A STUDY OF THEORETICAL AND PRACTICED PROCEDURES IN PLANT LOCATION AND ANALYSIS OF HIGHWAY LOCATIONAL INFLUENCES

Thesis for the Degree of M. A.

MICHIGAN STATE UNIVERSITY

Donald John Bowersox

1958

A STUDY OF THEORETICAL AND PRACTICED PROCEDURES IN PLANT LOCATION AND ANALYSIS OF HIGHWAY LOCATIONAL INFLUENCES

By

DONALD JOHN BOWERSOX

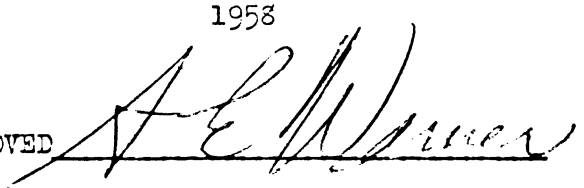
AN ABSTRACT

Submitted to the College of Business and Public Service
Michigan State University of Agriculture and
Applied Science in partial fulfillment of
the requirements for the degree of

MASTER OF ARTS

Department of Insurance, Law, and
Real Estate Administration

1958

APPROVED 

Donald J. Bowersox

AN ABSTRACT

Post World War II America has been characterized by industries forming, expanding, relocating and dying. Today's manufacturer, concerned with the problem of selecting a new location, faces a complex task. Selection of a location which offers the proper mix of cost, competitive, and intangible factors can often become the decisive factor between proliferation or failure of a firm. A site must be found which provides low costs of accumulation, processing, and distribution, located in a community with which the particular firm will be socially compatible.

Current theories of plant location illustrate the factors which are influential in locating manufacturing plants. These theories are highly beneficial in terms of general considerations but offer little guidance toward the procedures of selecting a specific site. For the curious executive, these theories will tell him what factors to consider at the general neglect of how to consider. The "how" of plant location breaks down into a logical deductive procedure consisting of four general steps: (1) determination of objectives, (2) regional delineation, (3) community delineation, (4) site delineation.

The primary objective of this study is to make a comparative analysis of theoretical and practiced plant location procedure. Procedure is defined as a broad process of delineation within which executive decision making can be oriented. To accomplish this primary objective a theoretical model of location procedure must be constructed. Development of this model requires that general theories of location be

considered from the perspective of logical procedure. The result, an applicational theory of plant location, represents a suggested framework for considering location problems and a model useful for comparative purposes.

Information concerning location procedures used by manufacturers is obtained by empirical inquiry. Analysis is made of the locational factors considered by six Michigan firms. No attempt is made to obtain a statistically representative sample. Analysis of interview results, with these firms, presents insights regarding practical procedures utilized in plant location. The primary objective of this study crystallizes with the comparison of results from empirical inquiries with the applicational theory.

A secondary objective under consideration in this study deals with the influence of highways upon plant location. During each of the empirical case studies, emphasis is placed upon evaluating priority given to highways as an influential factor in selection of final plant sites. Such factors as advertising potential and desirable public relations, resulting from location in close proximity to a major highway, are considered.

The nature of the twofold problem under consideration is relatively independent of location advantages offered by a region, state, or community. The point is emphasized that this is not a study to measure the desirability of locating a plant in Michigan. The factors under consideration are immaterial to political boundaries.

A STUDY OF THEORETICAL AND PRACTICED PROCEDURES IN PLANT LOCATION AND ANALYSIS OF HIGHWAY LOCATIONAL INFLUENCES

By

DONALD JOHN BOWERSOX

A THESIS

Submitted to the College of Business and Public Service
Michigan State University of Agriculture and
Applied Science in partial fulfillment of
the requirements for the degree of

MASTER OF ARTS

Department of Insurance, Law, and
Real Estate Administration

1958

ACKNOWLEDGMENTS

The author wishes to express his sincere appreciation and gratitude to the following individuals and organizations:

Dr. A. E. Warner, Acting Head, Department of Insurance, Law and Real Estate Administration, under whose inspiring supervision this thesis was completed. The benefits received from Dr. Warner's over-all direction extend far beyond the pages of this text.

Dr. R. E. Larson, Department of Insurance, Law and Real Estate Administration, for time so graciously allotted for consultation and advice.

Dr. P. B. Blomgren, Department of Marketing and Transportation Administration, for the advice and time readily granted each time requested.

Mr. Ronald M. Reifler, Fantus Factory Locating Service, for finding time in a busy schedule to grant a lengthy interview and for the valuable information he provided through publications and correspondence. A special thanks to the Fantus Organization for allowing the author to draw freely upon their published materials.

Michigan State University Highway Traffic Safety Center for providing financial assistance which helped make this study possible.

Michigan Economic Development Department, and particularly Mr. John Kavanagh for assistance in selecting firms whose location procedure was studied in this thesis.

Each of the firms studied, who in accord with prior agreement, remain anonymous.

Carol, Pat and Ed, for constantly providing inspiration and support. A loving family is beyond doubt a man's greatest asset.

TABLE OF CONTENTS

LIST OF TABLES

SECTION ONE

GENERAL CONSIDERATIONS

CHAPTER I

INTRODUCTION

Post World War II America has been characterized by industries forming, expanding, relocating, and dying. New plants are constantly constructed or occupied by firms at "selected" locations in order to take advantage of radically shifting markets, lower process costs, lower transit costs or specific intangible factors offered by particular communities. Experience has pointed out the inescapable fact that plants can no longer be located by intuition. Selection of a location which offers the proper mix of cost, competitive, and intangible factors can often become the decisive factor between proliferation or failure of a firm. The large number of available vacant plants clearly points out that the days of making money "in spite of yourself," are at least temporarily a thing of the past. In Michigan alone, 292 plants were listed vacant in early 1958.[1]

Today's manufacturer, concerned with the problem of selecting a new location, faces a complex task. A site must be found which provides low costs of accumulation, processing, and distribution, located in a community with which his particular firm will be socially compatible. Increased awareness, on the part of states and communities regarding advantages of attracting new industries, has stimulated extensive

---

[1] "Available Plant Summary," Michigan Economic Development Department, first edition, Lansing, Michigan, 1958.

promotion of their respective benefits. From this list of increasing alternatives, the manufacturer must select the one best or ideal location for his plant.

The task of locating a manufacturing firm is not an everyday occurrence on the agenda of most executives. When possible, executives first attempt to solve problems by modernization, internal reorganization, or improved production methods. Relocation is usually not considered until all these alternatives have been exhausted. Several related factors contribute to this rigidity. The minimax principle alone can cast enough influence to cause postponement. Relocation means extensive capital outlays. An individual entrepreneur may feel that minimum and more definite profits realized at his current location are more desirable than the risks of profit maximization.

Longevities of location also contribute to locational rigidity. Assume one factor, such as abundance of raw materials, was the prime influence in selecting the current location. After a number of years, this initial influence may be depleted or rendered less critical by technological developments. Technically, the firm is no longer bound by the economics of its first location. Other factors may now be critical cost considerations. Consideration of these factors may indicate the firm should seek a new location. Forces resulting from longevity of location will oppose this movement. During years of operation, a skilled labor force may have been developed. Local services have been realized which offer maximum convenience at reasonable expense. Community relations may be highly satisfactory. Faced with these conflicting interests, the ability of an executive to break his

environmental set and look at the long-term trend of his firm is greatly enhanced. From within this web of conflicting influences, the decision to relocate must be made and the procedures of location must be implemented.

Once the decision to consider a new location is made, an executive has basically three alternatives. First, he can turn his entire location problem over to a competent consultant. Second, he can undertake location analysis within his own firm. The third alternative is a combination of the first two. He can combine expert advice with personal judgment. Whichever alternative is selected, knowledge of the forces pertinent to his particular locational problem is a prerequisite to competent executive action.

Current theories of plant location illustrate the factors which are influential in locating manufacturing plants. This theory is highly beneficial in terms of general considerations but offers little guidance toward the procedures of selecting a specific site. For the curious executive, these theories will tell him what factors to consider at the general neglect of how to consider.

The "how" of plant location breaks down into a logical deductive procedure consisting of four general steps: (1) determination of objectives, (2) regional delineation, (3) community delineation, (4) site delineation.

STATEMENT OF THE PROBLEM

The concern of this study is twofold. The central problem is to make a comparative analysis of theoretical and practical plant location

procedures. In consideration of the central problem, the first task is to consider general theories of location in reference to the logical procedure of site selection. To the extent that location theory can be considered in a procedural perspective, an applicational theory of plant location evolves. Applicational theory represents a suggested framework for considering plant location problems. Procedure is defined as a broad process of delineation within which executive decision making can be orientated. The second task is to observe methods which have been utilized in locating plants. The objective of this empirical inquiry is to elaborate the practical procedures currently used by manufacturers. Comparison of the results of these two tasks forms the central problem of consideration throughout this text. This central problem resolves to the following question:

> To what extent are suggested theoretical procedures of plant location utilized by businessmen in selection of their plant sites?

A secondary problem under consideration deals with the locational influences of highways. Inquiry concerning highways has been selected for observation because of the author's current interest in this particular locational factor. Observation could be directed toward isolating any influential factor in the location process. For example, the effect of taxes, transportation, or markets are a few of the alternatives available for detailed examination. A larger and more complete empirical inquiry might be concerned with measurement of all critical factors as the primary objective of the study. In this study, we will be concerned only with highway influence. The secondary problem resolves to the following question:

What priority was given to highways as an influential factor in selection of final sites?

Consideration of these two problems will realize the objective of this study.

GENERAL METHODOLOGY

The relevant problems under observation are considered in the following manner. The chapters in Section Two examine theoretical considerations in plant location. Chapter II presents the applicational theory as a model for comparative purposes. The role of general theory in development of applicational theory is discussed. Significant literature utilized in preparation of this study is reviewed. Chapters III, IV and V discuss critical factors which manufacturers should consider in the first step of selecting a new site. Chapter VI, which concludes the discussion of theoretical considerations, is divided into two parts. The first part presents a brief discussion of the theoretical framework for selection of the actual site. The second part describes one method of implementing applicational theory. While the primary concern of this study is not details of implementation, the last part of this chapter introduces some insight regarding relevancy of the applicational approach.

