations research which can provide models for this type of competition is game theory. In some games there is a point of balance between the players representing the worst that can happen to the stronger competitor and the best that can be achieved by the weaker one. That kind of stable adjustment has been reached among large competitors in many instances. Game theory also provides models for competitive situations without this type of stability. Game theorists are working actively toward the construction of models which can stimulate a greater range of competitive situations with greater fidelity. Some applications have already been made in business and accelerated use can be expected as the theory progresses. There is no substitute for managerial experience and resourcefulness in devising or meeting competitive strategies but an orderly framework for evaluating the possibilities could be useful to the sharpest competitors.

CURRENT ACTIVITY IN NEW PRIVATE CONSTRUCTION

For many years the rate of construction activity in the United States has been observed as an indicator of both prevailing and prospective business activity. It is an important indicator not only for those whose activities are directly related to the construction industry, but also for those who are concerned with the outlook for the total economy.

Little explanation is necessary to understand the interest and value which a measure of construction activity holds for those whose economic well being is directly associated with it. While its effect upon the outlook for the total economy is somewhat less apparent, it is also of vital concern for several reasons. First, private construction activity accounts for a significant proportion of gross national product (about six percent during 1952). Secondly, the relationship between total economic activity and construction activity is a basic one. Continued long term growth of gross national product can result only by expansion of productive capacity of which modernization, replacement, and construction of new plants and buildings are an important part. Consequently, an increase or decrease in construction activity somewhat foreshadows the prospective rate of overall future economic activity.

Private construction activity during the first eleven months of 1953 showed a substantial increase (eight percent) over the same period of 1952. However, observation of the extent to which private construction for each month of 1953 exceeded the corresponding month of 1952 provides additional insight into its relative movement throughout the year. Even though construction during each month this year has exceeded the corresponding month last year, the rate of increase has been at a steadily decreasing rate since June, until a low for the year of 5.8 percent was reached in November. New private construction activity has failed to maintain its previous vigorous rate of expansion. For the present at least, it has passed its peak level and must now either stabilize at its

There are a number of economists and operations researchers who are attempting to cope with conflict of values within an organization. Schemes have been devised for rating objectives and working toward a point of compromise by successive trials. Conflict of values affects many types of economic activities starting with household purchases. There are doubtless many families lacking anything approaching a stable expenditure budget because of the lack of agreement on basic family goals. These tensions with respect to family requirements may often reflect still deeper tensions including basic conflicts within the individual personality.

The resolution of conflicts can range over into the areas of ethics and psychiatry but they are not thereby excluded from the interests of the operations researcher. He may properly take on the assignment of finding a procedure for resolving conflicts within an operating system if that is the crucial problem which is interfering with productivity. Conflicts at one level of consideration are sometimes resolved by appealing to criteria pertaining to some broader level. Conflicting goals in a single organization unit may have to be resolved in terms of the aims of the whole organization. Conflict in short range objectives may be reconsidered in terms of long range objectives. Some conflicts cannot be resolved at all within the existing frame of reference. Management must decide when to fight and when to seek constructive compromise. The analysis of the factors involved in the conflict is therefore an appropriate topic for operations research.

present level or begin a downward trend.

By virtue of its size, residential construction activity (accounting for about 50 percent of total private construction) to a large extent influences the level of total private construction activity. Even though the overall increase in residential construction was seven percent above the eleven month level for 1952, activity during the last three months declined sharply from the high levels experienced during the earlier part of the year. Therefore, there can be little doubt that residential construction is the most significant soft segment of total new private construction at the present time.

During 1953 farm construction was consistently below the corresponding 1952 monthly level. Since it accounts for a much smaller proportion of the total, it does not influence new private construction to the same extent as does residential construction. Nonresidential and public utility construction both have increased at an accelerating rate throughout most of the year. These relative gains, to a large extent, off-set the declines experienced in both residential and farm construction. However, because of the volatile nature of the various components, its off-setting influence cannot be assured for the months ahead.

The relative decline in the rate of current increase for new private construction activity raises several important marketing implications concerning the strategy of those who sell to this industry. First, selling in general will become a more difficult task and buyers will be more concerned over price and quality. Next, a greater proportion of sales effort might well be directed toward the nonresidential and public utility market because of its comparatively strong current position. Finally, manufacturers must review their distribution policies in light of both cost and efficiency. In addition, manufacturers must extend all possible aid and assistance to all parts of their distribution system so that sales position and morale are effectively maintained.

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THE MOTIVATION OF CONSUMER BUYING

This article initiates a series on consumer motivation representing a new approach to this fundamental aspect of marketing. Some features of this approach have been suggested in previous articles. These earlier insights are now embraced in a general theory concerning the motivation of consumer behavior. This theory is still in the making, but it has been considerably extended and clarified through recent developments in the basic research program of Alderson and Sessions. Of special significance for the future of motivation research were some psychological experiments carried on at the Massachusetts Institute of Technology. These research findings will be reported in succeeding issues. This article presents an introductory statement of the general viewpoint.

The basic doctrine to be expounded here is that rational problem solving is a key aspect of consumer behavior. Much of the current work of market analysts on consumer motivation attempts to explain buying behavior by irrational factors such as instinctive and unconscious drives. This tendency is understandable as a reaction against the excessive and exclusive emphasis on rationality by some economic theorists. The present view starts from an analysis of the nature of problem solving and what it means when applied to consumer buying. This view of motivation is able to take full account of non-rational factors such as habituation, ego-involvement, and emotional conflict. These factors can all be treated as aspects of the buyer's problem in the present view of rational behavior.

THE PLEASURE PRINCIPLE AND ECONOMIC MAN

During the 19th century Bentham and his followers thought they had found the key to human conduct in the pleasure principle. The individual sought to maximize pleasure, to minimize the corresponding pain of effort and evaluated all goods accordingly. Economic man was assumed to know exactly what he wanted, to have perfect knowledge of what the market offered in the goods desired, and to carry out with complete precision his calculations as to the net effect on happiness.

Still greater refinement of analysis was attributed to the consumer by the exponents of marginal utility. Confronted by a barrel of apples, economic man was able to arrange them instantly and automatically on a scale of descending values from the first apple to the last in anticipation of progressive satiation. The basic decisions made by the buyer were those relating price and quantity for the same product. The range of wants was fixed by the underlying patterns of needs. This theory of economic behavior really dodges the issue of motivation and merely seeks to explain how the buyer with a given set of preferences will adjust to the supply situation.

Here perhaps is the parting of the ways between economics and marketing. The economist for the most part has tried to get along without assumptions about consumer psychology. Consumer tastes and the processes by which

they are formed were outside the field of economics as narrowly defined. For the market analyst, on the other hand, the crucial task was to describe and if possible explain the pattern of consumer preferences. In its treatment of the practical problems of moving goods, marketing has often seemed to bear more resemblance to applied psychology than to economics.

BUYING HABITS AND IMPULSE BUYING

Two non-rational factors which have received a great deal of attention in efforts to explain consumer behavior are habit and impulse. John B. Watson, one of the founders of behavioristic psychology, entered the advertising business, and was the great exponent of habituation in buying. In fact, his view of human nature was that we bring little into the world except capacity to absorb a culture through exposure and conditioning. Our preferences as well as our skills are the result of learning. Constant repetition is a primary means for shaping learned behavior. Identify the people who can buy your product, bombard them with advertising messages, and build up a distribution network which makes it easy for them to buy. Many marketing plans are built on this philosophy and proceed as if habituation were the sole end and aim of selling.

Quite a different approach to motivation in recent years relies on instinctive drives to explain behavior. Personality and culture are diverse expressions of sexual desire, the will to power, or primary emotions such as rage or fear. For a product to sell, it must be hooked up with the individuals self-esteem or with deep seated urges he will not consciously acknowledge even to himself. Freudian psychology in its various forms, as well as older and cruder instinct theories have been employed in this attempt to search out hidden motivations. Marketing research has responded with a rash of depth interviewing methods, projective techniques, and other adaptations of psychiatric practice. Impulse buying is a major influence in the market and success awaits those who can plumb the hidden sources of these drives in such theories.

Both habit and impulse are undeniably important in a comprehensive view of consumer behavior. Both, however, play their part within a broader pattern of adaptation which cannot be explained by either. Rational decision and rational planning are as vital to the household as to the business firm. A new conception of consumer rationality will be presented, based on the psychology of problem solving or adjustment, and embracing the non-rational aspects of behavior as problem elements.

PROBLEMS OF THE CONSUMER PURCHASING AGENT

The new approach draws a clear distinction between the consumer and the consumer purchasing agent. It is the motivation of the purchasing agent which is directly rele-

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vant in marketing. The prospective consumer of a given purchase and the person making the purchase are often two different people. In many cases, the purchase is made for a household and the purchasing agent is only one of those who will share in its use.

The distinction still exists in a fundamental sense when only one person is involved. Most purchases are made to provide for consumption at some future time or use over some future period. Psychologically, he is in a different frame of mind in buying than in consuming. The rational buyer must weigh each purchase against an anticipated pattern of behavior and not merely in terms of satisfactions to be derived from the given article. In our modern American economy we do not typically sell food to hungry people or clothing to those who literally have nothing to wear. The purchasing agent and those he represents already possess a stock of goods which he is trying to replenish or extend. Only in the case of the dope addict or the alcoholic is the consumer and the purchasing agent merged into one by the drive of an overwhelming desire.

The positions of the consumer purchasing agent and the industrial purchasing agent differ only in degree. Rational behavior is a matter of planning, budgeting and careful consideration of comparative values. Rationality is exhibited in ability to learn from experience and to adopt new methods. It is exhibited in its choice of issues, and in applying itself to the significant rather than the trivial. Finally, it copes with the problems which arise in trying to provide the goods which will serve as the instruments of future behavior for one or more people each with several roles to play at home, at work, and in the community.

Returning to the issue of habit and impulse, it becomes apparent that it is immediately clarified by drawing a sharp separation between consumption and buying. Consuming habits are part of the pattern of living but buying habits are only derived from this pattern. Buying habits in the sense of repetitive purchases of a given brand, or customary trading at a given store can be broken over night with no real disruption in the pattern of living. Buying habits in fact, can more safely be regarded as deliberately chosen routines designed to save time and energy for rational consideration of more important matters.

The distinction between buying and consuming is equally crucial in trying to understand the place of impulse. The term impulse buying is widely and hopefully used by students of display merchandising. Close observation of unplanned purchases indicates that display often merely serves as a reminder and that the purchase still falls within an organized pattern. Impulse in the sense of breaking the pattern through the force of desire is a factor but it happens within definite restrictions. The rational buyer is more concerned to provide for the consuming impulses which may be expected to occur in the future. The impulse to eat between meals cannot handily be indulged unless the refrigerator is stocked with appropriate foods. The consumer must possess a set of golf clubs ordinarily if he is to obey that sudden impulse to spend Saturday on the links instead of mowing the lawn. It is true that there are consumer purchasing agents of less rational type who respond with childish abandon to items on display which have little genuine utility for them. This type soon runs up against the imposed rationality of being out of money and having to use some part of the next week's check for necessities before going on another splurge.

There is no intention here to leave habit and impulse out of a comprehensive view of motivation. In terms of the present view, however, the important thing is habit and impulse in consumption as seen through the eyes of the consumer purchasing agent. The presence of non-rational elements in buying itself is recognized but given a more restricted place. The purchasing agent is essentially engaged in solving problems. While there are differences in ability here as in industrial buying, the typical performance is fairly good and the desire and ability to improve is clearly in evidence.

UNCERTAINTY AND PROBLEMS OF CONSUMER BUYING

The definition of an operating problem is the same for buyer and seller, for large and small operations. A problem is an issue involving uncertainty as to the course of action to pursue in an operating situation. To solve a problem is to reduce uncertainty to the point where a course of action can be adopted with some confidence. Uncertainty arises either because the operating situation is complex or because the person who must act is confronted with contingencies beyond his control as to future events. The consumer purchasing agent, like other problem solvers, faces both complexity and contingency in carrying out his function.

The problem solver is trying to see the essential structure in a complicated situation and trying to make the best gamble in being prepared for future requirements which are subject to chance variations. Complexity in the consumption pattern arises from the many products needed to maintain a high standard of living and from conflicting ideas about the desired standard either among the members of a household or within the mind of a single individual. Uncertainty arises from the requirements imposed on the household from the outside including the pressures of business and social schedules and the common circumstances of illness or frustration, or of success and maturation. Out-guessing the future is hazardous either in the short-run or the long-run. Yet that is what the purchasing agent must do as effectively as possible if the household is to have means of carrying out desired behavior patterns in the light of its opportunities as they develop.

The approach to motivation presented here in bare outline is believed to have several major analytical advantages. It enables the analyst to deal directly with het-

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erogeneous demand or the choice among unlike goods as compared to the choice among different quantities of the same goods. It provides a more effective way of getting at the dynamic aspect of demand and identifying the motives which lead to changes in the pattern of living. The con-

sumer purchasing agent approach is called for in these respects and others as being more appropriate to an economy of abundance as compared to theories which were formulated in terms of more stringent assumptions as to scarcity.

THE INVOICE TRACE METHOD OF MARKET EXPLORATION

One of the recent developments in the economy that has brought certain marketing problems to the foreground is the intensification of interindustry or product competition. This situation has arisen primarily because production research people are doing their work well in connection with the development of new types of fabricating materials from which both industrial and consumer goods can be made. Certain established industries have suddenly discovered that their positions are being challenged by synthetic or "substitute" materials that are the products of the laboratory.

Never before has the manufacturer been confronted with such a wide range of materials from which to select the components or ingredients for his products. Many producers of fabricating materials are discovering that intra-industry competition, competition between the firms in the industry, is becoming of minor consequence as contrasted with the competition being offered by the new or revised products of other industries.

Lumber, for example, finds its market position being challenged by plywood and hardboard as well as by specialized products of the glass, aluminum, steel, and brick and tile industries. The producers of natural fibers are acutely aware of the competition being offered by synthetics. The introduction of the many members of the plastic family of products has caused virtual revolution in certain areas of manufacturing.

For these and other reasons, producers of fabricating materials are evidencing increased interest in studying the patterns of end use for their products and in reviewing their marketing and distribution policies. This interest is resulting in the inauguration of research programs by individual firms as well as stimulating research activity on the industry level through trade associations. While the bulk of these studies are being approached through the application of conventional survey and research techniques, many can perhaps be better attacked through the application of a technique developed for this particular purpose—the *invoice trace*.

THE INVOICE TRACE METHOD

Basically this method involves selecting a representative sample of material at the mill or plant level and following it through the channel of distribution until it reaches the hands of an end user. The end user may, of course, be an industrial user or manufacturer who is using the product being traced as a fabricating material in the production of goods, or the user may be an ultimate consumer who is reacting to the rapidly developing "do-it-yourself" trend.

The selection of the material to be traced at the mill or plant level is best accomplished through random choice of sales invoices in such a way as to assure an adequate and representative sample. To the extent that the invoices so selected lead the investigator to large-scale industrial end users, the trace is at an end and the specific uses made of the product by these purchasers can be determined.

Other invoices will lead the researcher to intermediate sellers. Where this is true, the trace is continued by selecting from the intermediate sellers' invoice files such invoices as are necessary as to account for the resale of the traced material. From here the trace is continued in similar fashion until the original mill sample of material has been traced through the channel of distribution to end use.

Decision as to which of several alternative methods of selecting invoices at the various levels of distribution should be used depends upon circumstances peculiar to the particular investigation. Normally, the invoice trace will reveal the siphoning off of some material to industrial use at all levels with the quantity of material involved in such sales diminishing as we proceed downstream in the channel.

The invoice trace, then, differs from the usual survey approach in two important respects. First, the sampling involved is concerned with the selection of a sample of *material* rather than a sample of *users*. Secondly, the search for end users is initiated in the channel of distribution rather than at the user or consumer level.

CONDITIONS FAVORING USE OF THE TRACE TECHNIQUE

It is not suggested that the invoice trace method of market exploration is superior to alternative approaches in any and all cases. As a matter of fact, the possibility of its application depends upon the presence of certain circumstances favorable to its use. Among other things, the plan presupposes the availability of complete invoice information at all levels of distribution, as well as a cooperative attitude on the part of the marketing functionaries and users involved.

A major difficulty may arise at the retail level of distribution. Some retail firms do not make sales invoices for cash sales at all and some record a minimum of sales information on invoices that do not reveal the names of purchasers. Under these circumstances, the trace procedure, strictly defined, ends at the retail level. Here it becomes necessary to substitute the opinions of retailers relative to customers' use of products for information secured directly from the user, or to design a sample of consumer-level buyers. Such adjustments may result in some dilution of the quality of the data secured.

The trace method seems to be clearly superior where the market being studied is somewhat narrowly distributed, but includes a broad range of end uses. Under these conditions development of an adequate sample of users would be complicated by the existence of many universes—each presenting problems from a sampling point of view. This would be true, for example, in the case of a material that has a wide range of industrial uses as well as a substantial market among ultimate consumers. Searching out eligible respondents by traditional means would be exceedingly

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difficult under such circumstances. This obstacle is especially difficult to overcome when we recall that the objective of the investigation is the determination of the percentage of total output going to various uses.

Another factor favorable to the use of the trace method is the absence of marked seasonality in the sale of the material, or the availability of reliable information concerning the seasonal pattern. The shorter the time period over which it is necessary to select invoices, the less complicated the method becomes in operation. It may well be difficult to trace invoices issued more than six months or a year in the past because of the varying policies of firms relative to the period of time over which invoices are preserved in the files.

ADVANTAGES OF THE METHOD

The invoice trace method of market exploration has been found to enjoy the following advantages over conventional approaches:

1. Once invoices have been selected and the appropriate information has been recorded, respondents for questioning relative to product use are automatically identified. Hence, the field investigator is relieved of any responsibility for seeking out firms and persons who have used the material and may begin at once the securing of information from persons known to be users. These savings in field time and cost become substantial, especially where the product being studied is not one used by a high percentage of business firms or households.
2. Data secured by an invoice trace can be made to yield a wealth of both qualitative and quantitative information concerning the nature of the channel distribution that is in operation. The availability of such information is vital to the formulation of effective distribution policies. The trace is capable of bringing inadequacies in the channel into sharp perspective.
3. Because of its very nature, the invoice trace reveals reliable *quantitative* data on end use that it would be difficult to gain in any other way. Such information becomes invaluable as a guide to the formulation of advertising and sales promotion programs.
4. The trace procedure provides unique opportunity for determining the character and intensity of competition. By providing ready access to respondents who have recently purchased and used the product, the method takes the field investigator to those who have recently made choices in the market and are, therefore, capable of revealing the alternatives to those choices and the reasons for the decisions that were reached.
5. A final advantage is found in the fact that the invoice trace method of market exploration is basically factual. Its operation is based on facts relative to what has happened in the channel of distribution, and the questions presented to sellers and users are essentially factual in character. As a result, the dangers inherent in procedures based upon analysis of opinions and interpretations are minimized.

LIMITATIONS OF THE METHOD

The invoice trace method is not without disadvantages, limitations, and special problems. One of the more important of these is the problem of estimating the size of the sample of shipments of material that will prove to be adequate. Successful planning in this connection will depend largely on the analyst's ability to estimate the breadth of the end-use pattern.

It is also true that tracing a completely adequate sample of material, while leading to an accurate measurement of end use, may not bring the investigator into contact with a representative sample of users. The user respondents contacted in connection with the trace are simply those functionaries and users who happen to be involved in the distribution and use of a sample of material. In most cases, however, they will represent a true enough cross-section to warrant the drawing of inferences necessary to effective analysis of the data secured. This comment is, perhaps, more in the nature of a warning than a limitation. It cautions the user of the invoice trace method against assuming that the invoice trace research structure provides, not only a basis for investigation of end uses, but a basis for collecting representative opinions of various types of distributors and users.

It is essential that the application of the trace method be considered only where the investigator can be certain of a high level of cooperation all along the trace line. If the climate of cooperation deteriorates as the trace proceeds downstream through the channel, investment in sample, planning, and operations may be lost.

It should also be pointed out that while the degree of respondent preselection implicit in the method leads to savings in interviewer time, the task of selecting invoices from files is time consuming.

CONCLUSION

It seems clear that more and more producers of fabricating materials are going to find themselves confronted with substantial interindustry or product competition. Hence, interest in reliable end use information as a guide to the development of more effective sales planning and sales promotion will increase. It also seems apparent that intensified product competition creates a need for review of channels of distribution and distribution policy. Under these circumstances, the invoice trace method of market exploration may well be an important development toward the goal of providing management with necessary quantitative and factual information.

Thus far, the method has proved highly useful to manufacturers who have found themselves suddenly face-to-face with declining or stabilized demand for their products, or in situations where expansion of productive facilities has caused increases in available supply. Such producers have recognized the necessity for rapid development along the lines of sales promotion. They have, however, been at a loss as to how to proceed because of a scarcity of basic information on what happens to the material once it leaves the plant or mill. The invoice trace provides a means of accumulating such data as is necessary for the initiation of sales promotion and reveals the means for keeping that data current.

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COST and PROFIT OUTLOOK

Alderson & Sessions—Marketing and Management Counsel

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February 1954

BUYING MOTIVES AND CONSUMER SHOPPING

No subject in marketing is of more fundamental interest than the motivation of consumer buying. This article continues the discussion of that subject initiated in our January issue. The viewpoint presented here has been maturing over a number of years but was brought into sharper focus by a research program carried out during the past six months. A complete report of the methods used in these investigations will be presented later. The theoretical position previously stated will be amplified here and some of its practical implications will be suggested.

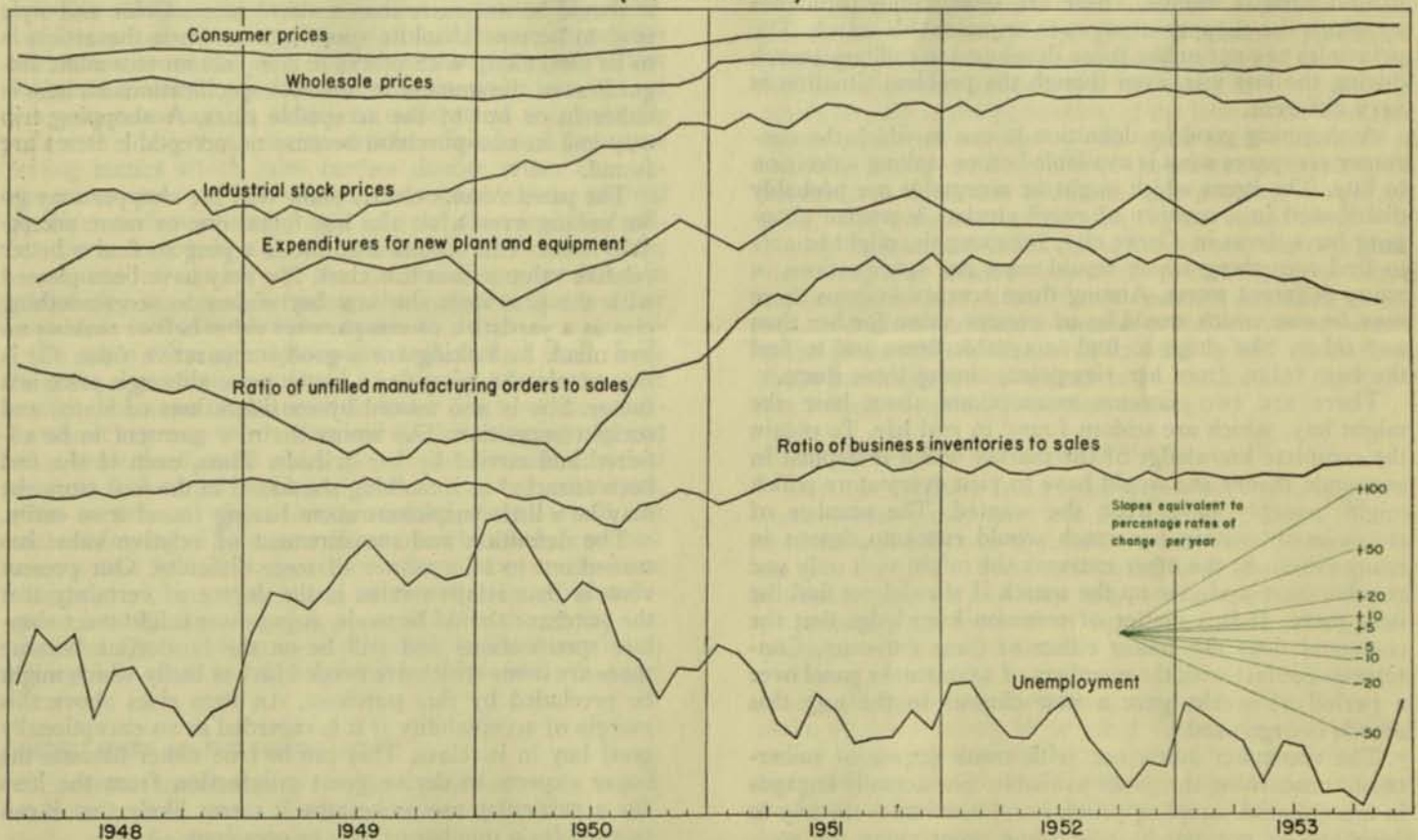
Marketing efforts attempt to reach and influence the consumer buyer. The typical buyer in our view is the purchasing agent for a household. It is the function of the buyer to make the best preparation possible for the future activities of the members of the household. Choosing the right goods is a complicated task because the modern household is involved in so many activities and its members often have conflicting aims and preferences. The purchasing agent runs a heavy risk of being wrong because it is difficult to foresee what will be needed most.