Section Three deals with the procedures utilized by six industrial firms in locating plants. These empirical studies present the basis for making comparisons between theoretical and practical procedures. Chapter VII describes the geographical area of concern as well as the specific methodology used in the empirical inquiry. The remainder of Section Three reports study results. Emphasis in

consideration of case studies is placed upon procedure. In actual practice, a decision not to relocate may be the legitimate result of this procedure. Of primary importance is the fact that current locational set was broken and search was implemented.

In Section Four, the primary and secondary objectives of this study crystallize. Chapter IX compares practical procedures with theoretical assumptions. Suggestions for continued inquiry, revealed during consideration of the primary problem, are presented. The final chapter of this text discusses the highway influence in locational decisions. The first part of the chapter is devoted to a discussion of the relevancy of the highway influence. The second part of Chapter X reports highway influence observations made during empirical inquiries.

Throughout this study, the terms locate and relocate are used interchangeably. Whether an executive is faced with locating a new economic enterprise or relocating an old establishment has little influence upon the general theoretical procedures followed. Adjustment to the particular problem at hand is the adaptive responsibility of the individual executive.

SECTION TWO

THEORETICAL CONSIDERATIONS

CHAPTER II

APPLICATIONAL THEORY

Prior to inquiry concerning the theoretical considerations of plant location, a definitive analysis of theory and theoretical approach, as used in this text, appears appropriate.

The word "theory" is a nebulous term. Few people can agree precisely what relevance should be attached to the implications of this vague concept. To the physical scientist, theory ideally represents a quantitative set of propositions which can be experimentally substantiated and mathematically expressed. To the social scientist, with the exception of some economists, theory may mean little more than an expression of a personal philosophy. To the non-curious student, the term theory may, and unfortunately often does, represent a psychological barrier to further inquiry. To the practitioner, theory often is viewed as impractical and irrelevant mental exercise. To be sure, the term theory has been used in a variety of ways.

The entirety of Section Two discusses theoretical considerations in plant location. What does "theoretical" as used in this section connote? From strictly a semantical point of view, Alderson offers a definition which appropriately illustrates the role of theory.[1]

---

[1] Wroe Alderson, Marketing Behavior and Executive Action (Homewood: Richard D. Irwin, Inc., 1957), p. 5.

> Theory is a set of propositions which are consistent among themselves and which are relevant to some aspect of the factual world. Some theorists are more concerned about consistency and others about relevance, but both are essential to theory in an empirical science.

The above definition provides insight into the role which theory ideally plays, but offers little elaboration concerning the role of theory in this analysis. For purposes of this presentation, theory represents a procedural framework aimed at guiding the deductive procedure of selecting a geographical plant location. The central problem is one of comparing theoretical and practical procedures in plant location. Consequently, we are first confronted with the necessity of constructing a procedural theory of plant location to be utilized in comparative analysis.

INFLUENCE OF GENERAL THEORY

Current literature offers numerous contributions aimed at development of general theories of plant location. The goal toward which these theories are orientated is the development of a conceptual framework of economic growth. Isard views the problem as essentially one of establishing rules that govern the economic structure; and one of developing a common denominator by which all forces stemming from the various interrelations can be expressed and evaluated.[2]

Continued development of a general theory aimed at advancing the available knowledge of forces contributing to plant location patterns

---

[2] Walter Isard, Location and Space-Economy (New York: John Wiley and Sons, Inc., 1956), p. 30.

is unquestionably a noteworthy and desirable objective. Study of such a theory would provide the executive with a conceptual framework of critical factors which he should consider in selecting a new location. The primary inadequacy of this general approach stems from a lack of practical relevancy. An executive can become thoroughly acquainted with critical factors in location and still find he is lost for a means of implementation.

The primary concern of this thesis is procedural comparison. The first interest is one of projecting a theoretical model--in essence, an applicational theory. General location theory, per se, does not fulfill this requirement. This does not mean that we can disregard current theoretical contributions. While we will not be concerned with the complete analytical approach of a particular theorist, the sum of these general theories provides the conceptual framework of economic location. From general theory, we will extract the interrelated critical factors pertinent to location problems.

The task of constructing an applicational theory is one of integration. Basic factors critical in location problems must be combined into a systematic procedure for selecting plant sites. Achievement of this synthesis will offer the executive a guide to be used in the selection process.

Unquestionably, general theory and applicational theory are interrelated. The primary distinction between the two presentations is point of emphasis. The factors under consideration are identical. Rather than considering general and applicational theory as alternatives, one is closer to the correct assumption when the applicational

approach is viewed as the practical extension of general theory. To the extent that general theory can be supplemented with procedure, the controversial gap between theory and practice is narrowed. Realization of the objectives of applicational theory will present the horizontal considerations of general theory into the vertical spectrum of the locational problem.

SEGMENTS OF APPLICATIONAL THEORY

Applicational theory consists of two distinct segments--critical factors and procedure. Selection of the final site is viewed as the resultant compromise between critical factor influences at each step in the location procedure. The entrepreneur, faced with the problem of selecting a location, virtually has a geographic potential as broad as he is willing to consider. The task confronting this executive is one of constant reduction. In essence, he faces the problem of deducting from all locational possibilities one specific site.

Critical Factors Segment

Critical factors can be broadly grouped into three categories--cost factors, competitive factors and intangible factors. Table 1 presents an outline of the critical factor segments of applicational theory.

Cost factors are those factors which are essential to the manufacturing process. Historically, the core of economic inquiry into locational analysis has evolved from consideration of these indispensable factors. Cost factors represent aggregate expenses which enter

into the final delivered cost of the product.[3] Utilizing the terminology first presented by Hoover, cost factor can be classified into two general categories.[4]

TABLE 1

CLASSIFICATION OF CRITICAL LOCATIONAL FACTORS

- Cost Factors
  - Transportation Costs
    - Material Orientated Location
    - Market Orientated Location
    - Intermediate Location
  - Processing Costs
    - Rent
      - Land Cost
      - Taxation Cost
      - Capital Cost
    - Labor
    - Power and Fuel
- Competitive Factors
  - Demand Requirements
  - Agglomerative Forces
- Intangible Factors
  - Cost Revenue
  - Purely Personal

The first category is transit costs. Transportation costs consist of all expenses necessary to accumulate raw material and all expenses necessary to distribute the finished product.

---

[3] Melvin L. Greenhut, Plant Location In Theory and In Practice (Chapel Hill: University of North Carolina Press, 1956), p. 167.

[4] Professor Hoover presents as the core of his thesis two influential cost groups--transfer and process. Although not treated in a similar manner, the terms have been adopted for use in this presentation. Edgar M. Hoover, The Location of Economic Activity (New York: McGraw-Hill Book Co., 1948).

The second main category is labeled process costs. Greenhut considers processing costs to include all costs other than transportation costs on material and finished products.[5] For our consideration, rent, labor, and power will be discussed as the most important processing costs.

From purely a least-cost method of locating a manufacturing firm, the combination of critical cost factors into a minimum cost mix determines a particular industry's location. A manufacturing firm is considered "ideally" located when all indispensable factors can be obtained at the lowest possible long term costs.[6]

Competitive factors consist of those factors which enter into the location decision as a resultant of an entrepreneur attempting to realize benefits of interdependence and/or to achieve differential advantage by virtue of location. These considerations have a distorting influence upon the site determined "ideal" by least-cost analysis. Competitive factors stimulate the entrepreneur to seek the site offering the lowest delivered prices over the largest available market area.[7] Throughout this presentation, competitive factors will be viewed as potential revenue adding and cost reducing influences.

Intangible factors consist of any consideration which will tend to influence selection of the final site which cannot be directly

---

[5] Greenhut, op. cit., p. 124.

[6] W. Gerald Holmes, Plant Location (New York: McGraw-Hill Book Co., 1930), p. 3.

[7] Greenhut, op. cit., p. 140.

attributed to cost or competitive factors. While cost and competition have received considerable emphasis in location analysis, treatment of intangible factors has generally lagged. Yet, in many location decisions, the influence of intangible factors has greatly altered final site selection. One drug company was faced with the problem of constructing a new plant, away from the location of other company plants, due to the lack of adequate water facilities. Locational analysis was undertaken to determine the influence of all cost and competitive factors. This analysis pointed out that the best location of the new plant would be at a major east-west transportation center, considerably south of current manufacturing facilities. After consideration of all factors, the new plant was constructed a short distance to the north. Executives believed that managerial control of operations was more desirable in terms of company policies than was maximum economy of operations.

The interrelation of these three basic categories of factors represents the heart of location theory. Whether the objective is application or development of general theory, these critical factors represent the basis of initial inquiry, as well as the common denominator between both approaches.

Procedural Segment

The second essential segment of a theory concerned with application is the procedural model. Fortunately, the natural and logical process of plant location yields a satisfactory procedure. Various writers have presented procedures based primarily upon empirical observations that can be adapted to our present inquiry in a highly

satisfactory manner.[8]

The procedural model is viewed as consisting of two basic steps--general delineation and specific delineation. Both steps combine to guide the process of reducing the geographic area of location potential to one specific site. Table 2 outlines the procedural segments of applicational theory.

TABLE 2

PLANT LOCATION PROCEDURE

General Delineation
- Microscopic Analysis

Specific Delineation
- Regional Delineation
- Community Delineation
- Site Delineation

General delineation consists primarily of a microscopic analysis. The objective of this self-evaluation is to first and foremost decide if relocation is necessary. While in all probability, a firm motivated to relocate has legitimate stimulants, the possibility of internal adjustments must remain open to consideration. Assuming that a new location is deemed desirable, careful analysis of all pertinent locational factors will determine the specifications which the new location must meet. Selection from this point on consists of attempts to match spatial alternatives with objectives and requirements obtained

---

[8] See: Holmes, op. cit., or Leonard C. Yaseen, Plant Location (New York: American Research Council, Inc., 1956), or Robert M. Atkins, "A Program For Locating A New Plant," Harvard Business Review (November-December, 1952).

from microscopic analysis.