In attempting to cope with these uncertainties the consumer buyer is above all a problem solver. The primary aim, as for any problem solver, is to maximize the expectations for successful action. It is something like the inventory control problem of the industrial buyer. The stock of goods which the consumer buyer is trying to replenish or extend constitutes the means and instruments required by anticipated patterns of behavior. Buying decisions may turn out to be wrong in the light of unexpected events. Poor judgment may have been used in evaluating the relative urgency of needs. But while skill in buying may vary, the performance of the buying function can best be regarded as a rational effort to reduce uncertainty.

It is true that there are irrational elements in all consumer behavior. There are deep-seated preferences which are hard to explain. The inertia of habit, the sudden sweep of impulse, conflicting desires either in one person or among various members of the household cannot be ignored. But all these are simply factors in the problem confronting the rational consumer buyer.

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PRINCIPAL ECONOMIC INDICATORS, 1948-1953 (RATIO SCALE)



DATA FROM SURVEY OF CURRENT BUSINESS

(See article on last page)

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UNCERTAINTY ON THE SUPPLY SIDE

The uncertainties perplexing the consumer buyer pertain to both demand and supply. Doubt exists both as to what is wanted and as to how to find it. Uncertainty on the supply side will be considered first. Shopping is an attempt to find what is wanted. There are some simple principles by which the shopper attempts to organize this search. The principles are not unlike those developed in military search during the last war, even though the problem situation is very different.

A shopping good by definition is one in which the consumer compares what is available before making a decision to buy. The items which might be acceptable are probably distributed in a number of retail stocks. A woman shopping for a dress in a large city, for example, might be able to find something which would meet her specifications in many different stores. Among these acceptable items there may be one which would be of greater value for her than any other. She shops to find acceptable items and to find the best value, from her viewpoint, among these items.

There are two extreme assumptions about how she might buy, which are seldom found in real life. To obtain the complete knowledge of the market which is implicit in economic theory she would have to visit every store which might possibly have what she wanted. The number of stores easily within her reach would run into dozens in many cities. At the other extreme she might visit only one regular store and give up the search if she did not find the item there. It is a matter of common knowledge that the consumer does not follow either of these extremes. Continuous contact with the members of a consumer panel over a period of weeks gave a new clue as to the way this search is organized.

The consumer starts out with some degree of uncertainty concerning the goods available. She actually engages in a sequential sampling process and terminates the trip in purchase or non-purchase at some point along the way. She obviously does not think of herself as a statistician but

the study indicates that she assigns conditional probabilities to the various possible stores. The nature of these probabilities was determined by survey methods and checked against the results of actual shopping trips. A typical probability distribution can be described for these consumers, all located in the Boston metropolitan area. A relatively high probability was usually assigned to a single store. This might be stated as 65 to 85 chances out of a hundred that the desired item could be found there. Next, there tended to be a group of four or five stores which were assigned a probability ratio of 40 to 60 out of a hundred. The shopper did not appear to make fine discriminations among these stores but to group them as the "also-rans" following the preferred store. Finally, there were all the remaining stores in which there was assumed to be only an outside chance of satisfaction and which would be visited only in extreme urgency.

These probability ratios are not offered as significant in themselves. They may differ by city, by type of product, and by class of customer. The important thing is that such ratios exist and that rational consumer buying behavior is guided by these probability estimates. Normally the shopper goes first to the store with the highest probability ratio and then visits the stores of the second group in whatever order seems most convenient. There are exceptions as to the order of stores since the typical shopping trip involves several items rather than only one. The order of stores also varies with knowledge of the market and becomes more settled as knowledge increases.

The final choice depends on judgments of two kinds of value which may be called absolute and relative value. Absolute value is adherence to necessary requirements. Characteristic aspects of these absolute specifications are that the article should be in a limited range as to size and that it should be not more than a stated price. Color and style tend to become absolute specifications when the article is to be used along with others to complete an ensemble. Regardless of the number of absolute specifications an item is either in or out of the acceptable class. A shopping trip may end in non-purchase because no acceptable items are found.

The panel results clearly show that the shopper may go on looking even after she has found one or more acceptable items. This means that she is trying to find a better relative value within this class. She may have been pleased with the first item she saw but wishes to see something else as a yardstick of comparative value before making up her mind. In looking for a good comparative value she is not merely shopping for a better price although price is a factor. She is also moved by considerations of status and social competition. She wants the new garment to be admired and envied by her friends. Thus, even if she had been attracted to something she found in the first store she may be a little suspicious about having found it so easily.

The definition and measurement of relative value has turned out to be a matter of some difficulty. Our present view is that relative value is the degree of certainty that the purchase should be made. A purchase might meet absolute specifications and still be on the borderline because there are items which are needed just as badly which might be precluded by this purchase. An item rises above this margin of acceptability if it is regarded as an exceptionally good buy in its class. This can be true either because the buyer expects to derive great satisfaction from the item for a particular use or because it seems likely that it can be used for a number of uses or occasions.

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Absolute and relative value can both be expressed as factors in a probability equation. Absolute value is either 1 or 0 according to whether the item falls in the acceptable class. Relative value is a fraction between 1 and 0 representing the degree of certainty that the purchase should be made.

SIGNIFICANCE FOR RETAIL MERCHANDISING

These studies of shopping behavior were directed toward developing a theory of motivations. The theory is of little worth unless it has direct implications for the solution of marketing problems. The work is still in an exploratory stage and will not yet support any sweeping generalizations concerning the marketing activities of all retailers or all manufacturers. Discussion of application here will be limited to an indication of the kinds of questions which a theory of motivation should eventually be able to answer. If there are principles determining the nature of shopping behavior, they are bound to have an impact on retail merchandising.

Despite their uncertainty as to available supply, it turns out that 80% of shopping trips in the Boston area end in buying something and that the majority of these purchases occurred in the first store visited. These ratios might not be quite so high in another city, since it is understood that Boston consumers are higher than average in store loyalty. The great advantage of being the first store on the list would undoubtedly hold in any market. The Boston study and similar work conducted earlier in Philadelphia indicate, however, that some stores get a substantial amount of business through the disappointment and frustration which shoppers have suffered in visiting neighboring stores.

The factors which place a store first on a shopper's list are the obvious ones of convenient location, charge accounts, special sale advertising, and satisfactory experience with the store in the past. The factors which result in lost sales after the shopper has entered the store are lack of adequate assortments, failure to understand and meet the customer's objections to the article offered and improper selling tactics which raise further doubts rather than reduce uncertainty. This analysis is equivalent to the old problem of first getting people into the store and then selling them something once they enter. What is new is the possibility of setting up the merchandising problem in probability terms and finding the optimum pattern for each store in its search for customers.

To apply these principles of control, a store would have to make a continuing analysis of sales in relation to store traffic. The store would need to know for how many customers it represented the first call on the shopping trip and what were the factors which gave it this priority. It would need to know, particularly for this class of customers, what sources of dissatisfaction caused them to walk out without buying. The store will get some business from customers who have already visited other stores on the same shopping trip but this is one of the benefits of advantageous location. In analyzing promotional strategy, the cost of direct appeals to get customers into the store may be set off against what it takes to satisfy them when they get there.

UNCERTAINTY ON THE DEMAND SIDE

Uncertain knowledge as to where goods are to be found, while important in the whole marketing process, is a relatively superficial aspect of the consumer buyer's whole problem. The deeper uncertainties may be said to be on

the demand side of the equation. The buyer is often in a quandary as to what the family really wants or should want. In buying goods, as in other aspects of human behavior, two or more objectives may be in conflict so that satisfying one tends to preclude the satisfaction of another. In discussing these aspects of conflicting demands it is again useful to look at the absolute and relative aspects of the problem.

There is an absolute clash between objectives if satisfaction as to one is bound to produce dissatisfaction as to the other. An example of a recurring problem of this type is when two members of the household have opposing and strongly held preferences. Clashes may occur over cigar smoking, the color or style of home furnishings, or even over the average winter temperatures maintained in the home. More fundamental conflicts about consumption and the purchase of goods are related to deep convictions or feelings about a way of life and what constitutes getting ahead for the family. One member may be much more concerned about "what people think" or both may be trying to conform to social norms but in terms of different reference groups. One may measure progress mainly in terms of social standing and the other in terms of possessions or money in the bank. The clash need not be between different persons but may arise from different aspects of the same personality or between an old pattern and a new in the process of maturation and the emergence of new objectives.

What might be called relative conflict pertains to the priority or degree of urgency of two objectives which are not in themselves incompatible. This type of conflict can be reduced to a matter of timing and the family budget. One type of purchase is precluded by another simply because there is not sufficient means to have both and to have them immediately. The rational consumer buyer meets this problem by a program of planned purchases. The item selected for the next purchase should be the one which makes the greatest net increment to the utility of goods already in the possession of the household. The consumer buyer necessarily applies some such evaluation in deciding among unlike goods. If the pattern of needs could be taken as final and complete, this problem would not arise. The consumer purchasing agent would simply be buying replacement items for a fixed stock, the only decision being how much to buy at the prevailing price. Given a changing culture, a constantly enriched standard of living, and an advancing technology for satisfying needs, there is always a problem as to what to buy next. Even those purchases which appear to be routine and repetitive are subject to review from time to time.

SIGNIFICANCE FOR BRAND ADVERTISING

Retail advertising is directed largely toward telling consumers where they can find the item they want. If it is truthful and effective it should help to reduce uncertainty on the supply side. Some advertising by manufacturers has a similar purpose and may help to reduce uncertainty by perpetuating an established buying routine through repeated reminders of a familiar product.

Brand advertising in general is directed toward influencing the preferences of consumers and helping them to make up their minds as to what they want. Advertising policy might be clarified in many instances if the advertiser defined his job as helping the consumer to solve a problem. Advertising can help reduce uncertainty at the level of relative conflict between objectives. Its relation to

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the deeper conflicts in family goals is more confused but offers an area for exploration and progress in the future.

Advertising in some form is an essential means for placing a differentiated product in competition. It must compete on its special merits and prospective users must be told what these merits are. The new product must break into an established pattern and must justify its right to be considered. The ultimate appeal is to the principle which has already been enunciated. It must convince the prospect that it will make a greater net contribution than will any other product to the utility of the assortment already in the possession of the household. The new good enters the pattern either because it is directly complementary to some of the goods owned or because it is expected to enhance the satisfactions which can be derived from the whole stock of goods. An application to advertising copy would mean that more emphasis would be placed on selling the new good into the typical household setting rather than presenting it as an end in itself.

While the ultimate aim of selling and advertising is to reduce uncertainty, an intermediate step may be to make households aware of hazards they had previously over-

looked. Life insurance, for example, has had to be aggressively sold. It took vigorous presentation to get consideration of more remote risks at the same level as more immediate contingencies. Having first been induced to give due consideration to these risks, the seller then offers his product as a reasonable and economical means of meeting them. A household, in turn, has a better chance of achieving a harmonious pattern if its members have considered together the more long-range as well as short-range contingencies. Such considerations might well influence the promotion of many products.

Finally, there is the consideration of keeping a product sold once it has been bought. This problem may arise as soon as the buyer gets it home. She may need to know what to say to sell it to other members of the family. Thereafter, the satisfaction that a family derives from a product will have a bearing on a repurchase and on what they tell their friends. Good advertising and a good product can be planned to sustain this continuous generation of goodwill. Our next issue will describe our motivation studies in greater detail, both as to research methods and statistical findings.

ECONOMIC INDICATORS DO NOT POINT TO A MAJOR DECLINE IN 1954

The prevailing opinion among forecasters has been that gross national product in 1954 will probably decline as much as five percent from the 1953 level and that unemployment (old series) will rise to 3.5 to 4.0 million. The recession expected is generally believed to be comparable to that of 1949 and early 1950.

In our opinion, this view is not justified by current available economic data. In general, conditions which prevailed in 1953 little resemble 1948, so that there is small reason to expect that 1954 will parallel 1949. This is shown clearly in the chart on the first page which gives the movements in seven major economic indicators over the period 1948 to 1953. This chart has a logarithmic or ratio vertical scale so that equal vertical distances anywhere on the chart indicate equal percentage differences. Percentage rates of change per year may be estimated by comparing the slope in an upward or downward movement with the lines in the "fan" in the lower right hand corner of the chart.

In contrast to 1948, both consumer and wholesale prices have remained relatively stable in 1953. Consumer prices in 1948 rose at the rate of 9.4 percent per year from March to September and declined at a rate of 6.7 percent per year from September to December. Consumer prices in 1953 drifted upward about one percent. Wholesale prices in 1948 showed an even sharper upward and downward movement, but in 1953, remained highly stable. Forecasters as a group do not expect declining prices, although they do expect declining income and employment. Falling prices are generally viewed as a necessary condition to business recession, so that there should be little concern until the price level manifests a definite downward trend.

Industrial stock prices during the first half of 1948 rose at the rate of 30.6 percent per year, and during the second half declined at a rate of 10.8 percent per year. In contrast, 1953 industrial stock prices declined at a rate of 17.4 percent per year until August, but have since risen at a rate of 33.7 percent per year. In the 1949 recession, stock

prices forecasted the upturn in business conditions by about nine months. If present conditions are comparable, the "recession" is nearly over.

Expenditures for new plant and equipment in 1949 fell 12.6 percent below the 1948 level. In contrast, expenditures for new plant and equipment in 1954 are expected to remain near the 1953 level. Business inventories over the past six years have generally been equivalent to 45 to 50 days of business sales. From August to November of this year business inventories stood at 50 days, a level that is perhaps two or three days too high for long term maintenance. A contraction of business inventories to 47 days, the level prevailing mid-year 1953, is to be expected, therefore.

Unfilled manufacturing orders in November 1953 stood at 74 days of sales. The peak level of the past six years, reached in August 1952, was 103 days. Since that date, the trend has been continually down. Fortunately, the 103 day level was substantially above that required for maintenance of "full employment" since unemployment has declined coincidentally with this declining backlog. At the present rate of decline the mid-1948 level of 51 days would not be reached until early 1955, and the 1949 level of 36 days, until late 1955 or early 1956. It is hoped that this backlog will provide sufficient time in which to complete necessary adjustments in the economy without marked increases in unemployment.

Unemployment reached what is believed to be a practical minimum in 1953. Even with the year-end upsurge, unemployment (old series) in December stood at only 1,850,000, which constituted 3.0 percent of the labor force as compared with 3.2 percent for December 1948. Nevertheless, the December level was the highest since 1948. January 1954 unemployment of 2,360,000, on the other hand, was below that of 1951. For the reason cited earlier, we do not believe that unemployment will continue to grow to 1949 levels.

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COST and PROFIT OUTLOOK

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EXPERIMENTAL METHODS IN MOTIVATION RESEARCH

There is a true story about a field investigator down South who was exceptionally successful in getting answers to "Why" questions. Since he was the only member of an interviewing team who was getting adequate results on this phase of a questionnaire his supervisor became very curious about the reasons for his success. The interviewer explained that when the respondent had answered a question about buying behavior he did not ask "Why?" Instead he paused and appeared to be considering the answer judiciously and then said, "What governs that?"

This manner of speaking might be a boon to motivation research if it was known and accepted in other parts of the country. The basic difficulties in probing for a disclosure of motives go deeper than semantics. The diversity of methods that are being developed for this purpose is frequently bewildering to the business man who may be interested in consumer motivation as applied to his own product. The purpose of this article is to provide some perspective for seeing these technical developments in relation to each other and to the function that each is designed to perform. Concrete illustrations will be drawn from our own experience in motivation research.

The rising tide of interest in motivation research may forecast major advances in the art of marketing. Products embody ideas and the consumer evaluation of products rests on these ideas. Advertising attempts to sell the product idea into an established pattern of information and attitude. The market analyst tries to discover what the product really stands for in terms of prestige and security or in terms of economy and gratification in relation to day to day living. The importance of the subject fully justifies the amount of attention which is being given to motivation research. There are two main lines of advance in techniques; first, improvements in interviewing methods and secondly, the design and execution of appropriate psychological experiments.

I. IMPROVEMENTS IN INTERVIEWING PROCEDURE

Many marketing investigations still rely on direct questions to obtain reports from respondents both as to the facts of market behavior and the motives behind the behavior. The investigator may be primarily interested in the facts of behavior and only be trying to get some incidental light on motivation. He may be under such urgency to get a national picture as to rule out the more intensive types of research that tend to be more limited in their geographic coverage.

The fallibility of consumer reporting springs from two sources. The respondent may not know the facts or recall them accurately and he may not be willing to disclose the facts. Both kinds of difficulty are especially acute with respect to motivation. Several motives may have been involved and the respondent may have difficulty in saying which one was his real reason for a given purchase or other action in the market. The urge to buy may operate

so automatically on some products that the subject is scarcely conscious of motives. The true motive may be considered vaguely discreditable to the respondent so that he is unwilling to report it. The Freudians go so far as to say that some of the deepest motivations are of a character that the individual will not even admit them to himself. Several improvements in interviewing methods will now be described as they developed in the course of motivation studies by our own organization.

DEPTH INTERVIEWING AND THE BUY-O-GRAPH

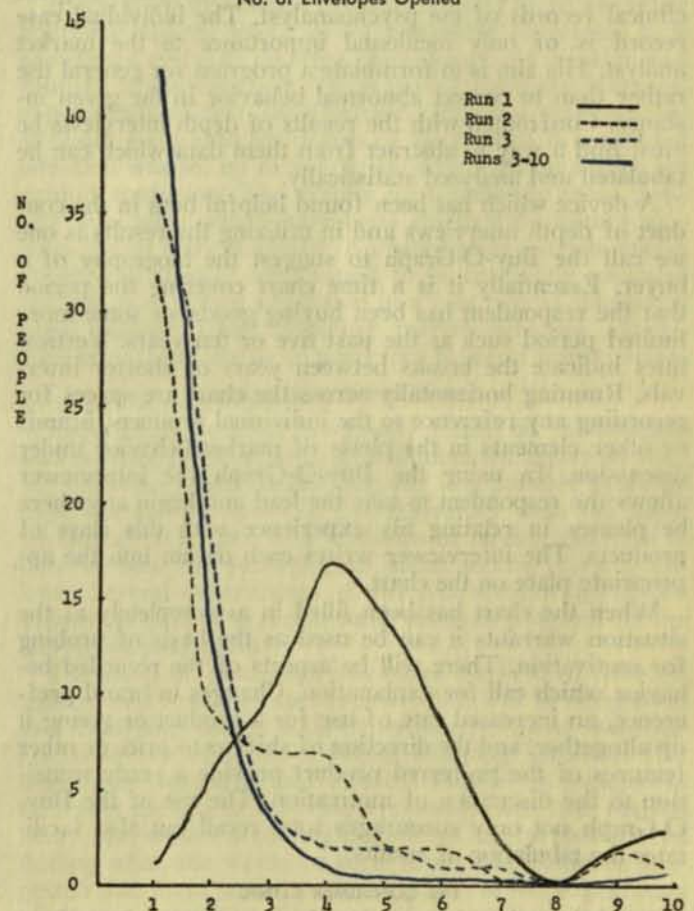
The designation depth interview has been applied over the years to a great variety of procedures. It is simply an interview of greater depth of penetration and sometimes adopts the theories and techniques of the so-called depth psychology. In general a depth interview tends to be an unprogrammed interview in which the investigator merely

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SHOPPING GAME BASED ON RANDOM NUMBERS

62 Subjects

No. of Envelopes Opened



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undertakes to promote free and total recall with respect to a phase of market behavior and motivation.

One of the real problems in the use of such a method is that it tends to produce diffuse case reports resembling the clinical records of the psychoanalyst. The individual case record is of only incidental importance to the market analyst. His aim is to formulate a program for general use rather than to correct abnormal behavior in the given instance. Confronted with the results of depth interviews he must find a way to abstract from them data which can be tabulated and analyzed statistically.

A device which has been found helpful both in the conduct of depth interviews and in utilizing the results is one we call the Buy-O-Graph to suggest the biography of a buyer. Essentially it is a time chart covering the period that the respondent has been buying goods, or some more limited period such as the past five or ten years. Vertical lines indicate the breaks between years or shorter intervals. Running horizontally across the chart are spaces for recording any reference to the individual products, brands or other elements in the phase of market behavior under discussion. In using the Buy-O-Graph the interviewer allows the respondent to take the lead and begin anywhere he pleases in relating his experience with this class of products. The interviewer writes each datum into the appropriate place on the chart.

When the chart has been filled in as completely as the situation warrants it can be used as the basis of probing for motivation. There will be aspects of the recorded behavior which call for explanation. Changes in brand preference, an increased rate of use for a product or giving it up altogether, and the direction of shift as to price or other features of the preferred product provide a ready transition to the discussion of motivation. The use of the Buy-O-Graph not only encourages total recall but also facilitates the tabulation of results.

THE CONSUMER CLINIC

A number of analysts now make use of group interviews as well as individual interviews. Our organization was one

of the first to adopt group interviewing, under the name of the consumer clinic, as an essential phase of every study. There are many values in the use of the clinic either as a supplementary procedure or as a primary source of data. It is used as a means of developing questionnaires which are to be used in making individual interviews. It often leads to the rephrasing of questions, the inclusion of additional questions, and to decisions as to the use of display materials or other features of field interviewing procedure.

The group situation offers unique possibilities for the probing of motivations. The "why" question sometimes seems a little arbitrary when posed to a lone respondent. He may not be able to say why he is doing something because it has never occurred to him that there is any other way of doing it. In a consumer clinic, differences in behavior, in tastes and in attitudes are apparent to all. Each individual is stimulated to think more discriminatingly about the reason for differences. At the same time there is some check on his professed motivations because of the presence of others.

An atmosphere of spirited debate sometimes develops out of the clinic setting. In fact, the leader of the clinic may deliberately precipitate issues as differences begin to emerge. There is conflict in the normal motivational background both among members of the household and between various goals of the same individual. One thing that is useful to know about a drive on the part of a consumer is whether it is strong enough to stand up against opposition. The clinic lends itself to a flexible use of individual and group interviewing in combination with various experimental procedures which have been made up in advance.

THE FAMILY OUTLOOK PANEL

A recent technical development growing out of our basic research program is a new application of the consumer panel. To characterize the special approach it is called the family outlook panel. The housewives in the panel are regarded as purchasing agents for their families. It is assumed that each is confronted with a series of purchasing problems which she is trying to solve through her planning and shopping activities. The family outlook, which is her frame of reference, is related in the short-run to an anticipated pattern of activities. The family's stock of goods must be replenished or extended to support these expectations. In the longer run the outlook is related to the basic goals of the household. It may be assumed that families, like businesses, hope to make some advance from year to year but family attitudes differ as to what constitutes getting ahead.

The latest family outlook panel was conducted in greater Boston, with weekly interviews for a period of six weeks. It was felt, after the panel was concluded, that a period of eight weeks with interviews every second week might have been better. The aim was to maintain contact long enough to get well acquainted but to stop the interviews before the participants became bored or began to change their buying habits perceptibly as a result of the panel. As compared to the ordinary depth interview the family outlook panel permits more penetrating questions as intimacy ripens. Experience proves that the panel opens the way for progressively more significant disclosures.

The behavioral facts collected pertained to shopping trips. At each call the interviewer obtained information on trips for the preceding week including items shopped for, items bought, number of stops and trips ending in non-purchase. The interviewer went back the following week

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after studying these shopping records and listing questions that were raised by this record of shopping behavior. As the panel progressed it was possible to get more fundamental explanations relating to family plans and budgets, the aspirations of family members, and the extent of harmony or conflict with relation to major purchases. After completing the interpretive interview the investigator collected data on trips which had taken place in the interim.

There is a common element in all of the methods described so far. In each case some record of actual behavior is compiled as the basis for probing into motivations. Subjects are asked to explain particular events or activities rather than to generalize on a class of events. The family outlook panel provides the broadest factual foundation and represents the most intensive of these efforts to get at underlying motivations. If many facets of behavior are to be explained the respondent may have to dig deeper into his own motivational structure in attempting to show how they are related. While this method still relies on direct reporting of motives, the reporting occurs within a well established frame of references. For many purposes it represents a distinct advance over the single contact depth interview.

II. PSYCHOLOGICAL EXPERIMENTS IN MARKETING

In addition to improvements in interviewing techniques, there have been significant advances in applying the methods of the psychological laboratory to the study of consumer motivation. A controlled experiment is a procedure set up to test some hypothesis. Since motives cannot be observed directly, the experimenter observes some aspect of behavior and then, based on his theoretical assumptions, makes inferences as to motivation. All scientific experiments follow the same general pattern of hypothesis and inference from theory. The vast amount that is known about the atom does not mean that any physicist has ever seen one.

Theories of motivation take on fundamental importance when psychological experiments are used. Theory is both the source of hypothesis and the basis for inference. The practical value of this type of research depends on the validity of the theory as well as on the excellence of research techniques. There are two broad classifications of theory with respect to the motivation of consumer purchases. One holds that the aspect of behavior under study is in some sense irrational. Members of this school do not believe that buying behavior can be adequately explained on the assumption that the buyer is acting on the basis of a clear conception of the ends he is seeking and the means which are appropriate to these ends. The opposing school believes in the essential rationality of consumer behavior in solving individual or household problems through the purchase of goods.

The writer adheres to the second view but not in the form in which it is implied in orthodox economics. The consumer purchasing agent is a problem solver but he works with imperfect knowledge, limited skill, and is confronted by uncertainty as to future requirements. The consumer is not wholly objective any more than is the business man or the economist. Judgment is distorted by vanity and prejudice, by hopes and fears and conflicting desires. All that is required by the writer's position is that rationality play a central, if limited, role in market behavior and that the problem solver takes his own irrationality into account as part of the problem. Rationality in the normal human situation does not consist in the flawless performance of an omniscient being but in the ability to do better as the result of experience.

The issue between rationality and irrationality can be somewhat clarified by the distinction between consumer behavior and consumer buying behavior. The first is a matter of subjective values, of personal taste and habituation. Buying behavior is instrumental behavior, and implies the use of energy and skill as in any productive activity. The motivation of consumer buying involves rational motives directly, but the buyer's problem in turn is affected by the subjective factors in consumption. There is a place for both types of experimental studies. Experiments designed for exploring the subjective aspects of motivation will be discussed first.

PROJECTION OF DRIVES AND ATTITUDES

The psychological device called the projective test has gained some acceptance in marketing. In a projective test the subject is asked to interpret some material such as an ink blot or a picture, to complete a sentence or a story or carry out some other task with no obvious relation to the subject at hand. The theory of the test is that the subject projects something of his own attitudes and desires into his interpretations. Since all subjects are given the same materials, differences in reaction must be of a subjective nature. Through projective methods the individual is placed in a position where he may exhibit an attitude rather than being asked to state whether he has such an attitude. Such tests were used in one market study where it was important to know whether consumers would react unfavorably to the word "rum." Inferences from test results are, of course, no better than the judgment of the investigator based on his background in psychology and marketing.

Aside from drives and hidden attitudes there are other irrational factors which affect marketing processes. It is sometimes useful to measure such things as confusion and conflict. In our own practice we have utilized psychological experiments to test for confusion between trade-marks. Without going into the details of the method, a controlled situation was set up in which subjects might or might not exhibit confusion. The results were certainly more positive than what would have been obtained by asking subjects if they were confused. A graded scale of trade-marks which had already been found to be confusing provided the means of rating confusion in a new pair of marks. In many similar areas involving market behavior experimental methods are to be preferred to direct interviewing.

PROBLEM SOLVING GAMES

Experiments can be designed to test the assumption that rational problem solving is a dominant aspect of buying behavior. Stated in another way it is possible to set up experimental problems in the laboratory with the same psychological structure as problems of buying and then to observe how the subject goes about solving these problems. Several experiments of this type were designed and utilized as part of a recent basic research program on the subject of motivation.

The chart on next page illustrates the kind of material used in one of these experiments which will be designated as a Shopping Game. This experiment or game was suggested by observations of actual shopping behavior. The hypothesis was developed that the shopper is engaged in sampling the stores that might possibly have the desired item. She makes some estimation of the probability of finding what she wants in each store. The evidence suggested that there was a great difference in her expectation of success among the eligible stores. Experience has shown

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that the best item sometimes turns up in unexpected places, so that it is scarcely rational for her to place complete reliance in a single store for an important item. Time and cost will not permit her to visit all stores.

In this situation it is to be expected that the rational shopper will visit stores in the order beginning with the highest probability. She will not visit stores of low probability except in cases of great urgency and lack of success in the more likely places. In this Shopping Game the subject was given a set of ten envelopes and told to work for the highest score under the instructions given. This score was to be obtained by choosing a number from one of the envelopes. The subject started out with ten counters worth 10 points each. He had to pay one of these counters for opening an envelope and that counted against his score.

The subject was told in advance how many numbers were to be found in each envelope. He was also told that the numbers had been distributed in a random fashion so that the chance of finding a good number in an envelope was proportionate to the number of cards in the envelope. Some numbers were unacceptable and the subject had to make a simple calculation on each number to find out whether he could use it. After a subject had made his run through the first set of envelopes he was given another set with a similar but different distribution of numbers. This continued until the subject had made ten runs in all.

The results of this experiment using 62 subjects is shown in the chart on the first page. The first run resulted in something approaching a normal probability distribution. A few stood pat after opening a single envelope, and a few opened them all, but the great majority were bunched in the middle of the range. That is the result that might have been expected if they had no advance knowledge of the respective probabilities of finding a good number in an envelope. The second run showed a decided change in the shape of this distribution, the subjects beginning to show by their behavior that they were taking the probabilities into account. By the third run a stable pattern had been established and was followed on all subsequent runs.

This final pattern can be justified as a rational one in relation to the stated probabilities. Most subjects stopped with one envelope, concluding that they had only a small chance of improving their score by going on. Some continued into the second or third envelope, or even further, depending on what they found in the first envelope and thereafter. The best numbers did not always fall in the first envelope and the subjects did not all get the sets of envelopes in the same order. As far as the reaction to probabilities is concerned, the game offers a psychological parallel to an actual shopping trip or series of trips. It might even be said that the learning process reflected by the changing pattern is analogous to what might happen to a group of shoppers moving into a new market and getting acquainted with the stores.

Data of this kind can be accumulated in less time and with less cost than can actual shopping trip data. The form of the experiment can be changed from day to day, if desired, to evaluate the effect of the various parameters such as the number of cards in an envelope and the payment for opening each envelope. Other versions of the game have been devised based on geometrical figures, descriptions of merchandise and on actual merchandise assortments. The goal is to complete an experimental apparatus stretching from the simple numbers game to one approaching actual shopping as closely as possible. Many problems can be explored through a flexible use of this apparatus.

This fairly elaborate experimental program is regarded as only a foundation for more fundamental research. Shopping was selected for study as a form of overt behavior. The motivations which the consumer buyer brings into the market are what the market analyst ultimately wants to identify. The program so far suggests that there are two kinds of value attached to products which might be distinguished as absolute value and relative value. Absolute value is the adherence to minimum specification which makes the item acceptable as a possible purchase. An item either falls inside the class of acceptable items and may be said to have a value factor of 1, or it falls outside and may be said to have a value factor of 0.

Relative value has to do with the rank of the particular item among all acceptable items. It is the desire to obtain a high relative value that makes the buyer go on looking after she has seen one or more acceptable items. Relative value in the sense in which the term is used here is not to be confused with dollar value. A ninety cent item might have greater relative value in its class than a hundred dollar item has in its class. Relative value is based on the probability that the item will turn out in retrospect to have been the right item to buy. The consumer arrives at her ex ante estimate on the basis of many subjective factors and in relation to many other items which might have been purchased. The measure of relative value may be regarded as a probability ratio lying between 0 and 1.

Consumer estimates of value, both absolute and relative, are reflected in market behavior. Using these clues the analyst must work back into the motivational structure of the family and the individual personality. Some answers are already opening up for applying psychological experiments in exploring motivation at these deeper levels. There is likely to be a continuity of research method throughout, since the general problem of rational behavior is that of acting in the face of uncertainty. The decisions taken or the attitudes formed before shopping starts are a part of this seamless fabric of rational behavior.

PROBABILITY DISTRIBUTION FOR SHOPPING GAME

A TYPICAL RUN: (Underlined numbers are unacceptable.) Each run has a similar distribution of 51 numbers.

Envelope	A	B	C	D	E	F	G	H	I	J
No. of Items	15	10	6	6	3	3	3	2	2	1
The items	<u>544</u>	538	<u>548</u>	539	483	<u>530</u>	538	487	<u>509</u>	<u>465</u>
In each	<u>519</u>	<u>525</u>	512	536	477	506	522	487	<u>475</u>	
envelope	<u>518</u>	512	502	527	473	501	459			
present	511	512	499	522						
a problem	499	498	469	521						
of choice	<u>492</u>	<u>485</u>	452	454						
parallel	489	474								
to the	487	472								
assortment	<u>485</u>	469								
of goods	482	462								
in a	<u>475</u>									
store.	<u>465</u>									
	461									
	456									
	454									

Supply of counters given subject at beginning of run.

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COST and PROFIT OUTLOOK

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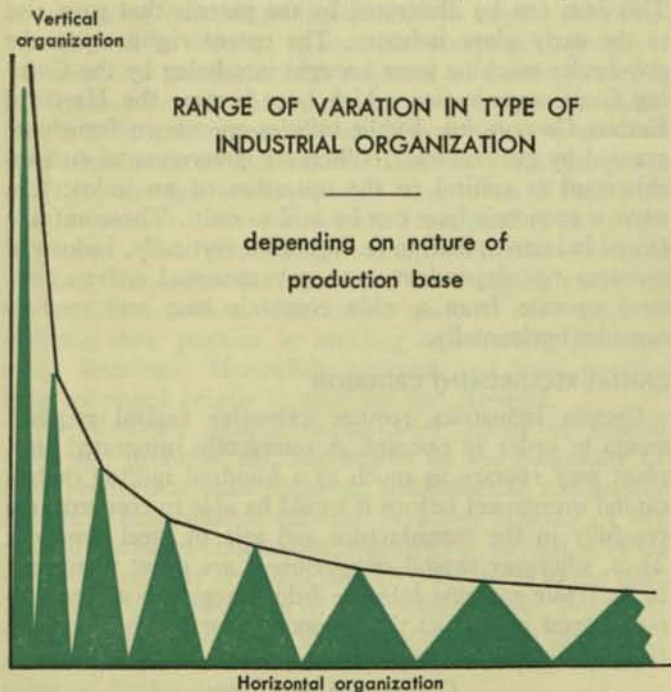
THE PRODUCTION BASE AND MARKETING ORGANIZATION

The prize contest announced in the June issue of COST AND PROFIT OUTLOOK produced a gratifying number of responses. The board of judges will not be able to hold their final meeting until the last week in August, so that the announcement of the results will appear in the September issue.

This issue contains the second of a series of articles by Leo Aspinwall, professor of marketing at the University of Colorado, and long associated with Alderson & Sessions as a consultant. We feel that his theoretical insights into the nature of marketing processes and marketing organization deserve a wider audience.

In the present article Professor Aspinwall points up some significant relationships between the kind of function an industry is called upon to perform and the way that it becomes organized to perform this task. He is not in any sense an apologist for monopoly. Rather he holds that competition necessarily takes a different form in the types of industries he contrasts even though it may be of equal intensity.

Goods can be classified in various ways to serve different analytical purposes. From the consumer viewpoint goods may be divided into use groups. In considering marketing channels and promotional methods it is illuminating to classify products by their marketing characteristics. For a broad perspective on industrial organization,



the nature of the production base provides a particularly valuable starting point. The production base of an industry is broad if it is relatively free of conditions which limit the number of firms which can enter the field. The production base is narrow if entry is severely restricted by such considerations as geographical concentration of resources, basic patents, or large capital requirements.

The concept of the production base is not quite the same thing as freedom of entry. There may be complete freedom of entry into an industry with a narrow production base in the sense that no firm already in the field possesses monopolistic power to bar entry to prospective competitors. Classification of industries by the nature of the production is concerned with inherent factors which tend toward concentration and which should be sharply distinguished from the exercise of monopoly power.

The base of production theory enables the marketing student to understand and interpret the way in which the products of an industry will be marketed and how the producing firms will be organized to accomplish their marketing tasks. It is also useful in predicting the changes in marketing channels and methods which will occur as the result of the advancing technology of production. An industry with a narrow base may tend to broaden its base. For example, only raw materials of the highest grade might be usable under a crude technology and these superior resources might be restricted to a small geographical area. As methods of processing are improved or synthetic substitutes developed, it may become possible to use materials drawn from widely dispersed locations. Similarly a broad base can become narrow as some resources are depleted, or if revolutionary technical developments give an increasing competitive advantage to patents or large-scale plant investment. The interest here is in the marketing and organizational consequences of the differences in the nature of the production base.

In general it can be anticipated that an industry with a wide economic base will be organized horizontally and that an industry with a narrow production base will be organized vertically. A horizontal organization is one in which there are many scattered production units and in which the producer typically has little financial stake or control over what happens at adjacent levels in marketing channels. A firm enjoying growth in this type of industry would usually expand horizontally. That is to say that it would operate over a wider geographical area or perform the same production and marketing functions on other products similar to those already in its line. The industry with a wide base may be more competitive in the sense that each firm recognizes that its products could be re-

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THE GEOGRAPHIC CRITERION

First among the natural resources upon which all production is dependent is land. Land supplies the raw materials needed for production, and in certain cases the supply of the critical raw materials is limited and at the same time confined to definite geographic areas. Thus the ownership or control of limited geographical land resources constitutes a narrow economic base. Land essential to an industry capable of being owned or controlled by one individual, partnership or corporation, or several of these entities constitutes a narrow economic base which tends in its industrial operation to become vertically organized.

Whenever the geographical extent of the critical land resource is so great as to be incapable of ownership or control by an individual, partnership or corporation, or by several of these entities, such land area, whether widely scattered or consolidated, is considered to be a wide economic base, which in its use as a resource will tend to be operated by concerns organized horizontally.

It might be said that at one time the Mesabi Iron Range in Upper Minnesota was this country's only supply of high grade iron ore and thus its ownership would constitute a narrow economic base. On the opposite side of the scale the total area of all lands capable of producing wheat is so extensive that it precludes ownership by one, several, or a group of entities. Therefore, such extensive land resources constitute a wide economic base. Industrial groups dependent upon such a base tend to be organized horizontally.

GOVERNMENTAL FRANCHISE CRITERION

Under our governmental system it has been deemed in the public interest to subsidize, to protect, to grant special rights, to enfranchise special interests so as to encourage greater productivity, or to encourage and reward initiative and innovation. This is done by granting franchises, patents, trade marks, or by giving governmental guarantee to contracts. These special rights in certain industries become the critical economic base upon which they operate. This idea can be illustrated by the patents that gave rise to the early glass industry. The patent rights upon the gob-feeder machine were brought into being by the Corning Glass organization which later became the Hartford Empire Corporation. Public utilities operate on franchises granted by governments. Wherever governmental enfranchisement is critical to the operation of an industry, a narrow economic base can be said to exist. These enfranchised industries tend to be organized vertically. Industrial concerns not dependent upon governmental enfranchisement operate from a wide economic base and tend to organize horizontally.

CAPITAL REQUIREMENT CRITERION

Certain industries require extensive capital requirements in order to operate. A completely integrated steel plant may require as much as a hundred million dollars capital investment before it would be able to compete successfully in the manufacture and sale of steel products. Thus, wherever capital requirements are great there tend to be fewer entrants into the field. Large capital requirements tend to restrict the economic base. Such industries tend to be organized vertically.

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placed by those of many other firms. It may not be nearly as competitive as another industry with a narrow base in terms of the vigor, skill, or determination of competitive efforts.

A vertical organization is one in which there tends to be a few production units or highly concentrated production areas and in which the producing firm is likely to own or control operations at several successive levels in the processing and marketing of products. The primary drive for expansion of growing firms in such industries is also likely to be manifested in a vertical direction. These are the fields which are marked by backward or forward integration as compared with the horizontal expansion or affiliation which is characteristic of industries with a broad base.

The contrast between a wide and a narrow economic base will become more evident in the subsequent discussion of four criteria which may be used to characterize an industry. There is a range of variation, of course, between the extremely horizontal and the extremely vertical types of organization. The chart depicting this range is purely schematic. The triangles are all given the same area for convenience of comparison. The height, representing verticality, decreases proportionally as the base, representing horizontality, increases. This difference in type of organization can be applied either to an industry as a whole or to the individual firms within it.

On the other hand, it requires a very small amount of capital to enter the popcorn retailing industry. A large number of people own enough capital to enter the small-scale retailing field, and thus it can be said that the economic base is wide with very little capital required for entry.

TECHNICAL KNOW-HOW CRITERION

Skill and special knowledge often constitute a real obstacle to free entry into an industry. At one time the carefully guarded secrets of full-fashioning women's silk hosiery was a limiting factor on free entry into women's silk hosiery manufacturing. The special trade was taught only to certain artisans, usually within families. Later, unions took over the guarding of the technical know-how of full-fashioning and carefully restricted the qualified practitioners. Translated into modern day operations, industries conducting extensive research operations accumulate a large amount of technical know-how that is essential to successful operation within their industry, and for the time being may preclude other entrants into the field. In such cases it can be said that industry operates upon a narrow economic base and will tend to organize vertically.

The technical know-how of raising wheat is not great so that there is no restrictive force that prevents free entry. The economic base in this case can be said to be wide and organization if anything will tend to be horizontal.

APPLICATION OF THE CRITERIA

The four criteria for evaluating an economic base may apply in varying degrees in a given industry, but all must point in the same direction to assure a wide economic base. Whenever a single criterion can be said to operate to show a tendency toward a narrow economic base, the single criterion will control. All business tends to seek differential advantage over actual or prospective competitors. Any one of the criteria for a narrow base may be sufficient to provide a protected position for existing firms. The removal of that one restriction by such forces as advancing technology is sufficient to expose the members of such an industry to increased competitive pressure.

Sometimes the adjustment required of existing firms is sudden and drastic when patents run out, new raw material sources are discovered, or marked changes occur in production costs or methods. Some of the industrial giants of fifty years ago would probably have fallen of their own weight by now even without the trust-busting campaign of that era. Meat packing, for example, has moved toward horizontal organization because of the changing nature of the production base. The major packers have tried to maintain their position by building or acquiring plants at many locations. Meanwhile regional and local packers have increased greatly in numbers and strength.

The decision against basing-point prices of several years ago probably had less impact on the geography of steel production than changing technological and supply factors. These include changes in major sources of ore and advances in combustion engineering so that it is no longer necessarily true that the ore must move to the coal. The increased cultivation of hard wheat in the Southwest compared with the Northwest has changed the geography of flour milling and strongly affected the channels of distribution for the products of the mills.

The oil industry can be said to have vertical characteristics, since its economic base could be described as being somewhat narrow. It is dependent upon crude petroleum that is produced in a limited land area capable of being owned or controlled through lease contracts by several corporations, partnerships or individuals. Oil fields as we know them today are not very extensive geographically, although they are more extensive than they were in the early days of the industry in Pennsylvania. The discovery rate of the industry is rapidly expanding the oil fields and we think of the industry as being composed of thirty leading companies. Not too long ago the Standard Oil Company occupied the dominant position operating from a distinctly smaller geographic base. We know the vertical character of the oil industry of this earlier day.

If we were to examine the industry at any time throughout its history it could be said that the capital requirements for entrance have always been large. Here again is a strong indication of a narrow economic base and the concomitant vertical characteristic.

The criterion of governmental enfranchisement may have influenced the industry earlier in its history but today it is not important. The patents on the various methods of refining crude have been widely shared among the members of the industry so that small claim can be laid to the narrowing tendency of governmental enfranchisement.

The technical know-how within the industry is in step with the amount of research that is undertaken by the various companies, and since most of the large companies carry on extensive research, there is not a large amount of difference in technical know-how. These last two testing criteria may even show some tendency toward broadening the base of the industry, but since one strong narrowing characteristic is present in our analysis the industry can be said to be on the vertical side of the scale.

EFFECT ON INTERNAL ORGANIZATION

The form of internal organization in large firms is influenced by the character of the production base. A narrow production base favors a centralized form of organization with authority closely held at the top and a clear line of command running downward through the organization. Competitive advantage lies in precise coordination between successive steps or levels. Elaborate scheduling and formalized procedures have evolved to accomplish this result. Careful attention is given to the design and maintenance of internal communication channels. Often there is a proliferation of staff units at headquarters concerned with current intelligence for top management and communication and coordination throughout the organization structure.

The opposite type of organizational design shows a horizontal pattern, with authority running outward to branch managers, but with very little depth at any one of these outlying points. The essential difference between vertical organizations and horizontal organizations is that authority is necessarily decentralized for the operation of widely dispersed units of the industry. This has the effect of making these widely separated units somewhat autonomous. But, since each unit operates in much the same way, central authority sets broad management policy and holds

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the individual units accountable for over-all management and operation.

Horizontal organizations may look simpler on the surface, but in some ways the executive skill required to manage them is much greater. Attempts to manage horizontal organizations as if they were vertical organizations breaks down completely, since the span of executive authority coupled with the difficulties inherent in horizontal organizations simply make the attempt inoperative. An executive in a central office cannot manage fifty branch offices directly and do it successfully. Where intermediate coordinating officials are interposed between headquarters and the branches, something vital in communication is lost and efficiency tends to decline. It is almost axiomatic to say that the span of an executive's control or authority rarely exceeds six or eight subordinates who report directly to him.

SOME MARKETING IMPLICATIONS

An industry with a narrow production base tends to have rigid or administered prices. This is generally held to result from the small number of firms in such an industry but this explanation ignores what is probably an even more important causal factor. With the emphasis on vertical coordination in an industry with a narrow production base, there is a need for stable price expectation to assure the orderly flow of materials and products from one level to another. Given the objective of operating the whole vertical structure like a single mechanism, uncertainty at any point in the flow can cause an interruption all along the line. When materials enter the system at one end it is a long journey before they come out at the other end and produce a payoff. Thus the span of risk is much greater than is usually the case in an industry with a wide base in which operations are organized horizontally. Stable transfer prices as between levels serve to reduce internal uncertainty, making it more feasible to cope with the large span of risk.

Price changes occur in an industry with a narrow base but at infrequent intervals and as planned adjustments to some basic change in the cost or supply situation. Prices in terms of constant dollars have become progressively lower in many such industries. Cost savings are passed on to the consumer even though prices do not fluctuate from day to day. There is an adequate profit incentive to reduce prices if the reduction will stimulate demand. Some of the best examples of consistent downward trends in prices are in industries of this type.

There often appears to be a special premium on technological innovation in an industry with a narrow production base. Perhaps it is because the task to be performed is especially well defined and integrated. Innovations at one level can be quickly matched by appropriate adjustments at adjoining levels because of over-all vertical control. Similarly, on the marketing side of such firms competitive campaigns can be carefully matured and directed toward long-run gains in position rather than short-run shifts in market conditions. Competitive attacks on the industry from the outside are also likely to be of a fundamental character, leading to major shifts in the nature of the production base. Examples would be the exploration and discovery of new supplies of raw materials or the development of synthetic materials as acceptable substitutes. Synthetic nitrogen grew out of Germany's difficulties when cut off from natural sources during the first World War. A similar development in synthetic rubber occurred during the second World War. These basic com-

petitive shifts, whether in war or peace, precipitate a new set of marketing problems for both the original members of an industry and the new entrants.

The closed marketing channels which are likely to go along with a narrow production base can be illustrated by the oil industry. Highly specialized facilities handled the product from the oil well to the consumer's car. Pipe lines for crude oil or finished products, tank farms, refineries, bulk stations and filling stations constitute a closed and tightly coordinated system for processing and marketing the products of a company.

The open channel as observed for wheat and its products is exactly the opposite of the organization of channels for oil.

Many thousands of independent producers, many independent grain elevators, open grain exchanges, many differently owned terminal elevators, many different processors result in many different products that flow through the hands of brokers, wholesalers, chain warehouses, cooperative wholesalers, and on to the thousands of retail outlets. This is a wide open channel of distribution and in general anyone may enter at any point he chooses.