Specific delineation consists of three additional steps necessary to arrive at a specific site. Proceeding on specifications outlined during general delineation, various regions are isolated as search areas. A search area consists of a specified geographical area within which the general objectives and requirements of the firm can be realized. Secondly, satisfactory communities must be located within alternative search areas. And lastly, alternative sites must be singled out for selection.

APPLICATIONAL THEORY

Thus far, we have discussed in cursory fashion the two major segments of applicational theory. Three categories of critical factors were presented as the foundation of location theory. Two stages of delineation were presented as aspects of the procedural model. On one hand, we have an array of factors theoretically relevant to location; on the other hand, a procedural framework orientated to selecting a specific site. The question of concern at this point is--how do we blend the critical factors with the procedural model in an attempt to present an applicational theory?

The point of marriage is found in the first stage of location procedure--general delineation. The microscopic self-analysis conducted by the firm is, in essence, a critical factor evaluation. The manufacturing firm considering relocation attempts to isolate the factors which are of vital concern to their locational problem.

While the location of any manufacturing firm is normally a

combination of factors; generally, one factor emerges as primary.[9] The primary factor is considered as that factor, all other things being equal which would dictate plant location. Other factors become secondary influences either confirming or distorting location selection as dictated by primary factor analysis.[10]

During the process of self-evaluation critical factors are isolated and transformed into objectives and requirements which the new site must satisfy. For example, in the aluminum industry, power would emerge as the primary factor. Closely allied to power would be raw material requirements. Of vital concern would be the competitive factors which management deemed necessary to include in locational decisions. Another consideration may be management's centralization-decentralization policies. From analysis of these and various other pertinent factors, the specifications which will guide the remainder of the procedural process are crystallized.

At this point, the specific delineation of geographical area takes place. Utilizing specifications formulated during general delineation, critical factors are considered at each step in the deductive process. At the procedural level of regional delineation, critical factor specifications are presented in a regional perspective.

---

[9] Greenhut, op. cit., p. 103.

[10] In reality, more than one factor may be considered as primary, each casting equal influence upon location decisions. The method of analysis remains unchanged. In cases of multiple primary factors, the paramount influence is viewed as the aggregate influence of all factors considered as primary determinates.

For the procedural levels of community and site delineation, specifications are also projected into proper perspective. Thus, in total delineation, applicational theory presents the manufacturing firm with specifications for evaluating alternatives at each stage of the deductive location process.

LITERATURE REVIEW

The remainder of this chapter presents a brief summary of the most significant locational literature utilized in preparation of this study. The six authors reviewed can be grouped into two categories. The first consists of general theorists. The work of these three writers was utilized to obtain relevant information concerning critical factors of location. The second category consists of a group of writers labeled as practitioners. The major contribution of these three writers is the procedural framework utilized in applicational theory.

Weber--Alfred Weber's Theory Of Location Of Industries[11]

Probably the first attempt at construction of a general theory of location can be attributed to Alfred Weber. Utilizing an evolutionary approach, Weber attempted to construct a theory explaining development of locational patterns. Starting with an undeveloped country and an isolated economic system, his analysis traces the development of economic activity. Weber's primary premise stated that

---

[11]Carl J. Friedrick (ed.), Alfred Weber's Theory of Location of Industries (Chicago: The University of Chicago Press, 1929).

any particular industry will tend to locate at the point where aggregate transportation costs will be minimized.[12] Within this general framework, he considered factors which tend to distort the least-transportation-cost location. Primary consideration is given to two distorting influences--labor and agglomeration forces. Agglomerative forces represent aggregate cost reducing influences resulting from spatial interdependence.[13]

Weber's primary contributions stems from his early treatment of location theory, and his discussion of various implications of transfer costs. Several of his transportation cost assumptions permeate contemporary literature.[14] Primary emphasis in this study was placed upon his discussion of transportation, labor, and agglomeration.

Hoover--The Location of Economic Activity[15]

Hoover's "The Location of Economic Activity," has since publication been considered as one of the most excellent summaries of general economic location theory. Hoover views location from the aspect of profit maximization. His central premise is that the ideal location is one which renders total costs closest to minimum, and total revenue closest to maximum. Hoover's work differs primarily from Weber's in

---

[12] Weber, op. cit., chapter III.

[13] Ibid., p. 134.

[14] Weber's discussion of industrial orientation in reference to the weight characteristics of raw materials and corresponding transportation costs, has been adopted as a traditional approach to considering the influence of weights upon industrial location.

[15] Hoover, op. cit.

regard to optimum location. While Weber was only concerned with cost analysis, Hoover extends his thesis to include demand considerations. Thus, he views the location problem for any particular firm as one of finding the least-cost location that will provide access to adequate potential demand. Pursuing a static approach to location, Hoover first emphasized upon two categories of cost factors--transfer and processing. The relative importance of each category upon location varies among industries. The factor which represents the highest cost will become critical in the location of a particular industry. In later chapters, the static approach is dropped and emphasis is placed upon a discussion of the dynamics of locational change and adjustment.[16] The primary contribution of Hoover, toward our current objective, is found in his detailed discussion of the influences of various locational factors.

Greenhut--Plant Location In Theory and Practice[17]

Greenhut's discussion of plant location is a combined theoretical and practical inquiry. His presentation of general theory is based upon deductive investigation of plant location literature and empirical study of eight Alabama firms. The primary objective of his inquiry is to integrate into theory practical factors which determine plant location. Greenhut's orientation to the factual world results in inclusion of the influence of demand and personal determinates in site selection.

---

[16] Ibid., Part II.

[17] Greenhut, op. cit.

His presentation clearly breaks away from the traditional "least-cost" approach to location. Demand is viewed as a variable factor, dependent upon freight costs, contacts, and competitor's locations.[18] For any particular firm, the ideal site is the one which offers the largest spread between charges and receipts.

The primary contribution of Greenhut's presentation is found in extension of determinates of location to include demand and personal considerations. His work was particularly influential in the competitive and intangible aspects of the general delineation phase of applicational theory.

The three authors briefly reviewed above were utilized as primary references in determinating critical factors of location. The following three authors were the primary sources of the procedural model utilized in applicational theory.

Holmes--Plant Location[19]

Published in 1930, Holmes presents one of the first attempts to describe the reduction process of selecting an industrial site. Three steps are included in the selection procedure: (1) choosing the general territory, (2) choosing the particular community, (3) choosing the site. Holmes discusses critical factors at each step in the selection, placing emphasis upon describing facilities. The point of primary concern is alternative facilities. The total selection procedure is viewed as determinating a "least delivered-to customer cost"

---

[18] Ibid., p. 279.

[19] Holmes, op. cit.

location. This refers to all costs which a commodity must bear from the time it is taken from nature until it is delivered to the manufacturer's customer.[20] Holmes' least-cost orientation results in little attention being given to demand and competitive determinates of location. Both factors are noted in a cursory manner. His selection procedure differs primarily from our applicational procedure at the point of initial inquiry. Holmes does not discuss in detail the advantages and benefits of self-analysis.

Yaseen--Plant Location.[21]

Yaseen presents the procedures of plant location in a popular perspective directed toward helping the executive who faces a locational problem. The procedure developed is based upon practical experience in plant location, obtained by the author, during association with the Fantus Factory Locating Service. The reductive process of site selection consists of: (1) self-evaluation of locational requirements, (2) community analysis, (3) site selection. Concerning each of these steps, Yaseen discusses critical factors in terms of facilities and checklists. His over-all treatment of the theoretical aspects of critical factors is very light. Yaseen's work differs primarily from Holmes with regard to competitive and intangible determinates of location. Throughout the presentation, location is viewed as a resultant of the mix of cost, competitive, and intangible factors. Yaseen's presentation is the primary source of the procedural model utilized

---

[20] Ibid., p. 3.

[21] Yaseen, op. cit.

in application theory.

Atkins--A Program for Locating the New Plant[22]

Atkins presents, in brief outline form, an effective procedure for management to follow when faced with a locational problem. Emphasis is placed upon the necessity of proper internal study prior to site search. Only when a firm realizes their true objectives can a satisfactory site be selected. The actual selection phase is viewed as two stage--comparison of areas and study of preferred communities. Atkins notes the necessity of including intangible aspects into the selection process. In order to arrive at the most satisfactory solution, a mathematically weighted evaluation of all factors critical to selection is suggested. The weights used for evaluation are obtained from analysis of cost factors and judgment of intangible considerations. The primary contribution of this brief work is found in the considerable attention placed upon preliminary thinking and evaluation.

In summary, the process of selecting a plant location is viewed as the resultant compromise between critical factor influences at each step in the locational procedure. The task confronting the executive is one of deducting from all locational possibilities one specific site. In order to guide the executive in selecting between various alternative sites, theory orientated toward application of the science of plant location is desirable. Applicational theory is defined as a procedural framework aimed at guiding the deductive procedure of selecting a geographical plant location.

---

[22]Atkins, op. cit.

The remainder of this section considers this critical factor--procedural relationship. Applicational theory is developed for both the general and specific phases of plant location procedure. The procedure presented in the following chapters represents the theoretical benchmark for consideration of our central problem--comparison of theoretical and practical procedures of plant location.

CHAPTER III

GENERAL DELINEATION -- TRANSPORTATION COST FACTORS

The first procedural step in the process of locating a plant--general delineation--consists of a microscopic self-analysis of current and projected manufacturing operations. During this period of examination, management outlines in the form of objectives and requirements, the tests which a new plant location must meet. As pointed out earlier, this process of self-evaluation establishes the specifications utilized during the remaining procedural steps necessary to reduce geographical potential to a specific site.

The general delineation phase of the location procedure consists of critical examination of current and projected operations in respect to three categories of influential factors: (1) cost factors, (2) competitive factors, (3) intangible factors. In this chapter, the transportation aspect of cost factors is discussed. In Chapter III, the influence of processing costs is considered. In Chapter IV, the competitive and intangible factors which influence final specifications are considered. By the process of least-cost analysis, factors critical to the locational problem are isolated and presented in light of relative importance. These critical cost factors are then viewed in perspective of competitive and intangible factors deemed critical. The resultant influences of all critical factor analyses are the specifications that guide the remainder of the locational process.