Lastly, the phenomenon of price leadership as it operates within narrow based vertical industries, and particularly the oil industry, is fairly easy to identify from oil fields to filling stations. Whenever posted prices for crude are changed, one company will initiate the new price and all other companies follow that lead. Price uniformity does not necessarily involve dominant leadership, but can arise from purely independent action resulting from the study by all companies of the same market facts. The prices on gasoline pumps follow much the same pattern, except that some independent retailers in most local markets have a tendency to cut prices, knowing that the large companies will not quickly follow their lead. The phenomenon of price leadership is nonexistent in broad based industries.

CONCLUSIONS

The base of production theory, when used as an analytical framework for the study of marketing problems, provides a clearer view of the essential facts upon which decisions must be made. It is deductive reasoning from the general to the specific, and from that point of view it has some limitations. The factual evidence for the industries mentioned would appear to support the conclusions which have been suggested and which may be summarized in closing.

1. An industry with a narrow production base tends to be made up of firms which are organized in a highly centralized fashion. Industrial organization, given a wide production base is likely to rest on many small firms or on large firms decentralized into numerous autonomous units.
2. In vertical industries competition is likely to emphasize innovation and long-run marketing strategy. In horizontal industries there is more concern with competitive tactics in responding to short-run situations.
3. Vertical industries tend to operate under a rigid price structure.
4. Vertical industries tend to operate through closed channels of distribution, while horizontal industries tend to operate through open ones.
5. Vertical industries tend to operate under price leadership, but there is very little evidence of price leadership in horizontal industries.

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COST and PROFIT OUTLOOK

Alderson & Sessions — Marketing and Management Counsel

Vol. IX, No. 10

Three Penn Center Plaza, Philadelphia 2, Pa.

October, 1956

PARALLEL SYSTEMS OF PROMOTION AND DISTRIBUTION

This issue contains the final article in a series of four presenting some of the theoretical insights of Leo Aspinwall, Professor of Marketing at the University of Colorado and technical adviser to Alderson & Sessions. This is the type of theory which provides an illuminating perspective for practice. An illustration cited in this article shows how such concepts can be used in solving marketing problems.

Professor Aspinwall has influenced many students during his long career as a teacher. In fact, the thought and attention lavished on his students and his clients have left him without the time or incentive for writing. These four articles in COST AND PROFIT OUTLOOK represent the only publication to date of some of his most challenging ideas.

The sponsor of a product must decide how it is to be promoted and what channels to use for its physical distribution. He is confronted with a variety of possibilities both for stimulating demand and for moving his product to the consumer. It turns out that there is a parallel relationship between these two aspects of the marketing problem with a distribution system and its appropriate counterpart in promotion usually occurring together. This pairing of systems occurs because the promotion and distribution requirements of a product are both dependent on the marketing characteristics of the goods. The preceding article explained how goods might be arrayed according to their marketing characteristics into groups designated as red, orange, and yellow. It was further shown that this array

could be translated into a numerical scale and presented in simple graphic form. The purpose of the present article is to indicate how the position of a product on this scale can be used to identify the parallel systems of promotion and distribution which should be used in marketing the product.

THE PARALLEL SYSTEMS THEORY

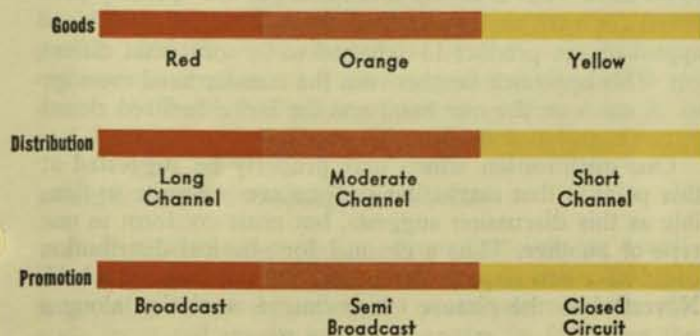
This set of ideas has come to be designated as the parallel systems theory. It is the kind of theory which is intended to be helpful in resolving fundamental practical issues in marketing. Theory alone cannot settle all the details of a marketing plan. It may save much time and effort by indicating the starting point for planning and the appropriate matching of systems of promotion and distribution. The gross margin earned on a product provides the fund which must cover the costs of marketing distribution and marketing promotion. The management of this fund involves many of the most critical decisions with which marketing executives have to deal. Even slight errors of judgment in this regard may spell the difference between profit and loss.

The parallel systems theory begins with a simple thesis which may be stated as follows: The characteristics of goods indicate the manner of their physical distribution and the manner of promotion must parallel that physical distribution. Thus, we have parallel systems, one for physical distribution and one for promotion. The movement of goods and the movement of information are obviously quite different processes. It was to be expected that specialized facilities would be developed for each function. The fact that these developments take place along parallel lines is fundamental to an understanding of marketing. A few special terms must be introduced at this point for use in discussing parallel systems.

A channel for the physical distribution of goods may be either a short channel or a long channel. The shortest channel, of course, is represented by the transaction in which the producer delivers the product directly to its ultimate user. A long channel is one in which the product moves through several stages of location and ownership as from the factory to a regional warehouse, to the wholesaler's warehouse, to a retail store, and finally to the consumer. The parallel concepts in promotion may be compared to contrasting situations in electronic communication. On the one hand there is the closed circuit through which two people can carry on a direct and exclusive conversation with each other. On the other hand there is broadcast communication such as radio and television whereby the same message can be communicated to many people simultaneously.

CHART 1

Relationship Between Goods and Marketing Systems



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In general, long channels and broadcast promotion are found together in marketing while short channels and closed circuit or direct promotion are found together. The parallel systems theory attempts to show how these relationships arise naturally out of the marketing characteristics of the goods.

CHARACTERISTICS OF GOODS AND MARKETING SYSTEMS

It will be remembered from the preceding article that goods were arrayed according to their marketing characteristics as red, orange, and yellow. Marketing systems can be arrayed in similar and parallel fashion. Red goods call for long channels and broadcast promotion. Yellow goods call for short channels and closed circuit promotion. Orange goods are intermediate as to their marketing characteristics and, hence, are intermediate as to the kind of distribution and promotion systems which they require. There is a continuous gradation from red to yellow and from broadcast to direct methods of marketing.

One of the fundamental marketing characteristics of goods is replacement rate. That is the frequency with which the average consumer in the market buys the product or replenishes the supply of it carried in his household inventory. Red goods are goods with a high replacement rate. A market transaction which occurs with high fre-

quency lends itself to standardization and specialization of function. The movement of goods and the movement of information each becomes clearly marked and separate. Opportunity arises for a number of specialized marketing agencies to participate in distribution, and the result is what has been called the "long channel." Messages to the ultimate user become as standardized as the product itself. This type of information and persuasion does not need to follow the long distribution channel from step to step in its transmission from producer to consumer. Such messages are broadcast to consumers through both electronic and printed advertising media which provide a more appropriate channel.

Yellow goods are low in replacement rate and high in other marketing characteristics such as adjustment. Requirements for this class of goods tend to vary from one user to another. Adjustment embraces a variety of means by which goods are fitted to individual requirements. The marketing process remains relatively costly and a large percentage of gross margin necessarily goes along with high adjustment. The opportunity for standardization and specialization is slight compared to that of red goods. Physical movement and promotion remain more closely associated, with a two-way communication concerning what is available and what is needed finally resulting in the delivery of the custom-made product. A transaction between a man and his tailor would illustrate this type of marketing. Many kinds of industrial equipment are specially designed for the given user and would also be at the extreme yellow end of the scale. The short channel is prevalent in such situations and all promotion or related communication moves through a closed circuit.

Many products lie in the middle range which has been designated as orange goods. They have been produced to standard specifications but with the knowledge that they will have to be adapted in greater or less degree in each individual installation. The replacement rate is high enough to offer moderate opportunity for standardization and specialization. At least one intermediary is likely to enter the picture, such as an automobile dealer buying from the manufacturer and selling to the consumer or an industrial distributor serving as a channel between two manufacturers. The car sold to customers may be of the same model and yet be substantially differentiated to meet individual preferences as to color and accessories. Broadcast media are used in promotion but not on the same scale relatively as for soaps or cigarettes. The industrial distributor is often supported in his efforts by specialty salesmen or sales engineers employed by the manufacturer. Advertising of a semi-broadcast character is likely to be used. That is to say that messages are specially prepared for various segments of the market for which the appeal of the product is expected to be somewhat different. This approach lies between the standardized message to all users on the one hand and the individualized closed circuit negotiation on the other.

One qualification which may properly be suggested at this point is that marketing systems are not quite so flexible as this discussion suggests, but must conform to one type or another. Thus a channel for physical distribution could have two steps or three steps but not two and a half. Nevertheless the picture of continuous variation along a

Continued on Next Page

scale is generally valid because of the combinations which are possible. A producer may sell part of his output through wholesalers who service retailers and sell the remainder direct to retailers. The proportions may vary over time so that one channel presently becomes dominant rather than the other. Similarly broadcast promotion may gradually assume greater importance in the marketing mix even though a large but declining amount of adjustment is involved in some individual sales.

MOVEMENT OF GOODS AND MOVEMENT OF INFORMATION

The schematic relationship between goods and marketing systems is shown in Chart I. This simple diagram depicts the parallels which have been discussed. It will be noted that the segment of the line allowed is greater for orange goods than for red goods and greater for yellow than for orange. It is a readily observable fact that the number of separate and distinct items in any stock of goods increases as replacement rate decreases. A drug store, for example, has to sell more separate items to achieve the same volume of sales as a grocery store. An exclusive dress shop will need more variation in styles and models than a store operating in the popular price range. Paint brushes, files, or grinding wheels will be made up in a great multiplicity of specifications to serve the industrial market as compared to the few numbers which suffice for the household user. Red goods by their very nature are those in which a single item is bought frequently because it meets the requirements of many occasions for use while in the yellow goods more numerous items with less frequent sales are required for a more accurate matching of diverse and differentiated use situations.

The second chart is intended to demonstrate the relationship between goods and the methods of distribution and promotion. It is not intended to show an accurate mathematical relationship since the data from which it is constructed are not mathematically accurate, but it does implement understanding of the problems with which marketing executives must deal. The reasoning is deductive, moving from the general to the specific and provides a quick basis for reaching an answer which can readily be adjusted to a specific case. The readings from the diagram are in complementary percentages that must be accepted as rough measurements of the kinds and amounts of distribution and promotion. Long channel distribution and broadcast promotion are grouped together as related elements of the marketing mix and designated as "broadcast" for the sake of simplicity. The line representing these two elements in combination slopes downward to the right since this type of expenditure can be expected to be relatively high for red goods and relatively low for yellow goods. Similarly short channel distribution and closed circuit communication are thrown together under the designation of "direct." The line representing direct promotion and distribution slopes upward from left to right.

APPLICATION TO A MANAGEMENT PROBLEM

A short time ago a project was undertaken for a well-known manufacturer whose operation is such that the range of products his company manufactures covers the scale from red goods to yellow goods. In following the

reasoning of the characteristics of goods theory and the parallel systems theory he was able to locate a certain product in its position on the base line. He drew the ordinate representing this product and found from the diagram that the distribution indicated was a modified direct distribution and that accordingly a considerable amount of direct promotion should be used. In reviewing what actually was being done with this product he knew that promotion was mostly broadcast while the distribution was a modified direct. Thus, promotion and distribution were not running parallel and such a finding for this product provided a substantial explanation of the poor performance this product was making. Research had confirmed that it was an excellent product and that it was priced correctly so that a reasonable volume of sales should have been expected. The planned sales for the product were not realized and to correct this situation a more extensive broadcast promotion program was launched, but from this program little or no increase in sales was realized. At this point the manufacturer decided that it would be worth a try to follow out the indicated promotional and distributional plan shown in the parallel systems theory analysis. A program of direct promotion was initiated and results were immediately forthcoming. The full sales expectations were realized and the manufacturer decided to establish a special division to handle the product which since that time has produced even more sales at costs considerably below the estimated costs.

A somewhat closer look at this case revealed that broadcast promotion was reaching thousands of people who were in no way qualified users of the product and that the type of advertising message was such that qualified users were unable to specify the product even if they wished to do so. A careful study of the problem showed that the direct promotion had produced all of the sales results. Thus the cost of the broadcast promotion had to be borne by qualified users and the result was a higher price than would have been needed if direct promotional means had been employed. The final result of this operation was that prices were lowered and the profit position for the manufacturer and all institutions in the distribution channel was improved.

Product B_2 in the diagram represents the product discussed in the case above located in its correct position. Reading the ordinate value in the vertical scale shows that the product it represents should be distributed 69 percent direct and that promotion should also be 69 percent direct. The complementary 31 percent reading shown indicates that 31 percent of the distribution should be broadcast and 31 percent of the promotion should be of the broadcast type. Product B_1 shown on the diagram is product B_2 as it was incorrectly located on the base line array of goods. The incorrect location was based on a measurement of the method of promotion that was being used. Actually this product was being distributed correctly by a modified direct method, and consequently consumers who might have been influenced to use the product had no means by which to exercise their wishes; the product was not available in retail stores in such a way as to make it readily available to qualified customers.

Continued on Next Page

By making analyses of products and their distribution and promotional programs, it will be found that many products are not in conformity with the parallel systems theory, and yet seem to be successful products. This would not of itself disprove the theory. Such results might indicate that better results might be had if the programs were modified in the direction indicated by the theory. This can often be done at a comparatively small cost by using test sales areas in which the adjustment can be made without affecting the national system in which the product may be operating. The results from such experimentation should confirm the analysis made under the parallel systems theory. A large amount of case material has been collected on the parallel systems theory but there seems to be an almost endless variety of cases and there is a need for constantly studying the problem in the light of the improvements in communications and distribution.

CONCLUSION

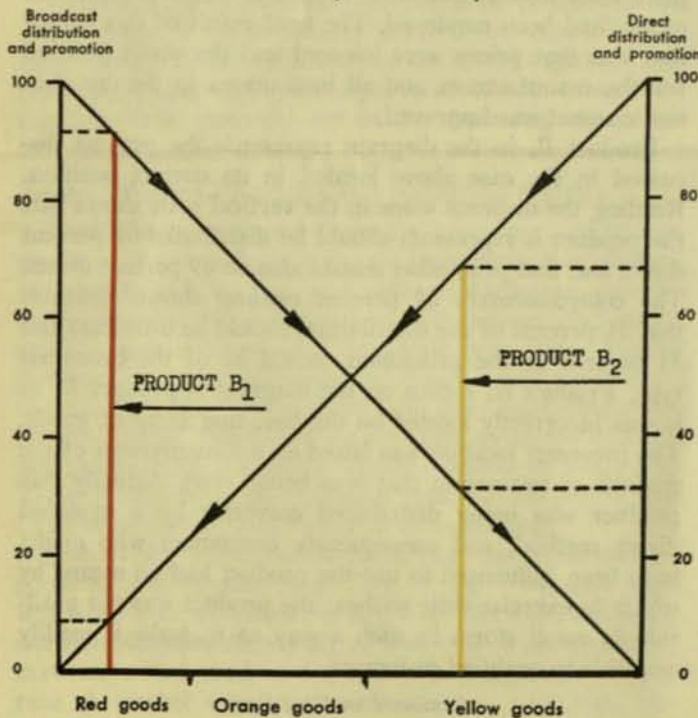
A further definition for broadcast promotion seems to be needed as well as for direct promotion. Whenever promotional means are used, without knowledge in advance of the identity of prospective users, the promotional means is considered to be broadcast. The firm employing broadcast promotional means relies upon the chance contact with potential customers for the product or service. The broadcast distributional means for such a product are so arranged that the customer for the product who has been reached by this type of promotion can exercise his choice conveniently and quickly. Retail stores are available within a short radius of the consumer who may wish

to purchase the product. Thus, the sales gap is shortened both as to time and distance and the effectiveness of the broadcast means of promotion is enhanced. The key fact that makes this type of marketing economical is that while the prospective users are unidentified, they represent a large proportion of the general public which will be exposed to the broadcast message. The opposite of broadcast promotion is direct promotion. The definition of direct promotion turns on the fact that the recipient of the direct communication is known in advance, so that the message reaches the intended purchaser by name and address or by advance qualification of the prospect as to his need and ability to purchase the product. The most direct means would be a salesman who calls upon a selected prospect whose address and name is known in advance, and where judgment has been passed upon his need for the product, and whose ability to pay for the product has been ascertained. The next in order might be a direct first-class letter or telegram sent to a prospect. Then perhaps door-to-door selling or mailing to persons found on selected mailing lists. These selected means of direct promotion used show a widening sales gap between the customer and the product. It is readily seen that broadcast promotion creates the widest sales gap. At the same time it can readily be seen that the marketing radius over which the customer may have to search for the product is increased. Compensating for this increased radius are the more intensive means of promotion that result from direct promotion, which will induce the customer willingly to undertake greater inconveniences of time and distance in order to procure the product.

These definitions relate directly back to the characteristics of goods theory. Whenever a high replacement is involved it becomes physically impossible to effect distribution by direct means. Such a situation calls for mass selling and mass movement of goods wherein all economies of volume selling and goods handling are brought into play. The low gross margin on the individual transaction requires that the aggregate gross margin resulting from mass selling be ample to get the job done. It seems ludicrous to think of fashioning cigarettes to the consumers' needs at the point of sale, putting on filters and adjusting lengths to king size. The gross margin required to do such a job would put cigarettes in the price class of silverware and the number of people who could purchase on that basis would be very small. But mounting a diamond in a special setting is not at all ludicrous, because the gross margin available is large enough to undertake such adjustment. It would be redundant to go through the whole list of characteristics since it is perfectly clear what the relationships would be.

These two theories are excellent marketing tools and aid materially in understanding the marketing processes and their interactions. At the same time they may become dangerous tools in the hands of those who are not skilled in marketing. Even the experienced practitioners need to be fully cognizant of the technological advances as they occur and how these advances affect marketing processes. Skill in use of these tools should increase with experience in applying them to actual marketing situations.

CHART 2
Parallel Systems Theory



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COST and PROFIT OUTLOOK

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THE FUNCTIONAL ORGANIZATION OF CITIES

The featured article is based on a lecture by Leo Aspinwall, professor of marketing at the University of Colorado and technical advisor to Alderson & Sessions. The second article was prepared by staff members who have enjoyed the advice and counsel of Professor Aspinwall on numerous store location problems.

The complexity of the metropolis be it large or small, old or new is difficult to deal with in these modern times. The scourge of traffic congestion in central city areas and the revolt of shoppers against this menace has brought about serious problems for both property owners and municipal government administrators — the property owner facing as he does the decreased earning capacity of his downtown property, and the municipal administrator the loss of the tax base upon which taxes are levied to support governmental services. These two closely related problems must be solved and solved in only one way: downtown property values must be maintained. Such a solution is not arbitrary; it cannot be compelled by passing laws; it must grow out of a full understanding of the functional organization of cities. Once we are able to reduce our understanding to plans and then communicate our understanding and plans to the people of the city, the one solution to the problem is well on the way toward realization.

The conclusion that understanding and plans will bring the solution of the problem within reach is easily set down in words, but both understanding of the urban complex

and plans designed in the light of understanding are long, arduous tasks.

This short article will attempt to formulate a basic understanding of the problem from the standpoint of functional design. A proper setting for formulating the functionalization of cities should be a brief introduction to the two current theories on urbanization.

SAARINEN THEORY

We are indebted to *Eliel Saarinen* for the idea that cities grow and develop in a cellular pattern by additions on the periphery. These additions tend to cluster around a central point, much as the nucleus of a cell. This growth pattern results in the accumulation of a group of cells, all joined together to form a city. Mr. Saarinen's theory posed the idea that each cell with its central nucleus is self-sufficient, the nucleus of the cell providing the business and service elements needed to serve the residential occupiers of the cell. The cells themselves tend to vary in that some are predominantly industrial, others may emphasize cultural activities, and still others may be purely residential. Thus the Saarinen theory of urban organization results in a complex of many self-sufficient cells, loosely joined to make up a city. This idea completely disregards the central city district which supplies the fullest complement of all services.

Continued on Next Page

SELECTING THE LOCATION FOR A NEW SUPERMARKET

Of both primary and ultimate concern when selecting a location for a new supermarket is the minimum acceptable investment that will be necessary to justify establishing a new store. This decision, of course, is primarily the responsibility of top management, and it becomes the basic criterion against which any proposed store will be evaluated.

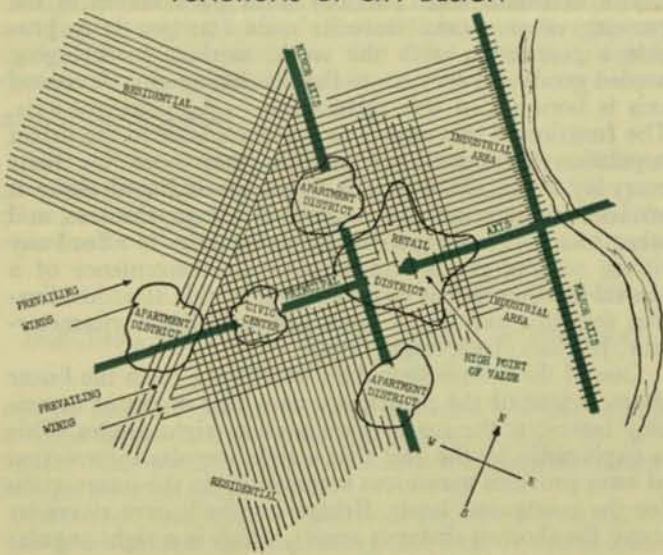
ESTABLISHING THE CRITERIA AND PRELIMINARY INVESTIGATION

Experience with the company's own supermarkets, knowledge of competitive activities, financial expertness: these combine to provide management with the basis for establishing the criteria. Estimating an acceptable rate of return on investment quite naturally involves approximations of the initial investment and operating costs necessary to sustain various levels of annual income. Analysis of cost and profit records concerning individual, existing company stores is the platform on which this basic criterion of return on investment will be built.

The next step is to discover which areas contain potentials worth investigating, and the most logical place to start is on a map. This map is divided into small areas for evaluation. Government census tracts frequently provide convenient boundaries because much statistical information such as population, income, etc. is available for

Continued on Page 3

FUNCTIONS OF CITY DESIGN



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RULE OF UNIFORMITY

The second current theory of urban organization is called "the rule of uniformity" and was developed by the present writer. The rule of uniformity makes an analysis of the functional activities of cities and seeks to join these functional activities by a framework of axes. The results of such analysis clearly delineate a workable design that shows a striking similarity between one city and another. The marked similarity of city design led easily to the title, "rule of uniformity."

The similarity of city design, when analyzed upon the basis of functionalism, raised many questions that required answering and led to a careful study of city phenomena covering over twenty years of observation. Among the first questions raised was why cities developed and why they developed at certain locations. Readings and observations quickly pointed out that cities develop at locations affording the economic means of livelihood for an indigenous population. The economic climate must exist and resources must be available before a population is attracted to a certain location. This is almost like a truism much oversimplified, since there is a voluminous literature available on industrial location alone.

MAJOR AXIS

The essential feature of any urbanization arises out of some means of transportation. There must be a means whereby goods produced in a particular locality can be carried to the markets of the world and all needed goods

and services brought into the area as they may be required. Thus an intercommunity type of transportation facility becomes the life-giving first essential to urbanization. This is called the "major axis" and is easily identified in any community.

Sometimes there may seem to be more than one major axis but usually, when the investigation is carried back to the early beginnings of a city, it will be found that the original major axis controls the true functional design of the community. Certain cities have experienced a shift of their major axes. These are very interesting special cases in which the minor axis (discussed below along with the principal axis) takes on principal axis functions and the principal axis becomes a minor axis. This might be less confusing if it were pointed out that this phenomenon rarely occurs in large cities located upon some substantial body of water—river, lake, or ocean. It follows, then, that transportation facilities capable of being moved are the types of major axes likely to be involved in a major axis shift.

The specialization of functions first appears on the major axis. This axis is the natural location for industry. The movement of heavy materials and bulk products requires easy access to transportation facilities and such services are essential to heavy industry. Certain obnoxious features go along with this industrial use of the major axis, and out of the dust, smoke, odors, and noise a repelling force is born that excludes other types of land occupancy and confines industrial land uses to close proximity to the major axis.

The term "axis" gives some implication of a straight line, but in this case it is not necessarily true. More often shore lines of rivers and bodies of water have curving characteristics so that more correctly a major axis band is created. This is likely to be curving and at the same time occupies more space than a line implies. Any examination of an industrial area will bear this out, and it will also be observed that there is a distinguishable grading of land uses. Starting at the major axis, heavy industry is first noted; moving away from the axis, light industry will take locations, and farthest away will be warehousing and wholesaling activities. This is the common characteristic of all land uses; that is, there is a tendency to locate in districts according to their needs and the value of the land they can afford to occupy.

PRINCIPAL AXIS

The industrial axis (major) must have access to the growing urbanization, since its main function is to provide a connection with the world markets by bringing needed goods and services to the developing city. A second axis is born out of this relationship—the principal axis. The function of this axis is to make available to the urban population the goods and services they need for their everyday living. This axis is "main street," and along it are located the retail stores, office buildings, theatres, and other such services requiring grouping so as to afford any citizen seeking goods and services the convenience of a central location. It has developed out of this functionalization that this axis has a more distinctly linear characteristic, just as a street might imply.

One of the unique situations developing from the linear characteristic of the principal axis is that it almost invariably intersects the major axis band at right angles. This is explainable by the fact that a right angular intersection of axes provides maximum accessibility to the intersection for the contiguous lands. Bridges are built over rivers by using the shortest distance across, which is a right angular

Continued on Next Page

situation, and this may be in part an explanation—at least in cases where rivers are involved.

This right angular situation creates an interesting phenomenon for urban geographers and a vital one for all land planners. It will be noted, when maps of cities are studied, that street structures involving the major and principal axes at right angles to each other are usually off-directional. Market Street in San Francisco strikes boldly through a maze of checkerboard streets up to Twin Peaks. Sixteenth Street in Denver runs at right angles to the South Platte River and the railroads up to the civic center. These are examples of this off-directional relationship. A quick reference to the city maps, usually found on highway maps, will show that the off-directional situation is the more common.

Coupled with this off-directional tendency is another important and controlling situation which involves the prevailing direction of the wind and its relationship to the industrial district with its smoke, dust, odors, and noise. The principal axis or "main street" will be built into the prevailing wind, so that these obnoxious features will be blown away from the other land uses to which they are injurious. It is understandable, then, that a common expression in our everyday speech, "from the wrong side of the tracks," is an apt description of a situation involving low income groups living on the leeward side of the industrial district. Thus, the high income groups choose residential locations to the windward side of the major axis.

HIGH POINT OF VALUE

Functionalism plays its role in the graded uses of the principal axis just as it does in the other axial features of city development. As of any one point in time, this grading force operates to create a "high point of value" which is the focal point around which the functional features of a growing city arrange themselves. Much of the most useful material growing out of the rule of uniformity has been developed out of the relationships of the high point of value to the rest of the city. We have been able to calculate, within limits, the rate at which the high point of value migrates and in which direction. Theoretically, this focal point in city design is never stationary but is sensitive to the pushes and pulls of urban land dynamics. Cities experiencing population growth tend to push the high point of value toward the residential district, up the principal axis and away from the industrial district. This has given rise to the expression used in urban land economics: "High class retailing tends to move in the direction of best and highest paying traffic." That is to say, retailers seek to move close to the customers that offer them the greatest opportunity for profitable trade.

STRING DEVELOPMENT

Behind this strong tendency are the forces related to a growing population and decaying buildings. The life span of certain downtown buildings is similar to other durable consumer or industrial goods—they wear out and have

to be replaced. Businessmen have to decide whether it is more economical to pre-empt new, undeveloped lands in the direction of "the best and highest paying traffic" or to rehabilitate old lands closer to the high point of value which are encumbered with old buildings. Out of this grows the phenomenon of the "string development."

String developments, if allowed to develop without the control of zoning, can be very detrimental to the functional design of a city, as well as the land value structure of the city as a whole. A long, block-after-block business development has the effect of causing traffic congestion on one of the important lead-in arterial streets. More serious, perhaps, is the effect of creating a total amount of business frontage far in excess of the amount needed, the result being the same as any increase in supply beyond normal needs—the price of the total amount of space available is depressed. This sometimes continues to the point where earnings are barely enough to pay taxes, let alone provide normal interest on the investment.

The answer to this problem is, first of all, strict zoning in accordance with the needs of the community. This has the effect of maintaining the general level of prices so that marginal occupancy is eliminated and firm occupiers have a full opportunity to make reasonable profits. Land improvements have only one means of recouping the original investment—through earnings—and once this opportunity is impaired, a distressed market sets in and all real estate investments are impaired.

A second method of controlling string development is by the use of a physical obstruction of some sort. Often the strategic placement of a civic center directly across or adjacent to the principal axis will have the effect of containing business activities on the down side of the principal axis. This control of the dynamics of districts provides an opportunity for the older buildings to be brought back into use on a profitable basis and goes a long way toward preventing the formation of business slum areas. In metropolitan New York City, Central Park has done much to confine business activity on Fifth Avenue within reasonable limits, although it is probably too far uptown to have prevented the lower Manhattan decadency.

MINOR AXIS

The final axis needed to round out the structural framework of the functional city is the minor axis. This axis is less stable in any city than the other two axes, because it shifts with the growth of the city. The minor axis is, as of any point in time, the most important crosstown street parallel to the major axis. One of the most striking examples of a minor axis is Broad Street in Philadelphia. The minor axis sometimes intersects the principal axis at the high point of value, but this is not essential in fulfilling the normal description of this axis. Its position, relative to the high point of value, has significance to a careful student of city structure, particularly as regards the city's maturity.

The small diagram on page 1 shows the important relationships of the rule of uniformity.

SELECTING THE LOCATION FOR A NEW SUPERMARKET

Continued from Page 1

tractured areas. From these same statistics, population and average income for the tract can be extracted and the two figures multiplied to obtain an estimate of total consumer income for each census tract.

However, total dollars spent will not be of tremendous use. It is consequently imperative that total income and expenses be broken down so that food dollars can be isolated,

and the food-buying potential of the tract be determined. There are several methods of accomplishing this.

1. Average annual consumer food expenditures in the area may already be known or can be determined on the basis of experience with operations in existing company stores, or from consumer expenditures for the city as a whole. If so, food expenditures for any given area can be estimated by merely multiplying the average annual ex-

Continued on Next Page

penditure by the population in each of the city's subdivisions. This obviates the computing of total income to determine the percentage spent for food.

2. If this information is not available, food expenditures can be calculated by first estimating total consumer income and then the proportion which is spent for food. One approach is to apply the national ratio of food expenditures to total personal consumption expenditures, published by the *Survey of Current Business*, against the total income of each subdivision. It should be kept in mind, however, that this is a national average and can be expected to provide only a rough measure of food expenditures for local markets, unless additional refinements are made.

In this fashion, areas which have adequate food store potentials can be isolated and a group of, perhaps, ten selected as offering possible opportunity.

SCREENING THE LOCATION

Let us suppose that these ten areas have in fact, been isolated. A staff member or an experienced consultant should arrange to visit those areas. While there, the location of existing retail food facilities should be noted and later marked on the map. Experienced observers will be able to estimate the sales volume of these food stores and also of non-food stores in the area. Observation and interviews with businessmen and store managers will also be helpful in interpreting the developing pattern of trade and traffic and any special conditions affecting the value of available sites.

From actually seeing the neighborhoods, executive opinions will be formed concerning the type of family living there, the future of the neighborhood (is it up and coming, or easing itself out), and whether or not existing competition is such that it almost precludes the possibility of adding a successful new store to the area. Opinions concerning the character and future of the neighborhood should be verified by a review of the trends of real estate values in the area, building statistics, etc. However, the primary purpose of this phase of the screening operation is to eliminate the least desirable areas and to select tentative sites available for construction in those areas which appear to be worthy of further investigation.

DEFINING THE TRADING AREA

At this point the choice may have been narrowed to three possible locations. The next step is to define the trading area. There are several ways of doing this. Nothing, of course, can substitute for experienced executive opinion. It may, however, be aided to a considerable degree at this point. If the proposed site is located in the immediate vicinity of an established shopping area, and particularly one which includes a supermarket operation, the problem of defining the trading area is relatively simple. Interviews conducted with people who shop there can be utilized to determine their residence. Residence can then be plotted on the map and the concentration pattern which results is a quite realistic picture of the trading area served by the existing stores. For similar purposes, the residence of families who do not patronize large retail outlets can be determined by tracing, through the Bureau of Motor Vehicles, license tags of cars parked at competitive supermarkets. Conversation with non-competitive store managers can frequently be of value at this point, also. However, these methods imply the assumption that the proposed store will serve a trading area similar to that which is already established. This, of course, is not always true.

Past experience with and analysis of the company's existing stores may be very helpful in determining the nature of one trading area for the proposed store. After all, here is a company-owned, ready-made testing ground. Residence of shoppers for each store can be determined and plotted on the map in order to define the trading area of each existing store. It is possible that the trading area for the new store will be roughly similar to those of stores of similar character.

One method of defining the trading area for any proposed site which is not amenable to the techniques mentioned above is to draw three boundaries around each site. The innermost represents five minutes' driving time from the proposed site, the next ten minutes, the last fifteen minutes' time. Within each of these boundaries, telephone or personal interviews may be conducted — starting with the smallest — to determine the food stores patronized by residents. Such information provides an accurate picture of shopping patterns within each boundary and these, in turn, can be used as a basis for establishing the trading area.

Interviews conducted within the newly defined trading area are not only of value in checking the realism of the definition but also may be of value in determining the share of market a new store might expect. This interview need not be lengthy, and several factors besides residence may be extracted from it: dollar amounts spent on food, where food is bought, by what means and how long it takes to get to the store, and whether or not the respondent thinks he would buy at the proposed supermarket. It should be kept in mind that opinions based on this last point may be somewhat unreliable; it is almost impossible to draw conclusions from such an opinion unless very definite characteristics of the proposed store are described.

The basic purpose of defining the trading area for each proposed site is so potential food expenditures can be estimated and so the executive can estimate the share of this potential which his new store may expect to obtain. Here primary dependence must be placed upon executive judgment, but it is amply supported by survey information, his knowledge of competitive strengths and weaknesses, past experience, and a host of other factors.

If a substantial proportion of the area within striking distance of the site is undeveloped, it is undoubtedly wise to consider future residential housing developments. Quite possibly the planning commissions will have projections of housing and income already available. If not, they may be estimated mathematically or graphically and a reasonably accurate approximation of total income obtained for the next five or ten years.

EVALUATION OF MARKET OPPORTUNITY AGAINST INVESTMENT CRITERIA

In attempting to choose the best of alternative locations or the acceptability of any one for development, potential opportunity determined by the methods described above should be evaluated in terms of the criteria established as the first step. In brief, it is possible to arrive at a realistic judgment of the ability of any one or all proposed locations to provide a minimum acceptable return on investment. From the estimated potential or share of market for each site, it should be possible to make estimates of floor space requirements, building costs, operating costs, and hence profits and return on investment. Ultimate selection of alternative sites can be made by choosing the one which offers the greatest profit opportunity and the best prospect for continuous success in the long-term future.

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COST and PROFIT OUTLOOK

Alderson & Sessions — Marketing and Management Counsel

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POPULATION RESEARCH AND MARKET ANALYSIS

*An address before the Population Association of America
By Wendell R. Smith
May 4, 1957*

INTRODUCTION

When I was invited to participate in this conference (that was in late November) I accepted without much hesitation, because it seemed clear that population analysts (or demographers) and market analysts are faced with a great many common problems. However, when I finally faced up to the problem of preparing this paper, I became aware of the fact that many of these common problems and areas of overlapping interest are so obvious as to require little by way of elaboration in a meeting of this kind. Therefore, I reoriented my thinking and will attempt to do two things in the time at my disposal: (1) to identify (rather briefly) the more or less standard and established uses of population information which are important in marketing research, and (2) share with you some of the analytical frontiers we are concerned about which will require the best efforts of both of our groups if they are to be penetrated and extended.

Before going further, I think I should define the vantage point from which management consultants and market researchers view the problems of population analysis. I do this because the precise nature of our field of professional activity is not generally understood. Essentially, we are in the business of solving problems for management. This is indeed a broad statement, but there is almost no limit to the kinds of problems that our clients may request us to study. In some cases, these problems are defined functionally; that is, they may be concerned only with production planning, sales administration, capital budgeting, or some other function which affects all of the aspects of the business as a whole. In other instances, problems may be restricted to certain products or product groups, or to specific geographic market areas, but be concerned with all essential business functions in these areas. However, regardless of the scope or the magnitude of the problems presented, the activities of the management consultant and market researcher may be summarized or described in terms of four basic analytical steps:

1. Development of a precise definition of the problem or problems in terms of the action alternatives that are available.
2. Determination of the information and judgments that will be required as a basis for selecting the most appropriate alternative.
3. Design of the research program that will provide the necessary information and judgment basis. This may involve analysis of secondary data (data of record), collection and analysis of primary data, or both.

4. Analysis of data so as to provide in usable form: (a) findings of fact, (b) conclusions based upon these facts, and (c) recommendations for action.

I would like to make explicit the notion that ours is a problem of tailor-making or planning project designs for each individual problem as presented. To be sure, certain components of research design can be standardized and applied over and over again. The fact remains, however, that a profession which bases its activities upon a problem-solving stance must stand ready, willing, and able to use any and all available research techniques that may be dictated by the particular job at hand. Hence, we place a great premium upon flexibility and versatility and are constantly on the search for new approaches, techniques, and data sources to be added to our tool kit.

ANALYSIS AND USE OF SECONDARY DATA

For the balance of my remarks, attention will be focussed upon (and limited to) problems that depend for solution, in whole or in part, upon population analysis. In general, these are problems concerned with the distribution and sale of consumer goods and services. Once such

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OPERATIONS RESEARCH AND THE ECONOMICAL USE OF CASH*

In these days of tight money it becomes particularly important to the businessman to use cash as sparingly and as effectively as possible. Here as in other business problems operations research methods can be very helpful. We shall see that it is possible to use these techniques to compute an optimum cash balance and to show how this figure will be affected by changes in the volume of the firm's expenditures and in the level of interest rates.

A firm's cash balance can usefully be interpreted as an inventory—an inventory of money which its holder stands ready to exchange against purchases of labor, raw materials, etc. It is really no different in principle from a shoe manufacturer's inventory of footwear which he stands ready to trade for the distributor's cash.

The reason for comparing cash on hand with a commodity inventory is that the operations researcher possesses a well developed body of techniques for determin-

*Abstract of a paper presented by William J. Baumol on June 13, 1957 at a session on Operations Research and Economics at the Conference of Pennsylvania Economists held at Bucknell University.

(Continued on Page 4)

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and the extent to which available population characteristics may be assumed to be good yardsticks for measuring market behavior.

2. "What is the prospective market for this new product?" This question is often raised at that point in the development of a new product where ability to complete design and to manufacture is assured, but would require a substantial additional commitment of funds. In such a case an approximation of the market, such as can be gained from secondary data, will enable management to decide whether or not additional developmental work should be undertaken or the project abandoned. The limitations here are the same as in the previous situation.
3. "In the future, will our market increase, decrease, or remain about the same?" This takes the consultant squarely into the area of forecasting. In this area, market researchers probably rank among the most ardent consumers of population projections and forecasts. Trends in population, along with other data, become the basis for determining where and when a shopping center should be built, what plans should be made for expansion of production facilities, whether or not sales forces should be expanded, and other decisions that bear upon management's ability to serve its future markets. In some instances this type of analysis is exceedingly complex. In other cases, it turns out to be quite simple. For example, the fact that sales of sterling silver flatware correlate almost one for one with the marriage rate makes it relatively easy to forecast the future of this particular industry. There are obvious precautions that must be taken with forecasts of this type; but they are exceedingly useful, at least as points of departure.

PRIMARY DATA COLLECTION AND ANALYSIS

Primary data collection, or field work, becomes involved under either or both of two sets of circumstances: (1) It may be necessary to fill gaps where data are not available from secondary sources; and (2) it may be necessary to establish the significant relationship between available population data and consumer buying behavior, if any. Regardless of why it is undertaken, primary data collection involves at the very outset utilization of population data as a basis for survey sample design. We have just completed a study that well illustrates such a sampling problem in all of its elegant complexity.

The basic problem was one of sharpening the client's advertising and promotion activities by identifying (in terms of age, income, occupation, and similar criteria) those women in the total population who are current users of a particular personal-care item. From available secondary data and company records, it was possible to estimate that within the universe to be sampled (all women 15 years of age and older) only about two percent were users of the product. The question was, what two percent? Our statisticians determined that we would need to complete interviews with about 1,000 of these users in order to meet the reliability requirements of the study. On this basis, it became necessary for us to conduct short screening interviews with a nationwide probability sample of

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a problem has been defined and decisions have been made as to the kinds of facts and judgments that will be necessary for its solution, the market researcher almost always begins by conducting an orderly review of available secondary data. In some cases he may find that all of the requirements of the problem are met by such information. More often it is discovered that there are gaps in the information that must necessarily be filled by collection and analysis of primary data. I would like to suggest examples of three situations where available population data is most apt to provide all, or nearly all, of the necessary information. These situations will be stated as questions.

1. "What is the market for our product?" This is a question that we often receive from manufacturers who seek to identify their customers and potential customers in terms of who they are, where they are, and how much they might be expected to buy. Oftentimes it is possible to rely exclusively upon existing population data to identify the various components of the market by age, family size, location of residence, etc., so as to provide an acceptable albeit approximate answer to this question. Much depends, of course, upon the degree of precision required for the selection of the action alternative,

40,000 places of residence. Hence, 150 counties, with probability proportional to population of women age 15 and over, was selected with four interviewing centers being designated at random for each selected county. In summary, we ended up with a total of approximately 42,000 completed screening interviews, long-form interviews with a subsample of approximately 1200 non-users (to determine why they were non-users) approximately 1200 long-form interviews with a subsample of users of a competitive approach to the personal care problem involved, and our required number of interviews with users of a product of the type produced by our client. This is difficult and expensive research.

My reason for citing this particular example is quite obvious. In marketing research work we need all possible precision and accuracy in basic population data. Our ability to use effective sampling procedures depends upon its availability.

Population data is also essential to proper analysis of the results of field data collection. In the illustration just cited we were able to determine the distinguishing characteristics of the user group in contrast to those of non-users and users of a competitive process. By then referring back to population data, it became possible for us to determine the percentage of all women having characteristics similar to those of the user group who were not users — hence giving us an estimate of market expansion potential.

So much for the standard and established uses of population information in marketing research.

MARKET SEGMENTATION

Now I would like to move to consideration of two selected problem areas in marketing research where it seems reasonable to assume that population analysis and market analysis have a common interest, but where the relationship is less definite. The first of these has to do with emerging recognition of the *phenomenon of market segmentation*. As management consultants, our attention has been drawn to this area of analysis by the increasing number of client-problem situations which have become soluble by doing something about marketing programs and product policies that tend to over-generalize the characteristics of both markets and marketing effort. These are cases where intensive advertising and promotion designed to differentiate the company's products from the offerings of competitors was not accomplishing its objective — cases where failure to recognize the reality of heterogeneous market segments was resulting in a loss of market position.

Many examples of market segmentation can be cited: the cigarette and automobile industries are outstanding illustrations. It is almost literally true today that there is no market for cigarettes. Rather, this market must be viewed as a group of market segments which insist upon special types of cigarettes such as filter tips, mentholated, king size, regular size, regular packages, flip-top boxes, etc. Recent introduction of a refrigerator with no storage compartment for frozen foods was in direct response to the distinguishable preferences of the market segment made up of home-freezer owners whose frozen-foods storage needs had already been met. Market segmentation, then, consists of converting (for purposes of analysis) a heterogeneous market into a number of smaller homogeneous markets, in response to differing product preferences among important market segments. It is attributable to the desires of consumers or users for more

precise satisfaction of their varying wants. Determining the extent to which the market for his products may be segmented is of vital importance to the manufacturer. He has before him the task of deciding whether he should use a marketing strategy designed to "force" the segments together by asking them all to accept the uniform product, or offering products tailored to the distinguishable requirements of the segments. Many economic forces are at work which are resulting in an increased interest in the latter strategy.

Now what does this mean for population analysis? To the extent that market segmentation is recognized and utilized as a strategy in the planning of business operations, market analysts will find it necessary to become interested in finer distinctions between elements in the population than has been true in the past. Furthermore, they will need to supplement available generalizations about group behavior within the population by developing more detailed insight into the "why" of small differences. Perhaps the time has come when we must begin to place relatively more emphasis upon attitudinal and behavioral arrays of population, not in lieu of but in addition to the arrays that are currently being made available.

BEHAVIOR AND MOTIVATION RESEARCH

The second frontier which I would like to mention is closely related to the first, the area of behavior and motivation research. Motivation research is being heralded as the "glamorous newcomer" to the marketing research field. Actually, there is nothing new about motivation research — it began when we first asked "why" questions in connection with consumer surveys. The thing that is being added is the more refined and reliable techniques of probing motivations. As is true in many other areas of behavior theory and analysis, motivation researchers are currently split between those who are probing to determine basic drives (*a la* Freud) and those who favor the Gestalt approach of regarding behavior as an expression of a desire to solve the problems that lie in the way of goal achievement. Obviously, both have much to contribute to true understanding; but, in general, we have found that considering the consumer as a problem solver is more helpful to us in attempting to solve the problems of our clients. It is certainly true that we can do a reasonably correct job of hypothesizing the present and future behavior of many groups within our population. However, such hypotheses turn out to be invalid in enough cases to make it desirable and necessary to sharpen our procedures. Hence, anything that can be done to extend our knowledge of goals, behavior, and motivations of groups and segments within the population will be of great value, not only to the market analyst but to the social scientist in general. Perhaps the key question is whether or not we have available the necessary technical skills and procedures.

I would like to close my remarks by reiterating an earlier statement to the effect that the field of marketing research does represent one of the very best markets for population research. We are vitally concerned with detailed analysis of the structure of present population and with projections, trends, and forecasts with reference to the future. We are also attempting to build upon the base which population analysis has provided with reference to the problems of behavior and motivation which I have mentioned. It is to be hoped that our combined efforts in this direction may make both of our fields more dynamic and pertinent in the future.

OPERATIONS RESEARCH AND THE
ECONOMICAL USE OF CASH*

(Continued from Page 1)

ing optimum inventory levels.¹ These techniques can be used to balance off the advantages of a sizeable cash balance against its costs.

It is, of course, convenient to keep a sizeable cash balance on hand because that can make it so much easier to meet required disbursements, particularly because it is not always possible to foresee in advance the precise magnitudes of required expenditures. But it is expensive to tie up large amounts of capital in the form of cash balances. For that money could otherwise be used profitably elsewhere in the firm, or it can be used to pay off debt, and reduce the firm's interest burden, or the money can be invested profitably in securities. When tight money limits the funds which are in practice available to the businessman he must recognize that every dollar he keeps in the form of cash on hand means one dollar less available for the purchase of labor, raw materials, etc.

To see precisely how the optimum cash inventory computation is handled let us go directly to the calculation of the optimum level of that portion of a company's cash inventory which is used to meet payments whose magnitude is known in advance. Suppose the company receives \$80 thousand in cash on the first day of each month which it will pay out in regular daily installments over the next month. Rather than keep all of this cash idle, some of it can be invested in securities, say at a return of 5 percent. But each time some cash is invested or withdrawn there is a fixed brokerage charge, say \$25. The company may then consider the following three alternatives for a 4-week month.

	Week				Average Investment
	1	2	3	4	
Possibility A: No investment (zero broker transactions per month)					
Investments	0	0	0	0	0
Withdrawals	0	0	0	0	
Payments	\$20,000	\$20,000	\$20,000	\$20,000	
Possibility B: Two broker transactions per month					
Investments	\$40,000	\$40,000	0	0	\$20,000
Withdrawals	\$40,000*	0	\$40,000	0	
Payments	\$20,000	\$20,000	\$20,000	\$20,000	
Possibility C: Four broker transactions per month					
Investments	\$60,000	\$40,000	\$20,000	0	\$30,000
Withdrawals	\$20,000*	\$20,000	\$20,000	\$20,000	
Payments	\$20,000	\$20,000	\$20,000	\$20,000	

*This amount is in fact never invested or withdrawn—it represents the amount withheld from the initial investment.

Notice that as the frequency of withdrawals increases, the average investment goes up from 0 to \$20,000 to \$30,000; thus, the annual interest earnings at 5 percent rises from 0 to \$1,000 to \$1,500. But in method A there are no brokerage charges. In method B there is one investment and one withdrawal per month, or 24 broker transactions per year which result (at \$25 per transaction) in a total brokerage fee of \$600. Method C requires four investment and withdrawal transactions per month,

or 48 per year, which will cost about \$1,200. Thus we have the results:

	Average Investment	Annual Interest Earning	Broker Transactions Per Year	Annual Broker Cost	Net Gain (Interest Minus Broker's Cost)
Method A	0	0	0	0	0
Method B	\$20,000	\$1,000	24	\$ 600	\$400
Method C	\$30,000	\$1,500	48	\$1,200	\$300

Clearly method B is the more profitable way for the firm to manage its cash.