LEAST-COST ANALYSIS

Cost factors consist of those factors which are essential to any particular manufacturing process. Basically, these factors can be grouped into two general categories--transfer costs and processing costs. Transfer costs consist of all expenses accrued in accumulation of raw materials and all expenses necessary to distribute the finished product. Processing costs represent all expenses necessary to convert the raw materials into finished products.

The task confronting location by least-cost analysis is to examine the cost relationship of all transfer and processing factors in order to pin-point the lowest possible aggregate cost location. For any particular manufacturing firm, the factors which represent highest dollar cost become the primary determinates of least-cost location. All other cost factors act as secondary influences, pulling the plant away from that geographical location specified by the primary determinates.

The first step in general delineation is to determine what the resultant least-cost specifications will be for a particular industry. The factors which determine these specifications can be identified by examining current and projected operational requirements in accord with theoretical considerations of transfer and processing costs.

TRANSFER COSTS

The economic spectrum of manufacturing consists of raw materials on one hand, and potential demand for finished goods on the other.[1]

---

[1] Holmes, op. cit., p. 4.

Plant location deals with this total spectrum and everything within; while transportation consists of a method by which the two extremities of the spectrum can be united. There are five principle modes of transportation available to manufacturing firms; rail, water, air, highway, and pipe line. The task of the location analyst is to establish transportation specifications based upon analysis of transit requirements and available facilities.

Transportation is considered as a major determinate of plant location in two ways--cost of service and type of service.[2] While transportation extends some influence in almost all locational factors, we are here concerned with it as an independent factor. Cost of service and type of service are both important determinates of transportation specifications. We will first consider the cost of service influence.[3]

Rate Influence on Location

The discussion of transportation rate influence on locational decision is traditionally presented in the following manner: "Other things being equal, how will transportation costs affect the location of an industry?"[4] This presentation assumes that processing cost factors, competitive factors and intangible factors are all negligible, and that the choice of location rests entirely upon transportation

---

[2] Greenhut, op. cit., p. 106.

[3] The point can be argued that type of service is in reality a cost factor since it may determine the actual amount of potential demand realized. For this discussion, type of service will be viewed as a factor which moves location away from the least-cost point.

[4] D. Phillip Locklin, Economics of Transportation (Chicago: Richard D. Irwin, Inc., 1947), p. 43.

considerations. While viewing the problem in such a vacuum is highly impractical, transportation specifications can be best illustrated using this assumed frame of reference.

Transfer costs stem from two essential forms of materials and product movements--accumulation and distribution. Accumulation costs consist of all expenses incurred to move raw materials from the point of extraction to the manufacturing plant. Distribution costs include all expenses necessary to move the finished product from the manufacturing plant to the consumer or retail outlet. As Hoover points out, the profit seeking firm will respond to both categories of transfer costs by seeking to reduce them.[5] Essentially, this reduction can be accomplished by locating the manufacturing plant either in close proximity to the raw materials, or in close proximity to the source of potential demand (market). Locating at a point which provides ready access to raw materials will lower accumulation costs. Likewise, close proximity to markets will lower distribution costs. To the extent that the consumer's market and the raw material supply are geographically separated, the locational problem is one of identifying the critical least-cost proximity.

To isolate the affect of transportation rates, we must first look at the foundations which determine rate structures. Basically, two forces are at work in the establishment of rates: (1) weight to be transferred, (2) distance to be covered.[6]

---

[5]Hoover, op. cit., p. 29.

[6]Weber, op. cit., p. 41.

The proposition that increased weight will increase freight rates is generally undisputed. This is not to infer that equal weights of various types of cargo will have equal rates. Rather, this means that increasing the weight of a specific product or raw material will normally increase freight costs.[7]

The distance to be covered influence upon freight rates refers to discrimination between long and short hauls. Long distance tariffs are usually constructed on the tapering principle.[8] While the total rate increases with distance, the rate charged per mile becomes less as the distance increases. Accordingly, a through rate between two points will be less than the sum of the rates to and from an intermediate point.[9]

Pursuing the certeris paribus assumption concerning other than transportation factors, the general principle is that any particular firm will tend to locate at a geographical point where aggregate outlays for transportation costs are minimized.[10] This point of least

---

[7] In some cases where other than "any-quantity" rates prevail, for example if rates on carload lots are lower than rates on less-than carload lots, it may be possible to increase weight without increasing costs. Furthermore, increased weight may decrease costs. See: Lockin, op. cit., p. 55.

[8] Ibid., p. 475.

[9] At this point, the granting of in-transit privileges will not be considered. It is sufficient to point out that this privilege can equalize the rates to and from an intermediate point with the through rates. See: Truman C. Bigham, and Merrill J. Roberts, Transportation (New York: McGraw-Hill Book Co., 1952), p. 25.

[10] Ibid., p. 22.

transfer costs will vary among different types of industry. But in all cases, it will represent the point where the peculiarities of any particular industry can be satisfied at least-cost within the scope of weight and distance rules noted above.

Because of the characteristic economy of long hauls, the ideal location for a production process using one material and serving one market will generally be at the source of the material or source of the market.[11] The weight factor will normally determine which is most economical. Consequently, most industries can be grouped into two categories: material orientated and market orientated. A third group of industries consists of "foot-loose" industries. These are industries, which because of the nature of their manufacturing process, find location at intermediate points most economical. Each of these three categories of industries are discussed in turn.

Material Orientated Industries

The locational influence of raw materials has held a prominent place in plant location literature. Greenhut attributes this emphasis primarily to the early history of industrial locations--prior to transportation advancements--and to the fact that water resources and power are often included in the term raw material.[12] For purposes of this discussion, raw materials are limited to organic materials included in the finished product. While in some industries, such as soft drink

---

[11] Hoover, op. cit., p. 31.

[12] Greenhut, op. cit., p. 113.

manufacturing, water is a primary ingredient; power and fuel are in all cases regarded as a processing cost.

Two basic types of industries are traditionally located in close proximity to the source of raw materials. Extractive industries, like mining and lumbering, can naturally only be conducted at the geographical point where the resources are located. Freight rates play an essential part in determining if the resources of a particular area will be developed. The profitableness of extracting the raw material is directly related to the cost of transporting the material to a profitable market.[13]

Normally, location of a plant to conduct extractive operations is dictated by availability of resources rather than economy of operation. Accordingly, extractive industries will not receive additional elaboration in this discussion.

Of primary concern is the second category of material orientated industries. This category consists of industries which employ materials that experience high-loss of weight during processing. Generally, these industries utilize a simple manufacturing process that employs low-valued, heavy or bulky raw materials.[14] Illustrations of weight losing industries are cotton ginning, lumber milling and beet sugar refining. For example, only about one-sixth of the weight of beets is represented by the sugar extracted.[15]

---

[13]Locklin, op. cit., p. 43.

[14]J. Russell Smith, and M. Ogden Phillips, Industrial and Commercial Geography (New York: Henry Holt and Company, 1950), p. 48.

[15]Hoover, op. cit., p. 35.

While generally it is true that industries utilizing weight-losing materials will tend to locate near the source of supply, this is not necessarily true of all industries utilizing heavy or bulky raw materials. If the manufacturing process is not weight reducing, locational proximity depends upon comparative transportation rates between raw materials and finished products.

One additional category of manufacturing that has been traditionally materials orientated is the canning and preserving industry. While transportation costs are a major consideration, the prime stimulus in this case is perishability. A modern example of an industry orientated by perishableness is found by examining the extensive development of orange juice freezing facilities on the same acreage utilized by the orchards.

In summary, transportation forces which influence manufacturing operations to locate in close proximity to raw materials are: (1) the raw material loses weight in conversion to finished products, (2) the transportation rate on raw materials is equal to, or greater than, the rate on the finished product. Processing crude bulky materials normally involves a large amount of waste weight; accordingly, it is generally most economical to remove the weight prior to transporting the crude material.[16] While historically proximity to raw materials was a primary force in plant location, transportation advancements have caused this influence to decline.

---

[16] Greenhut, op. cit., p. 114.

Market Orientated Industries

Industrial orientation to raw materials was determined to be the result of weight-loss in processing and/or higher transfer costs for raw materials than finished products. In the case of market orientated industries, the reverse is true. Desirable proximity to markets is normally based on weight gained and/or upon higher transfer costs on products than upon materials. While considerable other factors cast influence toward locating in close proximity to the market,[17] in this discussion we are concerned only with the influence of transportation costs. The prime example of weight gained in processing is found in industries which utilize ubiquitous materials. An ubiquitous material is one which is obtainable almost everywhere at costs so nearly the same that it does not enter into the location problem.[18] The manufacturer of beverages, utilizing water as a major ingredient, is a prime example of an industry orientated to the market because of inclusion of an ubiquitous material. Inclusion of a raw material which is ubiquitous will not limit the firm in choice of geographical location. The primary influence is to increase the weight--hence the transportation rate, if the product is to be distributed over a substantial market area.

While the weight increase factor and its resultant effect upon

---

[17] Other forces influencing market orientation are: (1) perishable finished products, (2) volatile demand, (3) necessity for close contact with customers for maintenance or other reasons.

[18] Hoover, op. cit., p. 35.

transportation costs influences market orientation, the primary market pull is found in comparative freight rates. Normally, the transfer rates on finished products are higher than those on raw materials.[19]

The reasons for this increased tariff are numerous. As raw materials pass through the various processing stages, they continuously approach the physical product package which will be offered the consumer. During this process, they become progressively more fragile, harder to handle, and basically more differentiated. In addition, customer demands are normally received in numerically small product lots, each of which require prompt delivery service. Consequently, as these additional demands are placed upon the transportation system, rates are adjusted accordingly. Assembly plants normally are located in close proximity to the market because of this rate increase factor. Transportation on the parts is generally less expensive than the finished product.

In summary, the transportation costs which influence location, in respect to market proximity are: (1) The raw material gains weight during processing, (2) The transportation rate on finished products is greater than raw materials. Thus far, we have dealt with industries orientated to the extremes of the locational spectrum. While orientation to raw materials or markets may influence some industries, other concerns find intermediate locations desirable. What then are some influences which cause firms to locate between extremities?

---

[19] Locklin, op. cit., p. 47.

Location at Intermediate Points

The preceding discussion of circumstances which cause industries to locate near the source of materials or at the market, is based upon the assumption that freight charges for a through movement are less than the charges to and from an intermediate point. While it is normally true that intermediate locations are more expensive transportation wise, there are some notable exceptions.