More generally, it is possible to show how the optimum balance of cash not held in short term investments will increase when the volume of transactions or the brokerage fee increases, and decrease when the interest rate increases. Mathematical analysis indicates that these will not be proportionate variations. For example, the optimal cash balance will increase only as the square root of the volume of transactions—i.e., there will be economies of large scale in the firm's optimum cash balance.

The reasons for this result can be suggested without the aid of mathematics. Most important, it must be noted that a given volume of payments can be met with different cash withdrawal levels. We observed that the \$80,000 could be paid by keeping the entire \$80,000 on hand, or by investing it and withdrawing \$40,000 twice a month, etc. In other words, even when the firm's total payments are fixed, the average cash balance used to meet these payments can be varied. We can see why this amount will vary directly with the value of the brokerage fee and inversely with the interest rate. Clearly, if the brokerage fee goes up it will pay to cut down the number of withdrawals: i.e., the optimal cash balance will rise. Similarly, if the level of the interest rate goes up it will pay to make withdrawals as small and as late as possible: i.e., the optimal balance of idle, non-interest earning cash will fall.

But why should the most economical cash holding not increase proportionately with the volume of expenditures? The answer is to be found in the nature of the cost of investment transactions. The minimum broker's fee is what makes it unprofitable to take cash out of investments in frequent small dribbles, although doing so will keep cash invested until the last possible moment. But the larger the amounts involved, the smaller, relatively speaking, will be the brokerage costs. On a \$1,000 bond purchase, minimum brokerage fees can be prohibitive. On a million dollar transaction they are negligible. Hence, the larger the total amounts involved the less significant will be the brokerage costs, and the more frequent will be optimal withdrawals. For this reason optimal withdrawals and cash balances will rise when the volume of transactions per firm increases, but will rise less than in proportion with the volume of transactions payments.

For expository simplicity this discussion has assumed that any reduction in cash holdings is used to purchase short term securities. In practice, tight money means that frequently funds can more profitably be invested inside the firm. This does not alter the nature of the analysis in any fundamental way. The same operations research methods can be employed to take this fact into account in determining the way in which the firm can use cash most effectively and most economically.

¹ See T. M. Whitin, *The Theory of Inventory Management* (Princeton: University Press, 1953), Chapter III.

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COST and PROFIT OUTLOOK

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COST CONTROL IN SELLING BY MANUFACTURERS*

No business makes all of its sales at equal profit. In every business — whether it be manufacturing, wholesaling, or retailing — there are some sales which are much more profitable than the company average, and a sizeable proportion of other transactions which are much less profitable — or even unprofitable. These are truisms of business life which executives encounter every day, and of which they are fully aware.

Therefore, it is surprising, but true, that most businesses do not *know* the exact dollar and cent cost of selling each product in the line or of selling to a specific customer or in a specific territory. This is as true of the manufacturer selling a broad product line in a national market as of the neighborhood supermarket which regularly stocks and sells anywhere from 3 to 6 thousand different items. But it is almost impossible to exaggerate how valuable it is for a business to know the costs and profits or losses attaching to each segment of its business.

That is, it is difficult to exaggerate the opportunities for increased marketing efficiency, cost reduction, and profit improvement offered to management by the combined techniques of distribution cost analysis and mathematical programming. In the offing may be a revolution in the planning and execution of distribution activities fully comparable with the achievements of time and motion studies and cost analysis in the factory.

MALDISTRIBUTION OF MARKETING EFFORT

The objective of "controlling" distribution costs is, of course, to reduce them. The typical executive, however, seems to think of the control or reduction of his distribution costs as a simple process of setting up a budget, usually arrived at without any reliable performance standards, comparing actual expenses with the budget, and chipping away at various elements of expense which exceed the budget. At best, this method of attack does not get at the heart of the matter. At worst, it may do more harm than good if the chipping process weakens needed selling pressures or curtails demanded distribution services. Sales volume thus suffers and total unit costs are raised instead of lowered.

The businessman is not — or rather he should not be — basically interested in limiting his over-all marketing expenditures to a certain number of dollars, or in attempting to force each of these expenses within the mold of some arbitrarily conceived ratio to dollar sales. The actual experiences of a number of businesses which have successfully achieved striking reductions of their marketing costs show that an entirely different line of attack is necessary.

In most businesses a small proportion of the territories, customers, orders, or products are responsible for the overwhelming bulk of the sales volume. On the other hand, a very large proportion of the customers, orders, products, territories, and so on bring in only a very minor proportion of the sales. For example, one manufacturer found that 78 percent of his customers produced only slightly more than 2 percent of the sales volume. In an-

other business, 46 percent of the number of products manufactured accounted for only 3 percent of the sales volume.

In the typical business, however, selling, advertising, and other marketing efforts all too frequently are expended in proportion to the area covered, the *number* of customers, or the number of orders, and so on, without explicit consideration of their actual or potential contribution to sales volume and profit. Of course, this means that in the typical business there is misallocation of effort in terms of results. In one business, for example, 59 percent of the salesmen's calls were made on customers from whom only 12 percent of the sales were obtained.

There are many reasons why this misallocation of marketing effort is common. Even the better-managed firms do not realize just how much of their marketing effort brings in only very small sales returns, since it is difficult to find out which sales can be ascribed to any specific outlay of effort. Indeed, most firms make no systematic attempt to evaluate marketing effort results for specific sales segments of their business, and usually measure the success of their marketing efforts solely by their *total* dollar sales. Moreover, the manufacturers of branded consumers' goods with a national market typically follow a policy of

*An address by Charles H. Sevin before the Fifth Annual Seminar in Sales Research; *Distribution Costs: A Key to Profits*; Miami University, Oxford, Ohio; April 29, 1957.

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RESEARCH IN INDUSTRIAL MARKETS*

Research in industrial markets in many cases differs markedly from consumer research. The differences are chiefly dictated by the characteristics and application of the product under consideration. If we might consider the large, custom-designed and installed electrical substation as appearing at one end of a scale—a scale measuring product application technology—we would place a grease pencil for marking packages in warehouses and shipping rooms at the other extreme of such a scale. In researching a product of the grease-pencil type, typical consumer research procedures are effective, and efficient. As the character of the product under consideration moves significantly on the scale in the direction of the electric substation, however, typical consumer research procedures become highly inefficient and inadequate for dealing with the technological aspects of the problem.

Since comparatively little has appeared in the literature and the trade press on this aspect of industrial research, I would like to discuss in some detail a general approach that accommodates the necessary technology, and becomes more efficient in doing so. This general procedure can be efficiently used to determine the market potential for new products, to discover new markets for existing products,

*Abstract from a talk given by Robert F. Dee before The Industrial Advertising Association in Chicago, April 8, 1957.

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100-percent coverage of the market in order to support their national advertising. These are only a few of the reasons for the widespread misallocation of marketing effort.

Careful comparison of the costs and returns from the different units of marketing effort will usually reveal that because of this maldistribution of marketing effort, a large number of sales made by the individual firm are unprofitable, even though the business as a whole shows a profit. Distribution cost analysis can be used by management to locate these unprofitable sales and to determine the magnitude of the losses for which disproportionate spreading of marketing effort is responsible.

For example, one company made a distribution cost analysis and found that 75 percent of their customers, bringing in only 8 percent of the volume, were responsible for a net loss of as much as 56 percent of sales. In another instance a distribution cost analysis revealed that 95 percent of all the customers in one small territory were unprofitable—with losses ranging up to 86 percent of sales. In a third company, 20 percent of the number of products in their line were unprofitable—with the most unprofitable product responsible for a net loss of 355 percent of sales!

SEGMENTATION OF COST AND PROFIT DATA

The substantial losses on unprofitable sales resulting from disproportionate spreading of marketing effort can be minimized or even eliminated, simply by making certain that the marketing dollar goes where it can do the most good. This can be done with the help of two related

tools—distribution cost analysis and mathematical programming—which can indicate to management where and how to apportion marketing efforts to make the most of potential net profit possibilities.

In a business where there is a marked misallocation of marketing effort, the resulting losses on unprofitable sales can often be eliminated by shifting some marketing effort from unprofitable to profitable sales segments as indicated by the distribution cost analysis; but this rule does not specify the precise magnitudes of these shifts. Here, mathematical programming enters. To make the most effective use of marketing effort the firm must select that particular combination of products, customers, territories, etc., which will make optimal use of the particular combination of the several types of distribution effort which are being used by that firm. Personal selling, advertising, sales promotion, samples, catalogs, warehousing of finished-goods inventories—all must be allocated optimally. This, it turns out, is what the mathematician calls a programming problem.

Those companies which have used distribution cost analysis as a management tool—even without the use of mathematical programming—have achieved startling reductions in their distribution costs by correcting only the more obvious maldistributions of marketing effort.

For example, in one company marketing expenses were cut nearly in half, from 22.8 to 11.5 percent of sales, and a net loss of 2.9 percent was turned into a net profit of 15 percent within a period of less than two years after shifting some effort from the 68 percent of its accounts which had been unprofitable. Another company shifted selling and advertising effort from less profitable to more profitable territories and achieved a 78-percent increase in average sales per salesman and a one-third reduction in the ratio of selling and advertising expense to sales; and the ratio of net profits to sales doubled.¹

The main problem in controlling distribution costs, then, is to find out how different parts of the firm's marketing process contribute to its costs, its profits, and its sales. But many businessmen are under the impression that they already know their cost and profit structure—after all, that is the information apparently contained in their accounting records. Unfortunately this is not so. Prevalent accounting techniques for recording the results of marketing activities are insufficiently detailed, showing averages only; their information is distorted by arbitrary cost allocations and their figures are only part of what is required. At the heart of the matter are a number of subtleties which are crucial. The first step in a distribution cost analysis is a finer breakdown and a reclassification of the firm's average cost and profit data. The over-all distribution costs for the entire business must be allocated to the specific segments of the business for which they are incurred. For example, through distribution cost analysis, we might be as detailed as to find that the sale of a thousand cases of product A through medium-sized retailers located in the Chicago metropolitan area involved X dollars worth of salesman time, Y dollars in transportation and warehousing cost, Z dollars in advertising expenditure, etc.

The need for all this detailed information is clear. Without it, the trouble spots cannot be located. The unprofitable points in the distribution process will otherwise remain hidden in the over-all averages and the opportunities for improvement in efficiency and profits will be missed. The objective of a distribution cost analysis is, then, to divide the business of the company into a num-

¹ Most of the preceding cases are taken from Sevin, Charles H., *How Manufacturers Reduce Their Distribution Costs*, United States Department of Commerce (Washington: Government Printing Office, 1948).

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ber of segments classified, for example, by categories of customers and products, and to determine marketing as well as production costs and net profits or losses for each segment separately.

DISTRIBUTION COST ANALYSIS

The results of the actual cases cited previously lead to a short discussion of the techniques used for analyzing marketing costs. Two basic principles of the techniques of distribution cost analysis can be readily summarized: (1) The distribution expenditures of a particular business, which are usually recorded on a "natural" expense basis, are reclassified into "functional" cost groups, which bring together all of the indirect costs associated with each marketing activity or function performed by that company. (2) The functional cost groups are "allocated" to products, customers, and other segments of sales on the basis of measurable factors, or product and customer characteristics, which bear a causative relationship to the total amounts of these functional cost groups.

The basis of the functional classification which would be used by any given firm is a study of the marketing activities performed by that firm. Most companies, especially those serving wide markets and producing and selling a number of products, have complex marketing organizations and engage in a wide range of marketing activities. Consequently, each company would have to set up its own functional classification to reflect its own marketing activities.

It is usually necessary to apportion many natural-expense items as they appear in the ordinary accounting records among several functional-cost groups, since they relate to more than one functional activity. "Natural"-expense items are distributed to functional-cost groups by means of time study, space measurements, counts, managerial estimates, and other methods.

After the indirect costs have been classified by functions, they are allocated on the basis of utilization by products, customers, and other segments of sales of the variable activities giving rise to these costs. The principle followed is to charge the product or customer (or other segment of sales) with the cost of its share of the variable activity of each functional-cost group: that is, the cost of the portion of the variable marketing effort for which it is "responsible."

Another way of stating this allocation principle is to say that the procedure is to determine, for each functional-cost group, the factor which "controls" it, tending to increase or decrease it. As used here, the term control is meant to convey the concept that under the firm's existing operating routines and policies, the dollar level of the functional cost is determined by the control factor; or, that there is a "cause-and-effect" relationship between the factor used as a basis of allocation and the dollar level of the corresponding functional-cost group.

Suppose now it is found by means of a distribution cost analysis in a particular firm, that, on the *average*, the sale of a dollar's worth of product X through medium-sized retailers in Kansas City contributes more to profits than a dollar sale of product Y through small retailers in Richmond. It is tempting to jump to the conclusion that more sales effort should be allocated to the former and less to the latter. But does this follow? Suppose, for example, that Kansas City is relatively saturated with the product and the firm has a high share of the market, while the Richmond market is ripe for development. Clearly, effort reallocated to Kansas from Virginia would be going precisely the wrong way!

Thus, the cost *presently* incurred by a specific segment of sales may be the right answer to the wrong question. It tells us how well the firm is doing now; but the firm

wants to know whether it can do better in the future and, if so, how and where. Accordingly, we must know the answer to additional questions: What would happen to marketing costs if more effort were directed here rather than there? Specifically, we want to know just how *changes* in total costs in each functional category are related to *changes* in volume in each segment of sales. In effect, for each sales segment and each functional cost group we need the cost-sales relationship both for variable costs and for separable fixed costs.

Once these figures are obtained, the marketing executive can proceed to apportion his distribution effort in a way which is guaranteed to increase his profits. The method can be illustrated readily in the simplest case where there is only one basic type of marketing effort to be allocated. In such a case, insofar as possible, effort should always be reallocated to those segments of sales where an additional unit of marketing effort will yield the highest contribution to net profits and overhead after deduction of variable costs.

The difficult problem, of course, is to determine just how the various functional costs will vary with sales. Since we must know the *changes* in distribution costs which accompany *changes* in sales, this is a most difficult problem. One apparently obvious way to approach it is to see what has happened to costs when sales changes occurred in the past. But past sales changes are the result of changes in several effort factors and have resulted from a variety of causes. Perhaps an even greater source of difficulty is a fact which is a central problem in the analysis of distribution costs. Unlike most production costs, which are a function of volume, changes in most distribution costs are both a cause and an effect of changes in sales volume. There are, however, a number of techniques which help us cope with this difficulty.

MATHEMATICAL PROGRAMMING

Usually, there are several types of distribution effort or cost to be economized. For example, the funds available for advertising may be limited, the salesman's time fully occupied, and warehouse space may constitute a bottleneck. We then wish to promote those sales which make the best use of all three of these facilities. But usually no one sales segment will do well in all of these respects. One product may use advertising dollars very efficiently because its sales can be increased with the aid of relatively little additional advertising expenditure. But if this product is also bulky, its added inventory will employ relatively large amounts of warehouse space. Similarly, another product may yield large additional profits to each additional hour of the sales force's time but small returns on each additional advertising dollar. The problem, as we have seen, is to select that combination of sales segments (i.e., products, customers, territories, etc.) which will make optimal use of these several types of distribution effort. This is precisely what the mathematician calls a programming problem.

The word "programming" most frequently occurs in the term "linear programming." When the facts of the situation state that costs will always be proportionate to sales so that, for example, a threefold increase in the level of sales in any one segment will always exactly triple all the costs incurred by the segment, the relevant program is said to be linear. Unfortunately, in a distribution cost analysis a *linear* program will almost never fit the facts. Worse still, it is virtually certain to give the wrong answer!

However, we must not go too far and reject totally the linear programming approach to distribution cost analysis. It is true that a linear program will usually not compute a correct *optimum*. But there is a very strong presump-

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tion that it will correctly indicate the best directions of change; i.e., it will correctly identify the sales segments to which more effort should be allocated and those in which effort should be reduced. The difficulty in the use of a linear program is that it will urge too much of the good things — whatever sales segments should be expanded, the linear program will urge the firm to expand indefinitely since it involves the assumption that there will be no diminishing returns. Now we do know that characteristically the firm will experience diminishing returns with an indefinitely large allocation of effort to any one sales segment, so that while the change suggested by the linear program may be expected to be in the right direction, it may also be presumed that the recommended change is too great.

It follows that where it is too expensive to undertake a full-scale non-linear programming analysis, or where the necessary data are simply not available, a linear programming analysis can still be exceedingly helpful. In general we may assume that it will be profitable to expand effort in the segments in which the linear program calls for such expansion, and to contract effort where the program indicates it should be contracted, but by less than the amounts indicated by the numerical solution.

RESEARCH IN INDUSTRIAL MARKETS*

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and to forecast the sales of established products over longer time periods than would otherwise be possible.

The approach demands a multi-phase procedure, which must be accomplished sequentially. At the start the only secure position for the analyst to take is that *nothing* is known about the product's possible markets. He should then study, or obtain for study engineering specifications on the material or device. Then he must begin to analyze the functional usefulness of the product. He may require engineering or technical assistance throughout — and he should use it freely and often. Having classified the many functional uses of the product, he must then begin to frame a list of potential applications for the product — a list as extensive as can be made. While this effort is admittedly more an engineering study than a marketing effort, it must be satisfactorily accomplished — and it behooves the industrial researcher to develop the ability and technical understanding which will enable him to work effectively with the engineer and the scientist.

With the kind of technical orientation described, the marketing analyst is ready to undertake the first phase of actual market investigation. The step now needed is that of an informal survey of industry, horizontally broad, but shallow vertically. We now have listed potential engineering applications for a new product, and we want to find the industries where the applications can be profitably utilized. But having assumed that we know nothing about the market for the product, we still must assume that all of industry and commerce represents our potential market. So, we turn to the industrial researchers' bibles — the standard industrial codes, the census of manufacturing, etc.

Utilizing the informed judgment developed earlier, a process of elimination is begun. Some of this phase will proceed as fast as you can read industry descriptions. Some of this work will go very slowly as you find that you must interview purchasing agents, design groups, manufacturing personnel, and others within locally available companies of the classification under consideration.

In practice, the great bulk of the savings which distribution cost analysis has made possible resided in its ability to find those sales sectors to which marketing effort was *most* glaringly misallocated. In the great majority of the firms to which it has been applied, this technique has discovered cases of gross effort maldistribution whose elimination permitted very substantial additions to profits. This means that where we do not have the data, the time, or the budget for a non-linear programming analysis, we usually can still obtain much of the benefit of a distribution cost analysis by its use alone, or by a linear programming approximation.

And, as we have indicated previously, actual experiences in numerous businesses demonstrate very clearly that the use of distribution cost analysis as a management tool presents an opportunity for increasing efficiency, reducing marketing costs, and increasing sales volume, the importance of which scarcely can be exaggerated. The achievement of a constantly expanding sales volume at lower unit costs through greater efficiency is, of course, the traditional American way of maintaining a healthy economy and a generally rising standard of living for the American consumer.

Finally you will have discovered by this process which industries represent potential markets that are worth the investment of intensive research and analysis.

The next step is to consider carefully the ability of the company to serve the industries which you have selected as offering the greatest potential. Some of them may represent a marketing opportunity which for your company is unattractive for any one of a variety of reasons. The investment or expense in attaining sales representation may be prohibitive. Or, the channel of distribution may be so diverse from the company's main business as to represent the need for reorganization of the sales force. Factors such as these should at least be taken into account before proceeding with the main, or second phase of the research effort.

Once the final list of industries has been determined by statistical analysis and by informal investigation, field research can be begun. At Alderson & Sessions we refer to this phase as a "case-study" procedure, and have used it successfully to solve many industrial research problems. This concept involves relatively small samples, with very intensive study made of the potential customers in the sample selected. Personal interviews are typically conducted in from 3 to 6 departments. The objective of interviewing is not the completion of a fixed number of rigidly controlled interviews, but rather the collection of necessary "units of information." Needless to say, this work requires the services of very capable analysts, and in some cases analyst teams, representing competence in both marketing and engineering. On occasion cooperative effort between the company studied and the analyst will suggest on-the-spot analysis of company data.

The case-study method pursues throughout its conduct several very specific requirements. Potential sales of the new product will be determined from the economic advantages found to be provided by the new product. By virtue of the type of study made, the requirements for introducing and marketing the product will become abundantly clear. Finally, by carefully classifying and projecting the summarized results of the case studies, the approximate size of the potential market and the "timing" necessary to its development also will become known.

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COST and PROFIT OUTLOOK

Alderson & Sessions — Marketing and Management Counsel

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A GUIDE TO OPERATIONS RESEARCH METHODS

This is the second of two expository articles¹ designed to provide information about the field of operations research to the businessman who is newly confronted with the possibilities of mathematics as a tool for decision making. The first of these articles tried to show *what* operations research can accomplish. This article, on the other hand, is designed to indicate *how* operations research is able to achieve its results.

The businessman reader may at first feel that this article is less well suited to his needs than was the one which preceded it. After all, he may well want more urgently to know what operations research can do for him than how it goes about doing it. But it is really very important for management to understand the methods of the operations researcher, because management problems simply cannot be left to the technician to handle alone and unsupervised. Each business situation is somewhat different from the next, and at least some of its workings are understood only by the businessman himself. The approach to each business problem must to some extent be custom tailored to fit the facts which are in the businessman's possession.

In employing an operations researcher, therefore, it is necessary for the businessman to understand the nature of his procedures in order to judge whether they are applicable to the problem, and whether they have properly taken into account all of its most relevant aspects. In the last analysis no techniques, however sophisticated and powerful, can replace the judgment, insight, and wisdom of the capable executive. Engineers and doctors have long known this. But the best engineer and the best doctor will be acquainted with the latest, most sophisticated methods which can help him to make the most effective use of his judgment.

TYPES OF "OR" METHODS

It may be illuminating to classify OR methods by the sorts of purposes they are designed to serve. Most questions which the businessman asks the operations researcher fall within one of two types which we will call prediction of consequences and optimization problems, respectively.

1. *Prediction of consequences.*—In considering a change in policy, the businessman wants to know the consequences of the proposed change. He wants to know what will happen to his sales if he lowers his price, or what will happen to his ability to meet customer demands if he reduces his inventory, etc.

There are many methods which can be helpful in attacking such a problem. Experimentation with price cutting in a few markets, statistical analysis of the consequences of past price changes, motivations and behavior research techniques—all of these can contribute to the solution of the pricing problem; and the operations researcher will employ these approaches when they are promising, but he also uses some new and specialized techniques in predicting the consequences of some proposed course of action.

The nature of these techniques is best understood by seeing what are likely to be the main difficulties in a problem of the prediction of consequences, difficulties with which good business judgment cannot ordinarily cope. Only three of the most obvious possible sources of difficulty will be mentioned: (a) Adequate records, of past experience with similar situations may not be available, upon which to base directly the required prediction. (b) The values of the variables which determine the consequences of the decision under investigation may be inherently unpredictable. That is, the problem may involve random or chance variables which, like the outcome of a turn of a roulette wheel, can only be predicted in probabilistic terms. The number of pieces of equipment which will need replacement during some particular month, the number of cases of a product which will be broken during warehousing, and the number of customers who will demand some product on a particular day are examples of such variables, whose importance for management problems is obvious enough. (c) There is a third and perhaps most important difficulty which faces the businessman who seeks, on the basis of his judgment and experience, to predict the consequences of some proposal. This difficulty arises out of the enormous number of variables which are involved in many such problems and their interdependence. OR techniques which are designed to cope with each of these classes of difficulty will be described below: Monte Carlo techniques which are used where data are inadequate; probabilistic analysis (such as queuing theory) which is used where random variables are important; and simultaneous relationship techniques (of which input-output analysis is an illustration) where there is a large number of important interdependent variables.

2. *Optimization problems.*—This second category of business problems probably encompasses the majority of OR investigations. The businessman does not want simply a better way to do something but rather the best, or optimal, procedure. Of course, selection of the best methods will always depend on the goals which the businessman has set for himself. An increase in advertising will often be good strategy if the primary aim is an increase in sales; but increased advertising may not be the answer to increased profits.

Among the optimization techniques most widely employed are the differential calculus, linear programming,

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¹The first article is "Operations Research Applied to Marketing Problems," *Cost and Profit Outlook*, Vol. X, March 1957.

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and nonlinear programming; and these too will be discussed below.

PREDICTION OF CONSEQUENCES: MONTE CARLO TECHNIQUES

Before we can hope to find out the consequences of a course of action, it is necessary to have some sort of data.

For example, suppose it is desired to test a proposed inventory policy to see how often the product will be out of stock, and how great the volume will be of deliveries which are delayed because there is not enough inventory on hand to meet customer orders. These figures, of course, depend on the fluctuations in the level of customer demands — how frequently total demand will exceed a particular magnitude.