Probably the best known exception to the general rule is the granting of in-transit privileges by the transport companies. In-transit privileges most widely utilized are milling and fabrication. In both cases, the raw material can be shipped to a process point, processed, and shipped to the final destination at a combined rate applicable to the normal through rates between the point of origin and the final point of destination.[20] Utilization of this artificial removal of the dis-economy of short hauls is particularly influential when the pull of the materials, and the pull of the market are otherwise almost equal. Examples of the rise of in-transit privileges can be readily found in the grain and steel industries. Disregarding rehandling costs as primary influences, the effect of in-transit privileges is to give the firm considerable more freedom in selecting their plant sites. The general effect of in-transit privileges is to promote the dispersion of industry.[21] A firm can locate at an intermediate point almost

---

[20] Ibid., p. 55.

[21] Bigham and Roberts, op. cit., p. 25.

as profitably as in close proximity to raw materials or markets.

Intermediate location can also stem from the use of transshipment points. A transshipment point is usually found where two different mediums of transportation meet.[22] Location at transshipment points can be highly beneficial to industries utilizing bulky raw materials and realizing final products which normally accrue high transit costs. In cases such as these, location at the junction point of water and rail facilities can greatly reduce the aggregate transportation costs. Water facilities represent the cheapest ton-mile method of transportation and can be used for transporting the bulky raw material.[23] Processing can then take place during the re-handling operation. This has the net effect of reducing unnecessary re-handling cost. Location at such a junction point means that raw materials will use only water transportation and that finished products can use the cheapest satisfactory means of reaching the market. The importance of Pittsburgh and Youngstown as steel making centers can be attributed to large extent to the availability of water transportation facilities.

Additional factors which pull toward location at intermediate points result from the need to utilize several raw materials or serve several different markets. A firm which utilizes various raw materials in processing can usually realize lowest transportation costs by locating at collection centers. A collection center is viewed as a

---

[22] Hoover, op. cit., p. 39.

[23] Greenhut, op. cit., p. 110.

location which has minimum aggregate accumulation costs for various raw materials. On the other hand, a distribution center is a location which has minimum distribution costs to various markets. When one material or one market cannot be identified as the primary factor to consider in transportation costs, compromise locations at intermediate least-cost points may be the only alternative.

From purely a transportation point of view, we have seen that industries will locate according to least aggregate costs in proximity to raw materials, markets, or at intermediate points. Still pursuing our assumption of certeris paribus, concerning other than transportation factors, what influences will tend to disrupt this least-cost pattern?

Distorting Influences

Within the basic framework of transportation influences upon location, several factors operated to disrupt location at the ideal least-cost point.

The basic and most influential factor is the availability of transportation facilities. Extensive industrial development of northeastern United States can be contributed to this factor. No point within this region is farther than ten miles from a railroad.[24] The influence of topography and its resultant effect upon transportation facilities cannot be overemphasized. Waterways are restricted to rivers, valleys, lakes, bays, and relatively level areas where canals can be

---

[24] Locklin, op. cit., p. 49.

constructed.[25] Other natural barriers influence the various modes of transportation substantially. The location analyst must be satisfied to reduce his tug of war between materials and markets to a location compromise along the current configuration of transfer routes.

Rate discrimination and geographic price discrimination will also modify location decisions. Utilization of base point pricing, f.o.b. pricing, or uniform blanket transfer rates can completely distort the basic influences of transportation rates noted above. While detailed discussion of the discriminatory factor is beyond the scope of this paper, this influence cannot be overlooked. Rate policies of the various carriers can greatly influence the location of industries. While rates are subject to regulation, the point must constantly be kept in mind that effective rates are set by the carrier. Close proximity to facilities does not necessarily mean lowest rates. Another point of interest is the fact that published rates do not necessarily represent the rate at which actual freight moves. It is to the advantage of the location analyst to make a detailed study of movement rates for his particular industry rather than to accept paper rates per se.

As noted earlier, transportation affects plant location in two ways--cost of service and type of service. Thus far, we have been concerned with cost of service. Type of service can also influence location. The extreme service restriction is found in perishable products such as ice cream and bakery goods. Such perishable goods

---

[25] Yaseen, op. cit., p. 13.

demand speedy movement regardless of cost structures. Discussion of service influences is dealt with in Chapter V in reference to demand requirements. At this point, it is sufficient to note that demand requirements can greatly distort location within the transportation spectrum.

Thus far, we have looked at one side of least-cost analysis--transportation. By detailed examination of transportation requirements of his particular industry, the location analyst can determine what transportation specifications are necessary for the new location. The next step is to view these specifications in light of process cost requirements.

CHAPTER IV

GENERAL DELINEATION -- PROCESSING COST FACTORS

In the preceding chapter, we considered the transportation aspects of cost analysis. We now turn our attention to the influence of processing costs. These costs consist of all expenses necessary to convert the raw materials into finished products. While the potential list of processing cost is unlimited, this discussion is concerned only with three primary categories: (1) rent, (2) labor, (3) power and fuel. The costs of raw materials is determined to be exclusive of processing cost--relevant only to the area of transportation cost factors.

Geographical difference in processing cost can be directly traced to forces of immobility. To the extent that any factor necessary for production is mobile, it will tend to move to the geographical area of highest reward. As Hoover points out:[1]

> The price of a freely mobile factor would be the same everywhere and would not affect the location of production or other factors at all.

Consequently, throughout this discussion, we are concerned with the mobility of the various processing costs noted. From the viewpoint of processing cost analysis, the most economic location is one which combines the cheapest critical immobile factors with the necessary array of inexpensive mobile factors.

---

[1] Hoover, op. cit., p. 69.

RENT

Rent is viewed in broad perspective to include the following cost factors: land, taxes, and capital.

Land Costs

Land prices between various regions represent the widest cost differentials. These cost differentials result from the immobile characteristics of land, and the wide variation in the natural endowment of sites.[2]

Variations in costs of specific sites stem primarily from the scarcity principle. The general rule is that the more intensive the land use, the higher will be the cost. Normally, the cost of the land will reduce as distance increases from the city center toward the peripheral. While the cost of land rent within the city may be so high as to preclude location, the city usually offers certain economies that will offset this increased expense.[3] Among these advantages are better transit services and a more flexible labor market. The entrepreneur can normally afford to pay varying rents for different sites according to their economic advantages.

For any manufacturer, there are basically two classes of potential plant sites. First, lots with existing construction which can be purchased or rented, availing the firm of a ready constructed plant. While vacant plants are found in abundance, their adaptability may be

---

[2] Ibid., p. 70.

[3] Greenhut, op. cit., p. 126.

limited. The average life of a real estate improvement is estimated in excess of 60 years.[4] Because of this extreme durability, the inventory of real estate accumulates rather than turning over. The resultant of this durable quality is a standing stock of plant facilities which have limited adaptability to the desires of individual tenants.

The second alternative is to purchase vacant land for construction purposes. Construction normally requires a substantial capital outlay which tends to bind the location decision of the firm, making their total operation less mobile. Whether to rent or buy is primarily a question to be considered in light of individual objectives. While both have inherent advantages and disadvantages, both are influenced by the intensity principle noted above.

The final site selected will be, of course, that one parcel of land delineated from the complete locational process. In essence, this is the apex of the location problem. While the objective is to pick a site which minimizes total cost, the location analyst must realize that land in itself is an independent cost factor. These basic considerations were pointed out to emphasize this independent influence.

Tax Costs

The influence of tax cost on location decisions is elusive, to say the least. Common knowledge dictates that a firm will attempt to locate at the point of least aggregate tax cost. It also follows that

---

[4] Ernest M. Fisher, and Robert M. Fisher, Urban Real Estate (New York: Henry Holt and Company, 1954), p. 162.

the 48 bodies of state tax laws, not to mention uncounted community ordinances, will render distinctively different tax assessments in various geographical areas. Yet, numerous empirical studies point out that tax costs are, at best, relatively unimportant secondary influences in location. Greenhut reviews four studies which all agreed that the incentives offered by lower taxes were not the determining factors in locating industries.[5] The locational influence attributed to taxes was concluded to be of primary concern only in selecting between various sites within a particular search area. In summary, Greenhut noted:[6]

> Given the governing factor, the tax incentive may induce a specific location within the area defined by the basic factor. If the location offering tax incentives is not within the area set by the governing factor, it is simply not considered.

Additional support is given to this conclusion by a study completed by Stolper concerning the influence of taxes on plants locating in Michigan.[7] He concluded that taxes rank far down the list of factors influential in location decisions.

These observations also agree with the study of taxation effects on industrial location completed by Floyd.[8] In discussing the theory

---

[5]Greenhut, op. cit., pp. 137-39.

[6]Ibid., p. 139.

[7]Study completed by Wolfgang F. Stolper for the Michigan Legislature as reported in The Lansing State Journal, June 11, 1958.

[8]Joe Summers Floyd, Jr., Effects of Taxation on Industrial Location (Chapel Hill: The University of North Carolina Press, 1952).

that higher-than-average industrial taxes in a community will restrict its industrial growth, he concluded:[9]

> It is evident that in many instances tax considerations do not influence the locational choices of manufacturing firms. . . . tax conditions may influence the locational choices of manufacturing companies which have a number of alternative sites situated in different taxing jurisdictions.

Consequently, taxes are viewed as secondary influences in plant location decisions. Few industries will relocate primarily because of high taxes. Taxes may play a role in the decision to relocate, but it will be the combined role of these and other high costs that cast the influence. Tax costs will be especially influential when political boundaries, such as state lines, separate the communities under consideration.

Capital Costs

Capital is, beyond doubt, an indispensable factor in development of manufacturing, but this does not mean that the manufacturer must be geographically near the source of funds. Capital is the most mobile of the factors relevant to location.

The major significance of capital rests upon availability and rent. In order for a business to proliferate, it must have ready access to capital at an interest rate which permits competitive pricing. Neither of these two requirements are directly related to location. Availability is directly connected to the financial status of the firm requesting loans, and the character of executives employed by the firm.

---

[9] Ibid., p. 23.

The price of capital is a direct result of the money market, although this too may depend upon the intrinsic character of the firm.