In solving such a problem, experimentation is not a real possibility. It can be costly in customer relations to try very much lower inventory levels just to see what will happen. Moreover, the experiment will add little more to our knowledge (aside from offering us data on just how angry customers do get) than does simply waiting to see what demands turn out to be with current inventory levels. Past experience can be used to construct an imaginary experiment — to see what would have happened if the proposed inventory level had been used in the past. But if the product is relatively new, this can provide only very limited information; and waiting around for experience to accumulate may be very time consuming and (if the current choice of inventory level is poor) very expensive.

The operations researcher has, however, invented another very effective way to gather the relevant data: that

is, to make them up himself, or rather to let the mathematical statistician make them up for him! Like the cutting of the Gordian knot, this may strike the reader as a direct and ingenious approach, but one which does not meet his original conception of the problem. How can improvised statistics help us to foresee what will happen in the real world?

The answer is that the numbers are invented in a manner which carefully employs the analytical methods of mathematical statistics in order to stretch as far as possible such few actual data as are available to begin with. In the absence of any change in any of the major purchase influences, such as a sharp temporary price cut (a sale) or an advertising campaign, we may assume that customers will arrive randomly, in a pattern somewhat similar to outcomes in successive throws of a pair of dice. The pattern of customer demands may then be described in terms of a frequency distribution, which indicates how many weeks in a year customer demand can be expected to fall between 50,000 and 55,000 units, how often the demand will lie in the 55,000 to 60,000 range, etc.

Now, from the available information and the nature of the problem, the statistician can decide which frequency distribution best describes the pattern of expected customer demands. From this frequency distribution it is then possible to construct an artificial history of customer demands by choosing randomly among all the possibilities, but in a way which is "loaded" to produce the right frequencies. To give a very simple illustration, suppose we consider two possibilities: *A*, weekly demand less than 50,000 and, *B*, weekly demand of at least 50,000. If, on some basis, the odds are computed to be 2 to 1 in favor of *A*, we can generate an artificial demand history as follows: Toss the (unbiased) die. If it falls 1, 2, 3, or 4, put down an *A*; whereas if it falls 5 or 6, put down a *B*. This might yield a pattern for weekly demands such as the following:

"Week"	Face of Die	Sales "History"	
		Under 50,000	50,000 or More
First	3	<i>A</i>	
Second	1	<i>A</i>	
Third	3	<i>A</i>	
Fourth	5		<i>B</i>
Fifth	6		<i>B</i>
Sixth	2	<i>A</i>	
Seventh	2	<i>A</i>	

This, incidentally, indicates the reason for the term "Monte Carlo method."

In practice, it is not actually necessary to toss any dice. Instead, we can use tables called "tables of random numbers" which have been worked out in advance. Moreover, the computations can be made by high-speed electronic computers which are able, in a few minutes or hours, to run off thousands of cases and manufacture data whose collection would, otherwise, require many years. But although this method is economical and powerful, it must be used only with the greatest care and caution. Everything, as we have seen, depends on the choice of frequency distribution (i.e., the odds of the various outcomes), and unless there is some assurance that these have been picked well, the entire calculation can be worthless.

PREDICTION OF CONSEQUENCES:

PROBABILITY CALCULATIONS — QUEUEING ANALYSIS

Sometimes there will be problems which involve a number of random elements whose effects are interrelated. For example, in a supermarket, customer delays at the checkout counters may be caused by the arrival of a large number of customers at the same time, or by the coinci-

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dental arrival of several customers each of whom has many groceries in her shopping basket, so that the average checkout time is materially increased.

Suppose the manager of the supermarket wishes to know the effect of adding two checkout counters. The analyst now requires two frequency distributions, one of which describes customer arrivals and the other the size of customer purchases. Once both of these have been found, mathematical analysis permits us, in many cases, to find out such things as the expected average customer waiting time, the expected length of the waiting lines at different times of the day or week, etc.

The basic idea of the calculation is relatively simple, although the details are ingenious and complicated. The probability that there will be, say, 25 customers waiting now is equal to the sum of probabilities of the several alternative series of events which can produce this result. For example, there would now be 25 customers in line if 24 customers were there one minute ago, none has since been serviced, and one more customer has just arrived. Since we know the probability of a customer having been serviced during any one minute and of a customer arriving during any one minute, we can find out the relationship between the probability that there were 24 customers a minute ago and the probability that there are 25 customers in line now. Similarly, we can find the probability that the lines will grow from 25 to 26 customers in this way; and we can trace, customer by customer, the expected growth of the queues in the supermarket from the time it opens in the morning with zero customers. We can also see how much the expected queue length will be reduced when two new checkout counters are added.

PREDICTION OF CONSEQUENCES: SIMULTANEOUS RELATIONSHIP TECHNIQUES

One of the greatest difficulties encountered in the use of pure judgment for solving management problems arises out of the mutual interdependence of the various elements which make up the situation. Make a decision about *A* and this will effect *B* and *C*, and in turn *B* and *C* will influence *A*. This can add greatly to the difficulties of rational decision making, because it means that the problem cannot be treated one piece at a time. If the effectiveness of advertising by use of one medium depends on the amount of advertising placed in other media, it is impossible to make advertising decisions by individual medium. Television expenditures can be made only on the basis of the decision about newspaper advertising and vice versa. In other words, the decisions must be arrived at simultaneously. Suppose now, as is frequently the case, that a firm allocates a fixed proportion of its sales to advertising expenditure. It is considering revising the breakdown of its budget and proposes to increase its expenditures by allocating 5 percent of sales to television advertising, 3 percent to national magazine advertising, and 2 percent to local newspaper ads. It is desired to know how much this will increase sales and the total advertising budget.

The relevant data are of course very difficult to come by; but even if these are somehow obtained, without the use of mathematics, the decision maker's troubles are only beginning. For the increase in expenditure on television advertising will presumably increase sales, which will presumably increase the number of dollars spent, for example, on newspaper advertising. But this in turn will increase sales further, both directly and indirectly, by increasing the effectiveness of television advertising; but then all three types of advertising will automatically be increased again, by the budgeting rule, and their direct and indirect effects on sales must again be taken into account. If he tries to take everything into account in his mental calculations, the decision maker must feel as though he were wrestling with a bunch of eels.

Fortunately, mathematics can be particularly helpful in coping with this sort of problem. Each of the interrelationships in question can be described by an equation, and a set of such equations can be solved *simultaneously* by standard methods. Electronic computers are particularly good at this sort of problem because none of the pieces of the problem is particularly complicated; rather, there are so many pieces to take into account at once.

Another example of this sort of interdependence problem can arise in a large company in which several divisions produce raw materials for one another; that is, when some of the products of several divisions are used by other divisions. In this case the amount each division needs to produce will depend on the amount produced by each other division; and if we want to know how a change in prices, and hence in customer demands, will affect the output plans of each division, we are back at a problem of mutual interdependence. This can again be solved by simultaneous equation techniques. When they are applied to such a production problem, these techniques are referred to as "input-output analysis."

OPTIMISATION METHODS: THE DIFFERENTIAL CALCULUS

We turn now to the second class of business questions — those beginning: "What is the best way to —?"

It should be noted, incidentally, that prediction of consequences problems, which were just discussed, often represent only the first step in an optimisation problem. Once we predict the outcomes of several alternative courses of action, it is natural to investigate which of these outcomes best meets the businessman's needs and so constitutes the optimum course of action. For example, in the queueing problem, once the length of waiting time has been related to the number of checkout counters, it is natural to ask what is the optimum number of counters. By computing the cost of additional checkout counters and balancing this off against the advantage of the resulting reduction in length of queues, an optimum number of counters can be determined.

One obvious way to handle such an optimisation problem, if there is a small number of possibilities, is to examine each possibility in turn and to pick out the one which is most satisfactory. To aid in deciding whether to ship a crate by rail, truck, or by boat (assuming all three take about the same amount of time), quotations can be obtained on the shipping costs and the cheapest of the three carriers can then be used.

But often the problem is much more complicated. The number of possible choices can be very large, and there may be interdependences such as those which have just been discussed. For example, in the advertising budgeting problem, the question can easily be changed to: "What is the ratio of promotion expenditure to sales for each of TV, newspaper, and magazine advertising which will maximize profits?" Here we have an optimisation problem superimposed on a mutual interdependence problem, and the number of possible decisions may be limitless. And yet this is a standard business problem. Clearly, enumeration of the possibilities is out of the question, and more powerful techniques are required.

The differential calculus is a very old optimisation method, and it is still one of the most effective we possess. In the previous article of this series, several applications of this method to pricing and inventory problems were described. It is fairly easy to indicate how the method works. Suppose we know that gross profits will increase with advertising expenditure as follows: If advertising expenditure is \$750,000, net profits will be \$1,000,000; whereas if advertising expenditure goes up to \$751,000, net profits will rise to \$1,000,500. It is easy to see that there will be an additional 50 cents in net profits

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per dollar of advertising. But as the market becomes saturated, additional advertising, while it continues to add to sales, will add less to net profits. Clearly, so long as there is any increase in net profits per additional advertising dollar, it will pay to increase the advertising budget. The optimal advertising budget will have been attained when every opportunity to improve the budget has been used up — when the further addition of a dollar to the advertising budget will add nothing to profits.

But this is precisely how the analysis of the differential calculus works. If we have a relationship between net profits and the size of the advertising budget, it can often tell us, with the aid of neat formulas, how much each additional dollar will add to net profits. In mathematical jargon, this figure is called the *first derivative of net profits with respect to advertising expenditure*. Such a formula can also permit us to find the budget level at which this derivative is zero, i.e., at which a further dollar of advertising will add nothing to net profits. That will usually be the optimal budget level.

In effect, we may picture the graph of net profits as a hill, and our objective is to attain the highest point on the hill. The differential calculus can give us the slope of the hill at any point; we know if we are going uphill we have not yet reached the top, and if we are going downhill we have overshot. Only where we are going neither up nor down, where the slope is zero — i.e., where additional advertising neither adds to nor reduces net profits — can we be at the top.

OPTIMISATION METHOD: MATHEMATICAL PROGRAMMING

A very new tool which is now, deservedly, very fashionable among operations researchers is programming of either the linear or non-linear variety. The details of the computational procedure will not be outlined as they have been for the other OR methods described in this article. This is because they have twice before been described in *Cost and Profit Outlook*.¹

In searching for an optimal solution, a differential calculus computation can run into several difficulties, some of which are too technical to be of much interest here. The main disadvantage of the calculus method of solution is that it cannot take into account some of the important types of consideration which are often essential to an optimisation problem.

For example, in a production problem there is no way in which the limited capacity of a number of machines can ordinarily be dealt with by this method. The calculus computation may tell the businessman to produce 5,000

units of some product per hour; but if he has not the capacity to handle this output, then, at least in the short run, this answer will not be of much help to him. Or the calculus may end up recommending sales which are greater than the inventory on hand plus current deliveries, and for the same reason this is not a useful answer. In other words, capacity limitations ordinarily rule out the use of the calculus.

Similarly, suppose we are trying to find the least expensive mix of ingredients of specified quality to be used in making some food product, we may require that it contain no more than some maximum percentage of a preservative. This is very much like a capacity problem — we have in effect decided that, perhaps, 1.5 percent is the maximum preservative capacity of this product. And again the calculus does not take such requirements into account.

Thus there are many considerations — quality specifications, capacity limitations, and the like — which must be taken into account by other optimisation methods. The methods which do this are called mathematical programming. Unlike the differential calculus, they do not work by neat formulas. Rather, we only know how to find the answers by systematic trial-and-error procedures which are called *iterative methods*. This is actually no great disadvantage since these methods, because of their repetitious nature (each trial computation is conducted in essentially the same way as the last), are well suited to high-speed electronic computation; and in many cases, particularly where the problems are *linear*, the precise answer can be found very rapidly.

A problem is called linear if it turns out, in fact, that all the values of the dependent variables increase exactly in proportion with the values of the independent variables, so that a doubling of inputs means that outputs will also be precisely doubled. For example, a tripling of shoe production will usually require the use of three times as much leather. This, then, is an example of an approximately linear input-output relationship. But in a saturated market a doubling of sales force, and of all other selling expenditures, will not normally suffice to double sales. A moment's reflection will indicate that in this second non-linear case many more data are required to make a decision in full knowledge of the facts. We must know the effectiveness of selling expenditures in the presence of each of many different degrees of market saturation. And because in the non-linear case there are more data (and incidentally, more intractable data) to be handled, the computation naturally grows more complex. The operations researcher is then very fortunate when the facts of the situation which he happens to be analyzing involve relationships which are approximately linear so that he can employ the simpler, better explored, and more dependable techniques of linear programming to find the optimum values of the variables.

The procedures which have been outlined in this article constitute only a sample of the most important tools which the operations researcher has used in examining management problems. Their very great variety and complexity make it impossible to undertake more than a superficial outline. There has been no description of many other tools such as symbolic logic, game theory, and communication theory which promise, and some of which have already made, important contributions to the solution of management problems. Yet the businessman must master at least as much as has been presented here if he is to make most effective use of the opportunities which operations research has opened to him.

Review: C. West Churchman, Russell L. Ackoff, and E. Leonard Arnoff, *Introduction to Operations Research* (New York: John Wiley & Sons, Inc., 1957), pp. X + 645, \$12.00.

This long-awaited volume, edited by three of our most eminent operations researchers, adds a very excellent expository source book to the small but growing literature of operations research. The book will be indispensable to the student and will serve as a handy reference for the practicing operations researcher. Any firm which engages in operations research work will find it advantageous to own a copy.

Particularly outstanding are the sections which deal with waiting-time models and models which analyze the problem of replacing obsolescent or nonfunctioning equipment. The entire exposition is extremely lucid and authoritative. The chapter on linear programming may be subject to some criticism because it goes into technicalities before explaining the nature and purpose of the technique.

It must be made clear that this is primarily a technical volume written for technicians. But it is sufficiently simple to be usable by the student who has learned some elementary differential calculus and probability theory. At least some of the chapters, however, will be inaccessible to the reader whose mathematical training is limited.

¹ See "Operations Research Applied to Marketing Problems," *Cost and Profit Outlook*, Vol. X, March 1957, pp. 3-4; and "Solution of Management Problems Through Mathematical Programming," *Cost and Profit Outlook*, Vol. IX, May 1956.

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L. W. Smith

COST and PROFIT OUTLOOK

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OPERATIONS RESEARCH APPLIED TO MARKETING PROBLEMS

The appearance of the important new operations research volume¹ edited by Churchman, Ackoff, and Arnoff meets the most pressing needs of the student of operations research for a guide through the techniques and the methods of their application. As is the case in other professions, the practicing operations researcher will, of course, continue to rely primarily on the very fine professional journals and the advanced literature for his information. Thus, the only one who still feels the lack of systematic expository material designed explicitly for him is the businessman who will use the results of operations research investigations.

Of course, there have been some expository articles discussing the scope and spirit of operations research, or explaining some specific technique or procedure, or the results of some particular business application. But a number of executives have indicated to us that much of even this material is not wholly illuminating for the businessman who is newly confronted with the possibilities of mathematics as a tool for decision making. There is need, therefore, for a more or less systematic and easily comprehensible exposition of the applications and techniques of operations research. This is the first of two articles designed to provide for this need.

This article seeks to outline some of the types of marketing problems to which operations research techniques can be applied. To assure their relevance to the needs of practical problem solving, the cases described are all drawn from analyses in which Alderson & Sessions has been involved. The second article in this series will undertake a systematic expository survey of the techniques of operations research.

AN OUTLINE OF QUANTITATIVE MARKETING PROBLEMS

Much, if not most, of the work in operations research has been devoted to production problems where detailed quantitative data are more readily available, and mathematical (engineering) analysis more traditional, than is the case in marketing. Nevertheless, there is much to be gained by examination of marketing problems with the aid of OR methods.

It is convenient to divide marketing decisions into three major categories:

1. The pricing of products so as to make the most of market potential.
2. The determination of the magnitude and make-up of promotion and selling effort which can make most effective use of that market potential.

3. The choice of product delivery arrangement which makes the most of the businessman's money in supplying customer service.

Each of these areas presents problems toward whose solution the operations researcher has been able to contribute. Indeed, the last of these — the choice of channels for the delivery of goods — involves the inventory and transportation problems where operations research methods have scored their most noteworthy (and best publicized) success.

This article will discuss each of these three marketing decision areas in turn by means of illustrative cases designed to explain the methods of analysis which were employed, and the way in which they were able to help the businessman.

SOME PRICING PROBLEMS

Every pricing decision involves a process of balancing off cost and demand considerations. Too high a price may, even in prosperous times, drive customers into the arms of direct competitors; or it may lead potential purchasers to turn to substitute products or even to drop out of the market altogether. High coffee prices apparently increased the consumption of tea, and high costs of maid service have sent domestic help out of the middle-class American home. It is clear, then, that except where a price reduction leads customers to suspect that there has been a decrease in the quality (or the show-off value) of a product, a sufficient price cut can increase the amount of the product that the firm will be able to sell.

But volume is not the only relevant consideration. No businessman can afford the luxury of neglecting costs unless he is willing to undertake the marketing of a full line of loss leaders. Obviously the situation calls for some price in between that which drives most customers away and that which does not cover costs; but which is the "best" of these in-between prices?

Frequently the price decision is made by applying a fixed "reasonable" mark-up to per-unit costs. But the only really satisfactory feature of this solution is its simplicity. It is an inconclusive method because it leaves the businessman with the problem of determining what mark-up he considers reasonable, so that in a sense he is still back where he started. In effect, the method does not settle the price-setting problem — it merely disguises it as a margin-setting problem. Moreover, the cost data on which the price is based can be misleading. The unit cost of producing each of a thousand TV sets a year may be much higher than the unit cost if production goes up to a million. Which of these cost figures, then, is to be used in setting the price of a TV set? After all, the choice of price will help determine the number of sets which will be sold.

More serious still, there is no guarantee that a price set in this way will make the most of the market's profit potential. For example, a lower price than that set by the

A Rational Approach to Sales Management

by
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A graduate lecture sponsored by the Sales Executives Club of Cleveland and Western Reserve University.

Available Upon Request

¹ Churchman, C. West, Russell L. Ackoff, and E. Leonard Arnoff, *Introduction to Operations Research* (New York: Wiley, 1957).

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fixed-mark-up techniques may reduce the mark-up on each item sold; but by increasing sales, it may increase turnover sufficiently to lead to a substantial increase in the firm's annual net profits. Higher sales volume may even lead to lower production costs, as the well-known Henry Ford success story so clearly illustrates.

A public utility firm which sells industrial and home heating fuels asked for an examination of its pricing structure. It was found that a small reduction in price would make this fuel cheaper for most uses than the fuel which is its main competitor. An examination of past experience of this firm, and of distributors of the same fuel in other cities, showed that such a price cut was not likely to be met by a reduction in the price of the competing fuel. In addition, there was evidence that a price cut could be expected to lead to increased sales whose magnitude could, within limits, be estimated. Similarly, the costs of supplying different quantities of this fuel were also estimated from the company data.

It was now possible to compute the price which could be expected to yield maximum annual net profits. This might have been done simply by selecting a large number of different possible prices, computing the sales and volume which were to be expected at each price, and finding the corresponding estimated annual profit by subtracting the cost of supplying this volume from sales. This would have indicated the price which would yield the highest of these profit figures. The mathematical techniques of the differential calculus did essentially that, and found this price more accurately, more quickly, and at less cost to the client. In the case of the fuel supplies, it showed that a

substantially lower price would, indeed, increase profits considerably, both by making this fuel price competitive and thereby increasing volume, and by reducing unit costs.

Operations research analysis does not always call for lower prices. A large seller of a popular beverage found it was losing sales to less expensive, competing brands. It asked whether a reduction in the price of its products to competitive levels was advisable. Here again there is a problem of balancing off advantages and disadvantages. A price reduction has some effects which make for an increase and some which serve to decrease annual net profits. It increases the number of items sold but reduces the net return on each item, unless (as we have just seen) there are substantial cost reductions which result from increases in volume. Given the reduction in mark-up which results from a price cut, it is possible to compute the breakeven level of increased volume—the level of volume increase which, if it is achieved, will just make up for the reduction in margin and result in a zero net profit change after a price reduction.

In the case of the beverage manufacturer, it was possible to show that the proposed price reduction would have been totally uneconomical, at least in the short run. To make up for the reduction in margin, the firm would have required a breakeven increase in volume of approximately 70 percent. It was highly unlikely that customers would flock in at a sufficient rate to make this possible. But, more important, the manufacturer did not even possess the capacity for a 70-percent increase in output. Thus the price reduction would almost certainly have resulted in a serious fall in his annual net profits.

THE OPTIMUM USE OF SELLING EFFORT

We will now turn to our second marketing decision area, selling and promotion. The firm must decide on the best use of its salesman's time, its advertising dollars, its sales managers' efforts, etc. It is not enough to know that a salesman is bringing in sales. If time spent on one class of customer brings the firm \$15 per hour of salesman time, while effort devoted to another customer class brings in only \$8, then every hour the salesman spends on the latter may, in effect, cost the firm \$7.

Most firms do not have the data and have not examined in detail the salesman's effort, advertising costs of sales by different districts, different products in the firm's line, and different customer classes. But investigation shows that the cost per item sold of a salesman visit to a small distributor, or of an effort to push an unpopular package size of the firm's product, or of a salesman maintained in a sparsely settled rural district, is often phenomenally high. Very frequently it is found that these sales activities actually involve substantial losses to the firm, so that it would serve the interests of the business to effect a substantial reallocation of selling activities.

In most businesses, a small proportion of its territories, customers, orders, or products is responsible for the overwhelming bulk of the sales volume. On the other hand, a very large proportion of the customers, orders, products, territories and so on, brings in only a very minor proportion of the sales. In the typical business, moreover, selling, advertising, and other types of marketing effort all too frequently are expended in proportion to the area covered, the number of customers, or the number of orders and so on, without explicit consideration of their actual and potential contribution to sales volume and profit. Of course, this means that in the typical business there is a misallocation of marketing effort in terms of results.

Careful comparison of the costs of and returns from the different units of marketing effort will usually reveal that, because of this maldistribution of marketing effort, a large number of sales made by the individual firms are

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unprofitable, even though the business as a whole shows a profit.

The technique which investigates in detail the profitability of the use of sales effort, in different districts and by different products and customer groups, is called "distribution cost analysis." In firm after firm this technique has uncovered substantially unprofitable segments in its operations and has led to very substantial savings. To mention only one of our most recent investigations of this variety, a firm was shown to be losing heavily on sales made during personal visits by company representatives to small retailers. Here mail-order selling offered the opportunity for substantial increases in profits, and any small loss in volume could be made up by a transfer of effort to more profitable accounts.

The first step in a distribution cost analysis is a finer breakdown and a reclassification of the firm's average cost and profit data. The over-all distribution costs for the entire business must be allocated to the specific segments of the business for which they are incurred. For example, through distribution cost analysis, we find that the sale of a thousand cases of product *A* through medium-sized retailers located in the Chicago metropolitan area involved *X* dollars worth of salesman time, *Y* dollars in transportation and warehousing cost, *Z* dollars in advertising expenditure, etc.

The need for all this detailed information is clear. Without it, the trouble spots cannot be located. The unprofitable points in the distribution process will otherwise remain hidden in the over-all statistics, and the opportunities for improvement in efficiency and profits will be missed. The objective of a distribution cost analysis is, then, to divide the business of the company into a number of segments classified, for example, by categories of customers and products, and to determine marketing as well as production costs and net profits or losses for each segment separately.

Once the required information has been collected in sufficient detail in the course of the distribution cost analysis, the optimum (most profitable) allocation of selling effort can be computed by the use of mathematical programming techniques. These are the new methods of computation which are used to find the values of independent variables (the amount of each type of selling effort devoted to each sales segment) that lead to a maximum value of the dependent variable (annual net profit). If the data are accurate and complete, this mathematical method can, for example, indicate the most profitable geographical distribution of the sales force; i.e., they may indicate that some men should be taken out of the Kansas City district and added to the Chicago territory.

The method can be illustrated readily in the simplest case where there is only one basic type of marketing effort to be allocated. It states that insofar as possible, effort should always be reallocated to those segments of sales where an additional unit of marketing effort will yield the highest contribution to net profits and overhead after deduction of variable costs. For example, suppose the figures show that in Boston an additional \$2 out of the fixed field sales force budget will yield an additional \$10 in sales, and that the additional variable cost of those sales is \$4. Then the fraction in question will be $\frac{10 - 4}{2} = 3$. If the corresponding figure for Oklahoma

City is 2.6, this indicates unambiguously that selling effort should be reallocated from Oklahoma to Boston.