Historically, capital has been an influential factor in location.[10] Today, financial requirements are rarely, if ever, critical determinants. This decline of influence is directly attributed to the rise in mobility of capital funds.

LABOR

The locational influence of labor affects various manufacturing firms in different ways. These variations tend to pull the location of particular industries toward the geographical point which will best satisfy individual requirements. While the accumulative influence of labor upon location is hard to measure, Yaseen considered this influence significant enough to state: ". . . labor for some companies is the greatest single influence motivating plant relocation."[11]

While there are great variations in labor requirements of different manufacturing industries, there are a number of firms which are attracted by the presence of cheap labor. Traditionally, wage levels in the United States have been considered to be lowest in southern states. Accordingly, many firms which operate on low profit margins locate in the South to take advantage of large numbers of low wage unskilled workers.

---

[10]For a brief review of the historical influence of capital on plant location, see J. Russell Smith, and Odgen M. Phillips, Industrial and Commercial Geography (New York: Henry Holt and Company, 1946), pp. 51-52.

[11]Yaseen, op. cit., p. 50.

Wages paid are beyond doubt important determinants of location, but only one aspect of labor cost influence. From the viewpoint of the employer, additional costs stem from productivity, skill requirements, stability, and labor legislation.

Productivity, or rather the lack of productivity, can represent a considerable cost factor for the manufacturing firm. Location advantages of an area which offers low wage labor may be offset by low productivity rates. Hoover points out that high wage rates do not necessarily attract job seekers or repel employers.[12] Low processing costs can be found in areas with relatively high wage rates. The essential concern for the manufacturer is the productivity of labor and labor's response to maintaining low overhead costs. Hot climates are normally considered to be the areas of low productivity.[13] While this statement has not been completely substantiated, to the extent this is true, the low wage advantages of the South may be offset by decreased productivity.

Firms which require highly skilled labor normally orientate in close proximity to the areas which offer the required skills. When other critical factors force manufacturers to move from areas of skilled labor, this loss can normally be offset by bringing skilled operators to train the local unskilled labor force. Such procedure was followed by shoe manufacturers when they first located their processing facilities in St. Louis.[14] It is possible to offset the lack of skilled

---

[12]Hoover, op. cit., p. 103.

[13]Yaseen, op. cit., p. 121.

[14]Smith and Phillips, op. cit., p. 51.

workers, but this is a costly and time consuming procedure.

Regardless of the planning and analysis taken prior to locating in a particular area, low labor costs will not be realized if the local labor force proves unstable. Turnover is an expensive proposition for the employer. Re-training expenses and loss of productivity are cost factors which can not be recovered. One measure of the stability of labor in a given community is the degree of labor organization. Highly organized unions, while possibly undesirable for other reasons, usually mean relatively fewer work stoppages. When highly organized, the fundamental questions of union organization have been settled. Examples of this can be found by comparing the wave of strikes experienced in 1946, with the labor situation in 1958. The year 1946 saw 928,000,000 man hours lost in one year alone.[15] 1958 has experienced continued workage in numerous industries despite expiration of labor contracts. Although this agreement to continue work is undoubtedly influenced by the general economic conditions, such an agreement could not be realized if the unions involved were not highly established.

Another factor which can influence labor costs between different geographical areas is labor laws. Virtually all industries are subject to state labor laws. Workman's Compensation Insurance rates normally are applied against payrolls at rates varying substantially between states. While not a limiting factor to some firms, compensation charges can represent a substantial cost to the manufacturer with a large work force.

---

[15] Yaseen, op. cit., p. 75.

The size of the labor force required can also directly influence the locational possibilities for some industries. Those manufacturers who require large work forces normally are restricted to more populated areas. In any community, the available supply of labor comes from all workers unemployed. The potential supply of labor represents all persons over 14 years of age who are not currently in the labor force.[16] Migration can substantially alter the supply of labor available in any particular community. Response of labor to geographical differences is often restricted, due to the lack of resources to finance movement.[17] While the mobility of labor may be somewhat "sticky," migration can materially affect the local labor supply in times of increased demand.

POWER AND FUEL

Historically, the location of power resources has been an outstanding factor in the selection of plant sites. But, power, like capital and labor, has gained mobility throughout the years. To the early industries, the most attractive sites were located at the fall lines of navigable streams. At this point, water could be harnessed to turn power wheels with minimum difficulty.

Technological developments have greatly altered the locational influence of power and fuel. Locklin adequately summarized this development:[18]

---

[16] Ibid., p. 41.

[17] Hoover, op. cit., p. 107.

[18] Smith and Phillips, op. cit., p. 54.

> . . . every reduction in the cost of production of coal, petroleum, and natural gas, and every cheapening of their transportation from the producing field to the power plant, every increase in the efficiency of steam and hydro-electric generating plants, every improvement in transmission technique and every extension of inner-connection among electric power systems tends to increase the availability of power to man.

While some plants are attracted by the availability of cheap and abundant power and fuel, the cost of power as a percentage of total delivered-to-customer cost in most industries, is not significant.[19] Wood pulp mills and aluminum reduction plants are examples of firms attracted to water-power sites. Natural gas, in the production of glass, and accessibility to coal and coke in steel production, are other examples of power and fuel orientated industries.

Due to increased mobility of power and fuel, the average industry will not locate plants solely because of power differential. Some particular processes take exception to this general rule. A few exceptions were noted above.

CONCLUSION -- COST ANALYSIS

Chapters III and IV have presented factors to be considered during the least-cost analysis phase of general delineation. Chapter III considered transportation cost factors. This chapter has considered processing cost factors. The combined influence of transit and process factors presents specifications for location based purely upon least-cost analysis. The job of the location analyst is to make a microscopic

---

[19] Yaseen, op. cit., p. 79.

evaluation of the objectives and requirements of his particular firm's operation. The cost structure presented in these two chapters provides a framework to complete this analysis. Critical cost factors should be isolated and the influence of secondary factors elaborated. At this point in the process of plant location, specifications should be established by method of least-cost compromise. The job remains to consider these least-cost specifications in perspective of modifying competitive and intangible location factors. Chapter V presents the framework for consideration of these additional factors.

CHAPTER V

GENERAL DELINEATION -- COMPETITIVE AND INTANGIBLE FACTORS

The problem of selecting a plant site requires broader consideration than simply least-cost analysis. An executive must consider influences of competition and intangible factors upon specifications utilized to guide the process of specific delineation. This chapter discusses these considerations.

COMPETITIVE FACTORS

The competitive influences upon location consist of demand requirements and forces of agglomeration. Demand requirements refer to adjustments in least-cost location which are necessary to satisfy consumer preferences. These adjustments usually require location in close proximity to potential demand which in turn has the net influence of dispersing producers over larger geographical areas. Agglomerative forces influence firms to cluster in selected geographic areas in order to realize benefits of spatial interdependence.[1] Thus, competitive forces can influence location toward dispersion or clustering. The influence which will be most dominant depends upon product characteristics of individual firms and their respective competitive requirements.

Demand Influence in General Locational Theory

Prior to examining the influence of demand requirements upon

---

[1] Weber, op. cit., p. 134.

least-cost location, a brief summary of demand influence in general locational theory appears appropriate.

The influence of consumer demand upon location is usually presented by making assumptions of undifferentiated products, equal geographical distribution of consumers, identical process costs, equal transportation rates and identical consumer preference, etc.[2] Under these assumed conditions, demand influences upon location result from the lowest delivered price. Each consumer will sell out in all directions to a point where he can sell as cheap, but no cheaper, than competitors.[3] In pure monopoly situations, the market served will take the form of a circle, the circumference of which is limited by elasticity of demand. In cases of pure competition, additional producers will move in to realize potential demand in areas not included in market circles, compressing the market of any particular firm into a hexagon.[4] This hexagon market structure results from each new firm selling out to a point where he can sell as cheap, but no cheaper, than competitors.

Another method of examining the influence of demand upon location is presented by assuming a linear market for purposes of simplicity. The assumptions noted earlier concerning market conditions are also made in the analysis. The influence of demand upon location is then determined by examining the resultant market divisions that occur as

---

[2] John A. Howard, Marketing Management (Homewood: Richard D. Irwin, Inc., 1957), p. 390, and Greenhut, op. cit., p. 141.

[3] Howard, op. cit., p. 388.

[4] Ibid., p. 390.

additional producers are added to the market area.[5]

While both of these approaches contribute to an understanding of the general development of economic activity, they are not directly related to the current objective. In applicational theory, the perspective is one of the individual firm. In consideration of demand requirements, we are concerned with additional forces which modify least-cost location.

Demand Requirements in Applicational Theory

In Chapter III, we examined the relationship of transportation upon location, and determined that some industries would be market orientated as a result of transportation costs. Here we are concerned with additional forces which result in market orientation.

For any particular firm, least-cost location represents the starting point. This ideal cost location will not be modified unless increased revenue will more than offset increased costs. Consequently, the locational influences of close proximity to demand are viewed as revenue-increasing factors. Each firm will attempt to find a location that will allow profit maximization. This will be the site which offers highest spread between cost and revenue. For small firms, this may mean locating in an area where a segment of demand can be serviced with required convenience. For large firms, adjustment to demand requirement may mean location of branch plants in some industries, and warehouses in others.

---

[5]For a linear development of demand influences upon location decisions, see Greenhut, op. cit., Chapter VI.

The most extreme influence for location in close proximity to demand is found in industries which manufacture perishable products. Regardless of cost structures, success of firms dealing in perishable products is directly related to their ability to reach the customer prior to deterioration. The ice cream and bakery industries are two examples of orientation in close proximity to demand. In both cases, finished products are more perishable than the raw ingredients utilized in production. Consequently, both industries conform to population density.[6]

Producers who are forced with extremely volatile consumer demand may also be forced to locate in close proximity to markets in order to rapidly replace depleted inventories.[7] If customers buy in small lots and are somewhat unpredictable in purchase habits, producers must be in a position to adjust to market trends in both style and quantity.

A third class of industries orientated to markets for competitive reasons are those manufacturers who do service work for other industries. Close proximity is often necessary in order to assure minimum time delays in breakdown and change-over requirements. This close proximity means sales because it is a cost-reducing factor for the industries served. As Holmes points out:[8]

---

[6]Hoover, op. cit., p. 38.

[7]Greenhut, op. cit., p. 164.

[8]Holmes, op. cit., p. 18.

> When service is of such importance, the manufacturer who deliberately moves away from his market in quest of cheaper rent, cheaper labor, cheaper power or lower taxes only invites a competitor to take the place he leaves, and his business.

The modifying influence of demand requirements is to orientate location in terms of sales as well as transfer and processing costs. Location in order to assure increased revenue can be a major influence for some industries in site selection. This influence is particularly important in locational requirements of firms which sell to a limited or highly concentrated market.

Agglomerative Locational Influences

Agglomerative forces refer to advantages of location gained from spatial interdependence. These incentives result from cost-reductions realized from economies of concentration. For a particular firm, this cost reduction can be direct or indirect. Direct influences reduce the major cost factors of the firm. This reduction can result from concentration of individual facilities or from benefits of linkage with other industries. Indirect cost reductions stem from other benefits realized from location in close proximity to an industrial population.

Direct cost reductions of agglomerative forces are normally considered in evaluation of transfer and process cost factors. Examples of linkage benefits are: (1) reductions in transfer costs resulting from better facilities developed because of high frequency utilization, (2) reductions in process costs because of a ready supply of technically trained labor, (3) lower interest rates resulting from availability of industrial capital. Examples of individual benefits of concentration are: (1) better control, (2) specialization, (3) less massing of

reserves, (4) reduction in unit price of materials, supplies, and services when purchased in large quantities.[9] The resultant cost reductions of linkage and individual concentration are major considerations of least-cost analysis. Additional attention will not be given to these factors at this point.

The indirect cost reductions of agglomeration are not as easily quantified. Greenhut refers to this category of influences as a group of generally neglected locational forces. He goes on to say:[10]

> The cost-reducing factor is distinguishable from the cost factor in that it emphasizes the relationship between physical distance and costs other than in terms of transportation costs and labor costs.

The main distinction between direct and indirect agglomerative influences stem from reduced quantities and better service.

Insurance is an example of a cost factor reduced by locating in an industrial community. A particular type of insurance may be available because of better protection, or familiarity of an insurance company concerning hazards involved. While the cost of the insurance is a direct cost, the reduction in units needed as a result of excellent protection represents the influence of indirect agglomerative factors.[11]

Advertising costs can also be reduced by location in highly populated areas. Lower expenses will be incurred to achieve equal promotional coverage.

---

[9] Hoover, op. cit., p. 80.

[10] Greenhut, op. cit., p. 163.

[11] Ibid., p. 169.

A second class of indirect cost-reducing influences stem from the availability of service industries. As pointed out in consideration of demand requirements, location in close proximity for service units means sales. For the manufacturer, locational proximity means reduced costs, resulting from prompt service in time of change-over or break down.

The combined influence of both direct and indirect agglomerative forces result in geographical clustering. Individual firms attempt to locate in close proximity to other industries to receive mutual benefits of spatial concentration, and will attempt to centralize individual production in order to realize economies of operation.

In summary, competitive influences modify least-cost locations in two ways. First, demand requirements force some industries to locate in close proximity to markets in order to assure adequate revenues. The necessity to consider sales in locations selection results in geographical dispersion of industries. Secondly, agglomerative forces influence firms to locate production at a few geographical locations in order to achieve economies of concentration. These benefits can result from individual economies of operation or from linkage with other industries. The influence which will be most dominant in any firm's locational specifications depends upon product characteristics and competitive requirements.

INTANGIBLE FACTORS

Additional forces which must be taken into consideration in establishment of location specifications are intangible influences.

Intangible factors can be grouped into two categories for consideration. Cost-revenue influencing factors represent those intangible factors which result from personal contacts of company executives. The second group of intangible influences refers to purely personal considerations in site selection.

Cost-Revenue Factors

Industrial location can be altered in order to take advantage of personal contacts and influences of the entrepreneur. These influences can have a direct result upon availability of materials, capital, and sales.

The availability of capital can be related to the personal friendship and confidence that exist between the entrepreneur and banker. Special requests for rush materials or spare parts, in order to eliminate bottlenecks in production facilities, may be considered more urgent if friendly relations exist. Last of all, additional sales can be realized by community contacts of company executives.

All of these intangible factors influence the cost-revenue structure of the particular firm. Without this aspect of personal consideration, locational forces are impersonal resultants of cost and competitive factors. With this personal influence considered, least-cost locations may be altered to increase revenues or to insure reduced costs. Obviously, this influence is more paramount to the small manufacturing firms.

Purely Personal Factors

Purely personal influences upon selection of a plant site result from the human needs and desires of a firm considering relocation. A

particular community may be selected because it offers desirable types of recreational, housing, or cultural facilities. A particular region may be selected because it offers a desirable climate for enjoyable living.

The net effect of intangible considerations is to normally alter the selection of ideal least-cost and competitive location. The range of freedom available in selection of sites to fit intangible specifications is somewhat narrow. For any particular firm, these factors may only be primary in selection of the most desirable community.

CONCLUSION -- GENERAL DELINEATION

Chapters III, IV, and V have discussed three categories of factors that should be considered by executives prior to making a geographical search for plant locations. Transportation costs and processing costs were presented as the critical influences of determining least-cost location. Competitive and intangible considerations were discussed as factors which may modify least-cost location for any particular firm. These three groups of locational influences have not been discussed in sufficient detail to reveal all locational implications. What has been presented is a methodological framework for conducting a critical analysis of individual locational requirements. The individual concerned with location should examine his own requirements in respect to each of these categories. Critical cost factors should be isolated and modified with respect to competitive and intangible forces. At this point in the selection process, general specifications to evaluate various alternatives resulting from site search should be formulated.

CHAPTER VI

IMPLEMENTATION OF APPLICATIONAL THEORY

The general delineation phase of applicational theory has suggested a procedural framework for identifying critical factors in plant location problems. Microscopic analysis of current and projected operational requirements provides information necessary to formulate location specifications. These specifications guide the remainder of the deductive process of establishing plant location.

The first part of this chapter comments upon a procedural framework for selecting the specific site. This framework represents the specific delineation phase of applicational theory. The second part of the chapter presents one method of implementing applicational theory. Attention is directed to the selection procedure utilized by the Fantus Factory Locating Service. Throughout this paper, emphasis has been placed upon development of a theoretical framework for executive decision making. The Fantus example provides some insight concerning the relevancy of this procedural model.

SPECIFIC DELINEATION

Specific delineation consists of three steps necessary to reduce the geographical area of concern to a specific site. Evaluation of location alternatives is made at the regional, community, and site levels of consideration. The specific delineation procedure is not viewed as a limiting process. Selection of the best community need not be made prior to conducting a search for satisfactory sites.

Several search areas can simultaneously be considered, including their alternative communities and sites.

Individual state factors are not considered as focal points of attention. Beyond doubt, some states offer advantages for location while others have distinct disadvantages. The potential geographical territory included in a search area is indifferent to political boundaries. Consequently, several different states may simultaneously be considered as locational prospects. The desirability of locating in any particular state is considered during evaluation of alternative communities.

Regional Delineation

The first step in reducing a potential geographical area to a specific site is regional delineation. The task at this stage of selection is to determine what areas qualify for field examination.

The total area under consideration will vary according to the specifications of individual firms. In cases where cheap labor is the primary locational influence, regional examination may be limited to Southern States. If proximity to markets is a prime requirement, regional possibilities will be in the general local of major market areas. Extreme competitive or intangible influence may limit the regional areas to a few in number. Whatever the total area, the first step in regional delineation is to identify which parts of the area will meet the broad requirements of location specifications.

The second step is to determine which of the alternative regions will be most economical for achieving locational objectives. Consideration begins with the assumption that all costs are regionally

variable.[1] Each potential region is evaluated by examining the expense of satisfying locational requirements. The differential in cost between alternative regions will vary with particular industries. As Yaseen points out:[2]

> In many industries a differential of as much as 10% of total manufacturing and distribution costs can be effected simply by virtue of geography.

For other industries, the cost differential between regions may be negligible.

For any particular firm, regional delineation will identify geographical areas which will satisfy locational requirements at least-cost. The regions which present possibilities for most economic operation become the search areas for particular communities.

Community Delineation

Up to this point, the executive concerned with relocation has, by process of elimination, selected a few general areas within which he must identify the one community which satisfies his requirements. Reliable sources indicate that the typical investigation bogs down at this point.[3]

Faced with selection of a community, the location analyst should focus his attention on the availability of necessary facilities. The requirements of the firm must be matched against the facilities of the

---

[1] Yaseen, op. cit., p. 5.

[2] Ibid.

[3] Ibid., p. 132.

cities. Such factors as availability of necessary utilities, adequate labor force, and necessary transportation facilities must be examined. If a particular community appears to have the necessary factors, a more detailed investigation is undertaken.

Detailed investigation consists of measuring all facilities in terms of potential costs of manufacturing. If all facilities are available at a reasonable cost, investigation is extended to include intangible characteristics of the community.

The character of local city politics and the community's attitude toward industrial development must be considered. Of primary concern is the question of compatibility between the firm and the community. For example: Will our proposed building and manufacturing operations meet with the approval of the community? Not understanding all implications of such intangible factors can result in a serious and expensive mistake on the part of the firm. The firm must also consider if the community fulfills the environmental desires of the firm's personnel which are to be transferred. Living conditions must be examined in terms of such factors as recreational facilities, cost of living, and adequate housing. If the community offers incentives, complete details should be examined.

Analysis of these and all other factors of importance will point out which communities are the best potential sources for conducting manufacturing operations. Evaluation of potential sites still remains.

Site Delineation

Evaluation of available sites represents the last step in the specific delineation process. Only if the community meets all other

requirements will the search be necessary. Selection of a site to construct a new plant can normally be successfully completed in all industrial minded communities. In locational problems where a ready constructed plant is sought, evaluation of sites may be necessary prior to community delineation.