Of course, in practice the available information is limited so that the computed results will represent only an approximation to the best solution. Nevertheless, case after case has shown that a distribution cost analysis will lead to substantial, sometimes even phenomenal, savings.

CHOICE OF DISTRIBUTION ARRANGEMENT

As already indicated, this marketing decision area, the choice of distribution arrangement, includes such problems as the choice of transportation routes and inventory levels. Illustrative is one of our current problems. We are investigating a warehouse location problem for a firm which stores its products in a number of public warehouses located throughout the country. With very little notice, this firm can move its inventory out of any of these to other warehouses. In all there are about 100 locations at which warehouses possessing the requisite physical facilities can be found.

The problem, then, is this: Should the firm employ 8, 18, or 80 of these warehouse locations? And if it should use, say 35 warehouses, which of the possible locations should these occupy? This is a complex problem involving considerations of transportation distances, freight rates, inventory levels, and warehousing rates. It is essentially a complicated routing problem in that a decision to employ warehouse *A* is a triple decision to ship from some factory, *B*, to some customer, *C*, along a route via *A*.

Here intuition and common sense are particularly likely to mislead. In deciding between warehouses *A* and *B*, judgment may do a good job. But with so many inter-related possibilities, a decision to move out of the Denver warehouse may make it desirable also to move from Cleveland to Akron, and to make a chain of other adjustments in order best to serve the customers formerly receiving shipments from the Denver warehouse. Nor can all the possibilities be enumerated and investigated one at a time. The number of possibilities is truly astronomical. As is well known, there are 6 different ways of choosing 2 warehouses from 6 possible locations (*AB*, *AC*, *AD*, *BC*, *BD*, and *CD*). When the possible location choices go up to 100, the number of possibilities increases enormously and leaves ordinary large numbers, like billions or trillions, far behind.

Fortunately, mathematical programming techniques can help once more. It is again a matter of choosing values of variables (the amounts shipped through each warehouse) which maximize annual net profits. Computational techniques like those which can be used with a distribution cost analysis are applicable here and can indicate, within the limitations imposed by the accuracy of the available data, what will be a good choice of warehouses, how much should be shipped through each warehouse, and from which factory and to which customer shipments should be routed through any particular warehouse.

The method of programming computation can be outlined briefly. The technique essentially involves little more than systematic trial-and-error calculation. We first try out the current warehouse arrangement to test whether it is the best one possible. We can compute how much cost would change if one additional warehouse were employed, or if the company's stock were moved out of one ware-

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CORRECTION IN OIL

The February issue of *COST AND PROFIT OUTLOOK* was devoted to "A Plan for the Middle East." The statement was made that 50 super tankers following the route around Africa could carry a large part of Europe's oil requirements from the Middle East. The author was relying on a statement by an authority on oil transport but an error was made in transcription. The figure should have been "50 more," with about that number now in the planning stage.

Meanwhile the geography of petroleum may soon undergo a major change. References have recently appeared in the trade and daily press to a vast new North African field which is being explored and developed by the French. This oil would reach the coast by pipeline and would not involve passage through the Suez Canal.

house into other warehouses now used by it, or if the company were to move inventory out of one such warehouse and into another single warehouse which it is not currently using. The increase or reduction in costs which would result from any such one-warehouse change can be computed from data on transportation costs and warehouse storage costs.

Suppose these computations show that some of the changes would result in a reduction of the company's total warehousing and transportation cost. The electronic computer which makes the calculation is instructed to pick out, from among all the possible single warehouse changes, the one which permits the largest reduction in costs. Obviously this change will leave the company better off than it was to begin with.

We are now ready for the second step in our mathematical programming trial-and-error calculation. As a second trial solution, the electronic computer uses the improved warehouse arrangement which was discovered in step one. Again, all single warehouse changes (adding one warehouse, leaving one warehouse, or substituting one warehouse for another) are considered and the cost changes which would result are computed. If any change can reduce cost, we must go on to a third trial solution, and so on.

Thus the computation method involves, on paper, a step-by-step change in the warehouse arrangement, and each step is guaranteed to leave the firm better off. Eventually this process must lead us to an arrangement whereby no further single warehouse change can reduce costs any more. This is the end of the computation.

Closely related to the warehouse location problem is the more common inventory-level problem. In fact, part of the job in computing the cost effect of any warehouse arrangement is a determination of the most appropriate inventory level for each warehouse. Only when the total amounts to be stored have been determined can the storage rates specified by contract with each warehouse be used to calculate the corresponding total storage cost. Since the most economical warehouse arrangement is that which saves most on both storage and transportation costs, it is clear that determination of the best warehouse location must also involve determination of optimum inventory levels.

As in every problem described in this article, determination of the best inventory levels involves a balancing-off of advantages and disadvantages. A low inventory level has virtues and vices, and it is necessary to find the intermediate inventory level which achieves the best compromise between them.

The most obvious disadvantage of a small inventory is the likelihood that it will lead to lost orders. If customers find that the seller cannot provide rapid delivery of the items which they wish to buy because they are out of stock, they may turn to the seller's competitor. If this happens too often the firm may lose customers, not just sales. Buyers simply will get tired of having to wait for order after order and will switch their allegiance to a competing seller.

Low inventories also have another disadvantage. It is only possible to keep small stocks on hand if the supplier is prepared to make frequent deliveries to his warehouses. A firm selling 600 refrigerators per 6-day week, from a single warehouse, can either deliver 600 refrigerators from factory to warehouse at the beginning of each week, or deliver 100 each day (or it can make deliveries on some other schedule). The once-a-week delivery schedule involves an average inventory level of 300 (plus whatever inventory is kept on hand for emergencies). But daily

delivery never involves an inventory against foreseen sales which is larger than 100 refrigerators. Thus inventories can be kept low, but at the cost of more frequent deliveries. This may involve the costs of additional book-keeping, higher handling costs, and higher transportation rates because shipments are so small they must go in less-than-carload lots.

It is seen, then, that low inventory levels must result in higher shipping costs and in increased danger of lost orders and lost customers. But high inventory levels are also costly. Storage costs, insurance costs, tax payments, interest payments on money capital tied up in inventory, pilferage and deterioration costs are all high when inventory is large. It is obvious then that inventory levels must be prevented from going too high or too low. In particular, an attempt to keep an inventory so great that no item ever runs out of stock and no customer order is ever delayed is likely to be catastrophically expensive, and it may be futile as well. For any commodity it is likely that occasionally many orders will, by coincidence, be placed at the same time. The cost of providing against such a remote contingency is almost never worth incurring.

The optimum inventory level can be found, as well as the data permit, by the use of standard operations research methods. The various types of inventory costs (storage, handling, taxes, lost orders, etc.) must first be translated into mathematical notation. Once this is done it is usually possible to employ the differential calculus in essentially the same way as it is used in the price determination problem, to find the inventory level which will yield the highest profits to the firm.

There are other related problems like the choice of inventory levels. Low inventories mean lost orders, because goods are frequently out of stock and can incur costs in frequent reorderings. On the other hand, large inventories involve high carrying costs including insurance, taxes, deterioration, and pilferage. A frequent problem is the choice of inventory level which achieves the best compromise between these costly extremes. There are standard mathematical methods for dealing with this problem.

Another related inventory problem arises out of seasonal swings in prices of perishable raw materials. It is costly to concentrate production exclusively at the season when raw material costs are low, because this can add substantially to labor costs, require a large plant capacity much of which may have to remain idle the rest of the year, and require the storage of finished-goods inventory between production seasons. On the other hand, production spread evenly throughout the year can involve very high labor costs. Here one must find the best compromise between completely even production and production concentrated entirely during a few months of the year. It may perhaps be surprising that the mathematics of the solution is very closely related to that of the optimum routing problem, but in fact the reason is simple—storage from September to January is a movement through time just as shipment from New York to Dayton involves movement through space. The optimum production inventory schedule involves the choice of optimum routes through time and can be solved by methods simpler than, but similar to, those required for the warehouse location decision.

We see, then, how operations research methods can find application in almost every field of marketing. The illustrations have been chosen to indicate a variety of ways in which management can profit from the use of OR techniques as part of its decision-making process; but it is not possible to draw up an exhaustive list—the field is vast and the horizons have not been reached.

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COST and PROFIT OUTLOOK

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THE CHALLENGE OF MARKETING MANAGEMENT

The executives of a marketing organization are concerned with three primary management tasks. Management is responsible for establishing the sales goals for the organization, for developing a marketing program through which to achieve these goals, and for maintaining the effectiveness of the organization itself so that it can carry out the marketing program. Successful operation requires that these responsibilities be discharged effectively and that action in these three fields forms a consistent pattern. A vigorous and successful management will set ambitious goals but it will conceive of its program and organization in appropriate terms as to quality and scale.

The general goal of every marketing organization is to make a satisfactory profit while rendering useful services to its customers. While this statement is true, goals must be defined more precisely in order to form the basis for a plan of action. There are short-run and long-run objectives. Management wants to maintain or expand its posi-

tion in the market to provide the basis for future earnings as well as to make a profit currently. Expansion leads in the direction of serving new customers introducing new products or utilizing new channels of trade. Every avenue for cultivating new business involves some risk with respect to the business the firm already has. Varying costs of getting new business pertain to every segment of opportunity. Sales goals must be consistent with each other and with the economic principle of seeking maximum results for the amount expended. Goals that are to be incorporated in a marketing plan must be specific as to the dates when the desired volume levels are to be attained and the composition of total sales volume and profits by products and by customer classes.

A rational goal is not merely something to be devoutly wished, it must also be one with a reasonable chance of attainment. The feasibility of an objective depends both on the character of the market opportunity and on the capacity of the organization for generating marketing effort of the requisite scale and quality. In the final determination of sales goals, management judgment is engaged in balancing the desirable against the feasible.

A marketing program is a statement as to how marketing effort is to be allocated to the various goals which are sought by the organization and to the various means which will be used in attaining them. A program describes a sequence of marketing activities and includes both a schedule for co-ordinating these activities over time and a budget for reconciling the various requirements with the total resources available during the operating period. A program embodies the chief executive's conception of policies and strategies by which his goals can be attained. It provides a comprehensive framework within which more detailed plans or routine procedures can be devised.

An organization may be regarded as an operating system with composition and structure appropriate to the task to be performed. A basic function of management is to keep the organization attuned to its changing marketing tasks, with modification as required both in personnel and organization structure. Ideally, the organization should be that which is required to carry out the current marketing program and have the capacity for adaptation to unexpected market developments.

MARKET PLANNING AND MARKETING RESEARCH

Of these three elements of sales goals, marketing program, and organization, the marketing program is usually the central concern for the executive engaged in planning. The program mediates between the desired goals and the capacity of the organization which must be brought into adjustment with each other. A program is obviously unrealistic if it greatly exceeds the capacity of the organization. As a basic step in organization planning, however, it is frequently desirable to project an ideal program in relation to sales goals in order to determine what changes

ELEMENTS OF MARKET PLANNING

SALES GOALS

Measuring Opportunity

Sales Forecasts
Market Potentials
Consumer Behavior and Motivation
Market Testing
Industrial Markets

MARKETING PROGRAMS

Allocating Effort

Product Line
Marketing Channels
Prices and Discounts
Sales Budgets
Marketing Mix
Advertising Media
Advertising Appeals
Sales Compensation
Production Scheduling
Quality Control

ORGANIZATION

Mobilizing Capacity

Organization Structure
Internal Communication
Standards and Supervision
Training and Executive Development
Inventory Policy
Production and Procurement Base
Investment Planning
Financing Market Expansion

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should be made in the organization. Similarly, it is sometimes possible to lay out a program representing maximum effort for a strong and vigorous organization, and thus discover that sales goals should be revised upward.

Most of the innumerable details of market planning can be delegated to technical staff. The formal techniques useful in carrying out a planning assignment are beginning to compare favorably with the formal tools of marketing research. For example, programming methods developed out of military problems are proving to have useful business applications. Even with ample technical assistance, however, the chief marketing executive must accept or reject. The results of his most crucial decisions are embodied in the marketing program and in the adjustment of program to sales goals on the one hand and organization on the other.

Market research and analysis provide essential support in every stage of market planning. A first step in determining sales goals is to measure the market opportunity. Many of the fundamental techniques of marketing research are addressed to this basic purpose of evaluating the potential market and predicting the rate at which the market can be developed. Market potential is not a simple concept but usually involves the study of interrelated growth rates and factors which may accelerate growth or retard it. The potential for many products depends on the number of automobiles on the road or the number of owner-occupied homes. Sales of cars or houses depend in

turn on growth in population and consumer income as well as on subtleties of motivation which determine the use of income. Expressed graphically, potential is not a point on a line but a family of curves representing the way that buyers may be expected to behave under various combinations of price and promotion, and at various stages of the innovation process in the case of a new product.

Just as sales goals can be related to the measurement of market opportunity, scientific analysis can be applied to the allocation of effort to facilitate the development of marketing programs. From this viewpoint a program can be regarded as a matching of inputs and outputs. The inputs include the time of sales personnel and other resources such as advertising materials and display space in retail stores. The outputs are sales and profit results by products, by sales territories, or other significant segments of the business. There is both a qualitative and a quantitative aspect to the matching of inputs and outputs. That is to say that the allocation of effort involves decisions both as to the kind of effort needed and the amount that will pay off in application to each of the desired outputs.

Finally, there is a marketing approach to organization analysis and planning. It starts by specifying the job which the market requires of the whole organization before attempting to write job specifications for individual executives or salesmen. Function determines structure under this approach to organization planning. The flow of processes embodied in the marketing program is analogous to the production line in the factory. Organization is the means for co-ordinating manpower and other resources to preserve an orderly flow.

There is a direct parallel to production capacity in what might be called marketing capacity. Because of morale factors as well as cost, it is essential that a marketing organization be kept working at close to its full capacity. Men must be motivated as well as directed to achieve this result. In mobilizing sales capacity, the marketing executive utilizes many devices for selection, training, supervision, and incentive compensation. The concept of mobilizing capacity has still broader implications since resources must be obtained from owners or investors. The top executive must first be convinced that he can utilize an increase in marketing capacity and then present a clear and persuasive picture relating it to marketing goals and programs. The analytical foundation for such a decision is somewhat parallel to a recommendation for the construction of a new plant.

THE ELEMENTS OF MARKET PLANNING

The chart on page one shows the relationships among these various elements of market planning. The left-hand column indicates the three broad areas of responsibility for marketing management. The right-hand column suggests some of the ways in which marketing research and counsel can assist management in each of these areas. A number of types of analysis are suggested under the broad headings of "Measuring Opportunity," "Allocating Effort," and "Mobilizing Capacity." Each of these topics calls for specialized scientific techniques. The confidence with which these techniques can be applied increases daily out of the successful experience in their application by both market analysts and marketing executives.

This chart should provide the marketing executive with a useful way of looking at his business. Perhaps he does not need to be reminded of the need for clearly stated and well-considered goals, or for a marketing program and organization appropriate to the attainment of these goals. There may be some reassurance, however, in this demon-

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stration of the way in which scientific market analysis has developed to match the needs of marketing executives. The topics listed under the three headings in the right-hand column should provide a check list against which the executive can consider the state of his information and the formulation of assignments for inside planning staff or outside management counsel. The range of topics is as broad as the whole function of market planning. Sometimes it is desirable to delegate a comprehensive planning assignment. In that case the planners or consultants would have the responsibility for reviewing all of these topics and undertaking fact finding and analysis where the materials for planning were lacking. In other cases an executive reviewing this list in relation to his own problem might be able to identify specific topics as presenting a stumbling block in the formulation of a marketing program. In such cases he does not want a complete design but is only looking for a few missing pieces. Nevertheless, a blueprint of the whole structure should help him in defining the areas of uncertainty where technical help is needed.

THE GOALS OF MANAGEMENT

The remainder of the discussion will deal with some of the issues facing the top executive in coping with goals, programs and organization. Use will be made of some actual cases drawn from current consulting practice. Little attention will be given to detailed techniques of analysis and planning even though such services can be of crucial importance on all of the issues mentioned. The intent, rather, is to picture as concretely as possible some of the questions to be met and the dilemmas which management is called upon to resolve in the face of uncertainty and change.

With respect to the goals of a marketing organization, reference has already been made to the problems of consistency and feasibility. Two recent cases illustrate the many ways in which conflicts among objectives can arise. The consultant often serves a useful purpose in helping management to put its objectives in sharper focus, and, in some instances to become aware for the first time that basic conflict exists. It is not always true that management knows exactly what it wants to do and calls in technical counsel simply to determine how to do it. Quite often a major need of management is to arrive at a clear definition of what can and should be done and to develop a policy position with respect to incipient conflicts.

In one of these recent cases involving a conflict of objectives there was the classical issue of wanting to expand into new product fields without losing sales on established products. The decision had been made to go into a further stage of manufacture producing end-products as well as intermediates. The company had laid down two principles apparently without taking note that they were in direct conflict. On the one hand they wanted to make end-products for which they could supply most of the intermediates or raw materials. On the other hand they did not wish to enter into competition with their established customers. There are many similar situations in market expansion as when an ethical drug company sees a major opportunity in over-the-counter products sold to the consumer. The client company in the case just mentioned seemed to be influenced first by one principle and then the other. Actually, there is no full resolution for this basic conflict. It must be disposed of by evaluating as carefully as possible the probable gains from entering the new field, the probable injury because of reaction on present customers, and deciding whether the net gain is sufficient to justify the risk.

Sometimes a company would gladly drop a product or a service which has been continued for reasons of prestige or good will rather than profit. The second case of conflicting objectives illustrates the difficulty of serving management unless it really knows its own mind or is willing to discuss the conflict with candor. A manufacturer of a piece of household equipment had been losing ground in both sales and profits and retained counsel to recommend a course of action. The analytical group assumed that the manufacturer wanted to make a profit on this product and recommended a program for expanding its sales. It was well known that one reason for continuing the product even though it was a minor part of the manufacturer's business was his fear of losing prestige on a related line of industrial products. What was not revealed in advance was that the cost structure in the factory was such that the product could not conceivably make a profit under current competitive conditions. What this manufacturer really wanted was a dignified way of reducing losses rather than an aggressive program for increasing sales and profits. Because of his inability or unwillingness to define the problem in this way, he did not get a marketing program he could use, but he did end with a clearer understanding of his objectives.

The test of feasibility always needs to be applied to sales goals which visualize rapid and continuous market expansion. Sometimes a so-called five year goal is nothing more substantial than the projection of past growth trends. It may not even take account of the point that the company or its industry has reached in its present cycle of growth, the prospect for leveling off before the end of the five-year period, or of pending developments that may even precipitate a downward movement. A simple device was employed in a recent consulting project to place the prospects of growth in a more realistic perspective. In general, there are only three possible sources of growth in company sales: increased sales on present products, introduction of new products developed in the research laboratory, or acquisition of additional products through mergers with other companies. Plan A made the maximum assumption concerning growth from present products and then determined what would have to come from new products or acquisitions to reach the stated sales goal. Plan B started with the minimum assumption as to increased sales for present products and carried out similar calculations concerning growth from other fields. The same process of setting up maximum and minimum assumptions was then applied to new products already under development in the laboratory and to acquisitions which had been under consideration. The result was six contrasting patterns of possible growth from various sources. Management got a new feeling out of this exercise as to the relative feasibility of these subobjectives and a sense of where to concentrate its effort to have the greatest probability of reaching the five year goal.

It is sometimes helpful to think of a marketing organization as moving from one crisis of growth to another like a living organism. Each stage of its life history is really a transition stage. The supreme art of management resides in a sense of timing which anticipates each critical turning point. In a marketing organization this rests on a knowledge of markets and particularly on a feeling for the pace of market change.

GUIDEPOSTS IN PROGRAMMING

There are several criteria which can be applied to marketing programs in determining whether they are appropriate to the goals the organization seeks. Marketing

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effort can be wasted or actually harmful unless it is squarely on the target. Instances where this is true are often encountered in reviewing advertising expenditures. One company found that it had been advertising a chemical product for the wrong market for two years. That is to say that there were better and cheaper products for the use recommended, whereas the product in question was extremely effective in another use field where no competitive product could touch it. In another case millions of dollars were spent inducing new users to try a product at a time when it suffered a serious disadvantage in comparison with other products. The laboratory succeeded shortly thereafter in remedying this product defect. Meanwhile some of the advertising expenditure which might have created good will a year later undoubtedly created ill will because it was premature.

Sometimes a marketing program is ineffective because the total effort is below the threshold necessary to be effective. Some advertisers apply this principle by saying that they will not use an advertising medium unless they can dominate it for their class of goods. Obviously the small or moderate sized advertiser cannot always find a medium in which he can secure a dominant position with the funds available. A modification of this principle was suggested by a recent analysis for a beverage manufacturer. Faced with heavy competition in every region and in each of the available advertising media, there appeared to be a marked difference in results from market to market. Analysis indicated that he had to spend at least 10 per cent of the competitive advertising dollars in any market to make an impact, and that above that figure competitive shares tended to vary directly with advertising expenditure. Thus, where a dominant position is not available it would seem that an advertiser has to get above a certain noise level in order to be heard at all in competition.

Much has been said about the proper co-ordination of marketing programs, and countless examples have been noted that advertising will not work without distribution, or vice versa. Aside from this co-ordination of timing and execution, there is the broader question of the co-ordination of all the parts of a program in a well-balanced pattern. A planning executive in a marketing organization needs an esthetic sense of the fitness of things which goes beyond mere logical calculation. In other words, the best plan cannot be fully determined by considering the marketing mix in terms of a little more or a little less of one element or another. Sometimes it is the responsibility of the planner or marketing consultant to suggest several sharply contrasting plans and to insist that a clear-cut decision must be made as to the general direction which the program is to take. In some cases the program has grown by accretion and embraces a variety of activities which cannot be reconciled with each other. In one recent case it was difficult to find two major customers who were actually being sold in the same way or where a common marketing policy could be said to hold.

A major issue in developing programs is whether the company should schedule its own marketing effort fully in advance or whether it should be primarily concerned with fathoming the moves of competition and being prepared to counter them. The best point of compromise between a fully scheduled program and holding some resources in reserve varies, of course, with the competitive field and with the size of the company and its flexibility in action. In most established organizations it is better for management to concentrate on its own job than on what competition is doing. To the extent that every company's market position is unique, there is a best strategy for it which should be followed regardless of competitive tactics.

ORGANIZATION AND THE POWER TO ACT

Turning to the problems of organization, the marketing executive must be sure that he has capacity to act in relation to the occasions of action which will confront him. Psychologists say that no man has ever used more than a fraction of his brain because of blocks and conflicts within the human personality. The successful organization like the successful individual has done a better-than-average job of mobilizing capacity by overcoming these obstacles. In case after case, destructive tensions may be seen at work in marketing organizations. Advertising clashes with sales, product managers with district managers, and policies are constantly breached to meet one special situation after another. Individuals may be either too aggressive or too backward in pushing their particular assignments in conjunction with having the common fault of failing to relate them to the over-all objectives of the firm. Tension is not always to be deplored, however, since tensions of the right sort are closely related to the vitality of the organization or the living organism. The function of leadership on the part of the marketing executive might be defined in part as that of maintaining creative tensions within the organization. To do this it is recommended that the marketing executive be sensitive to organization in both human and operating terms, and that he view his organization problem in a three-fold perspective.

An organization is in one sense a structure designed to facilitate the functions to be performed. An effective structure must make an appropriate place for steps in the management process such as decision, conceptualization, and the control of routine procedures. In other words, management must decide what to do, how to do it, and then see that the prescribed program is actually carried out. The organization structure must facilitate these management activities as well as make a proper grouping of the activities of subordinates.

An organization is also a network of expectations. Basic among these are the sales goals which have been established since it is through them that the expectations of the individuals are to be realized. The executive serves the organization and the individuals who make it up by keeping these overriding objectives in the foreground. He expects performance of his subordinates consistent with their abilities and secures commitments that assignments will be carried out. In turn he commits the resources of the organization in support of these tasks and for the reward of successful performance. This two-way commitment between the executive and his subordinates is the foundation for what has been called the creative tension within a vigorous organization.

An organization may also be viewed in a somewhat longer perspective as a flow of individuals into and out of a working environment. An individual is recruited not only for what he can do today but for his capacity to assume greater responsibility later on. An organization is both an operating system dealing with today's problems and an assemblage of men and resources in constant preparation for the tasks of tomorrow. The successful executive in dealing with either markets or organization must wear a species of mental bifocals in which short-run and long-run considerations are always present together. He is both acting and getting ready to act. Held in proper balance these management objectives can reinforce each other. This is the essence of the power principle which the writer has previously suggested as vital to management. In pursuance of the power principle, the successful marketing executive will act in such a way as to promote the power to act.