In selecting a site, attention must once again be directed toward cost analysis and consideration of intangible requirements. In addition, physical requirements and topographic features must be considered. Naturally, the direct cost of procurement is the primary governing factor. Other costs such as obtaining rail sidings, utility hook-ups, and highway access also require evaluation. From the intangible aspect, the firm must determine if the neighborhood is consistent with the desired image of the firm. For some firms, location in close proximity with "linked" industries may be desirable. If a particular type of labor force is utilized, it may be necessary to locate close to the residential areas of these workers. Unskilled and women workers usually depend upon public transit systems for transportation to and from work.[4]

Only after satisfactory plant sites have been determined is the total delineation process completed. At this point, the firm's executives are armed with the necessary facts to make an intelligent location decision. Sufficient information should be available to determine which area, what community, and the site which will be most satisfactory for relocation.

---

[4] Holmes, op. cit., p. 249.

FANTUS FACTORY LOCATING SERVICE PROCEDURE

Applicational theory has presented a procedural framework to guide the deductive process of plant location. Our concern was directed at stages of delineation rather than details of implementation. The remainder of this chapter presents one method of implementation--that utilized by the Fantus Factory Locating Service (FFLS).[5]

For 35 years, FFLS has specialized exclusively in the economics and engineering of locational problems. Founded in 1929 by Mr. Fantus, FFLS has participated in over 1500 locational decisions. The realm of activities undertaken includes plant, warehouse, and office location consulting, plus individual community and utility promotional consulting. Among the clients who have received the service of FFLS are found such prominent names as Westinghouse, Admiral, Borg-Warner, Continental Can, Fairchild, and many other successful corporations.

The locational procedure utilized by FFLS was developed in 1933 by Leonard Yaseen, senior partner and managing director of the New York office. Formally labeled, "Standards of Industrial Analysis," this procedure consists of four steps: (1) analysis of present facilities, (2) territorial delineation, (3) comparative analysis of finally selected communities, (4) final cost comparisons. Each of these steps and the specific methods of analysis used will be discussed.[6]

---

[5] The information reported on the following pages was obtained by personal interview with Ronald M. Reifler, Plant Consultant for Fantus Factory Locating Service, Chicago, June 20, 1958, and from promotional literature distributed by Fantus Factory Locating Service.

[6] Appendix A presents the analysis outline utilized by Fantus Factory Locating Service.

Analysis of Present Facilities

Identification of needs and requirements of the client is the first and most paramount problem in selecting a new location. The purpose of this extensive analysis is twofold. First, factors pertinent to locational problems must be identified prior to conducting a locational search. Second, every attempt must be made to understand the viewpoint of executives concerning locational desires.

In order to identify critical locational factors, FFLS asks the company to fill out an extensive questionnaire concerning the present and planned operations. The degree to which FFLS participates in answering the questionnaire varies with companies. Ideally, the entire analysis is completed by the firm under the guidance of a FFLS representative.

This analysis, first of all, presents a brief historical outline of product lines, company growth record, and principle reasons for considering geographical realignment of production facilities. Market information is requested regarding major areas serviced, shipping particulars, warehouse locations, terms of sale, competitor's locations, and speed necessary in reaching the market. Principle raw materials are outlined in terms of source, quantity, and method of shipment. Other information includes inbound and outbound freight costs, required labor skills, wage rate structure, taxes, and utility costs. Detailed information concerning the physical outlay of present facilities and requirements for the potential location are also requested. All of this information is presented in relative dollar amounts as experienced

at the firm's present location.[7] This outline of current costs provides a measurement to determine if relocation is really necessary.

Viewpoints of company executives are obtained by requesting information concerning preference of geographical area, size of community, and type of community co-operation required. In cases where management's opinion concerning certain intangibles of location is not clearly defined, FFLS may use an elimination procedure for selecting among alternatives. By groups of threes, various alternatives are presented to management to consider and choose between. By process of elimination FFLS is able to determine which intangible location factors are considered as most important by each of their clients. This information is then used to guide the selection of a location that will be compatible with the desires of the firm.

Territorial Delineation

The information provided from present facility analysis allows FFLS to begin their search. The factors determined as critical guide the remainder of the selection process. In cooperation with other members of FFLS, the representative leading the investigation evaluates all factors pertinent to the client's locational requirements.

The center of the market is charted to determine geographic location, percentage of distribution to each area, and comparative freight rates. Sources of raw materials are plotted in order to determine center of accessibility. FFLS keeps data files on all communities

---

[7] Yaseen presents an outline used for computing this cost analysis in his text. See Yaseen, op. cit., pp. 10-11.

over 2000 population in the United States. Each of the communities in potential search areas is evaluated in reference to the firm's requirements. This process of focussing all FFLS resources on the problem at hand allows those areas which qualify for field investigation to be isolated.

Comparative Analysis of Finally Selected Communities

Field investigation is undertaken in all communities which appear to have the necessary locational qualifications. FFLS representatives evaluate and chart every facet of each community's economic and social life.

All records are examined to determine availability of transportation facilities, current industrial development, available labor supply, utility and sewer systems. Personal conferences are conducted with city representatives concerning the community's attitude toward industrial development. Complete information is obtained concerning municipal services, tax structure, available housing, living conditions, banks, climate, and possible community inducements.

Interviews are conducted with local industrialists in order to obtain information concerning their manufacturing experiences. This provides data which is not distorted by community promotional effort. Details are requested from these manufacturers concerning all aspects of the desirability of locating in the community.

All desirable sites or suitable plants are evaluated in each city. This includes examination of the general neighborhood, physical characteristics of the site and/or plant, transportation facilities available,

utility analysis, and complete examination of probable price.

When this detailed field examination is completed, FFLS has the necessary facts to judge the facilities and character of each community in reference to their client's needs and desires. The next step is to present these alternatives to the client for consideration.

Final Cost Comparisons

Locations considered as desirable alternatives are presented to the client for evaluation. Usually the final presentation consists of four to six cities, with about four to six alternative sites in each city. This final presentation utilizes two comparative charts and sufficient documentary material to support all conclusions reached.

The first chart presents a dollar and cents breakdown of potential delivered-to-customer costs in each of the alternative communities. In essence, this is the same chart developed during the client's analysis of his present location--extended to cover new locational alternatives. The left hand column of the chart presents the client's current costs which can be evaluated against potential costs at various new locations. In this manner, the actual economies of relocation can be determined.

The second chart presents a summary of non-recurring costs and intangible benefits at each of the suggested locations. Expense of setting up operations at each point can be determined from this comparison. Intangible factors available at each location are evaluated in accord with the client's desires and presented on this chart.

For most clients, this completes the work of FFLS. In some cases, the representative may be requested to perform some additional duties, such as purchasing the site, but these extensions are not pertinent

to our current interest.

This discussion has presented an example of implementation within the framework of applicational theory. As noted in the literature review, Leonard Yaseen's contributions provided the primary source of the procedural framework utilized in applicational theory. Mr. Yaseen's role in development of FFLS procedure was also noted. Because of this similarity, the procedures of FFLS was selected to illustrate implementation. The next step toward achieving the objectives of this study is to evaluate the procedural framework utilized by manufacturers who have selected their own plant sites.

SECTION THREE

PRACTICAL CONSIDERATIONS

CHAPTER VII

EMPIRICAL METHODOLOGY

The objective of Section Three is to report empirical observations concerning practiced locational procedures. Chapter VII describes empirical methodology utilized during preparation of case studies. Chapter VIII presents the results of interviews with six industrialists. In total, Section Three provides necessary insights for evaluation of the primary and secondary problems under consideration in this study.

EMPIRICAL METHODOLOGY

There are at least two methods of obtaining practical information. The first, and possibly the least difficult method, was to review and interpret all available locational case studies. While convenient, the shortcomings of this first alternative are many. Utilization of prepared materials limits observations to available case studies, avails only reported information, and requires interpretation and adaptation of materials to the task at hand. In light of these noted shortcomings, this first alternative was determined as inadequate for the purposes of this study.

The second method of obtaining desired information was to conduct field studies. The primary advantage of this method stems from control over cases studied and materials analyzed. This empirical approach was determined as the best method of obtaining information consistent with the objectives of this study.

Geographical Study Area

The geographical area selected for consideration was the State of Michigan. While the total area available for consideration was unlimited, Michigan was selected for two reasons: (1) close proximity to industrial firms, (2) close proximity to necessary supporting information.

The nature of the twofold problem under consideration--locational procedures and influence of highways--is relatively independent of location advantages offered by any region, state, or community. The point is emphasized that this is not a study to measure the desirability of locating a plant in Michigan. The factors under consideration are immaterial to political boundaries.

Number Of Firms Studied

A sample size of six firms was selected for analysis. No attempt was made to obtain a statistically representative sample of industrial firms located in Michigan. Analysis of six locational procedures was arbitrarily determined sufficient for the primary objective of this study. A limit was placed at six firms in order to utilize interviews rather than questionnaires in obtaining desired information.

Selection Of Firms

Selection of the six industrial firms to study was made with the co-operation of the Michigan Economic Development Department. No restrictions concerning type of industry, location of industry, or prior location of industry was considered in selection of the firms to study. Each of the firms selected had to meet the following requirements:

1) All shall have located subsequent to 1950.
2) All shall have selected new sites distinct from the land on which prior facilities were located.
3) Each of the firms selected shall have different ownership.

Through the assistance of one of the Economic Development Department's industrial agents, a list of twelve potential study prospects was obtained. Selection was based upon examination of firm files and upon the judgment of the industrial agent. Only those firms with a past record of co-operation in research projects were selected. Special attempt was made to select firms of various sizes. Because of the consideration applied in selection of these potential firms, a list of twelve was determined satisfactory to obtain an acceptance rate of six firms for analysis.

In co-operation with the project advisor, the six most desirable firms were arbitrarily selected as invitational prospects. Selection of invitational firms was made in a manner which presents an array of different size firms.

Classification of Sample

The six firms selected for analysis were classified into three groups for analytical purposes. The basis of classification was number of plants operated by each of the firms. Number of plants operated was selected in order to provide some insight into the frequency of locational problems confronted by the various firms. The limits of each group are as follows:

Category One - Large Size Firms - 7 or more plants
Category Two - Medium Size Firms - 4 to 6 plants
Category Three - Small Size Firms - 1 to 3 plants

Each of the categories contains two firms.

Method of Contact

Each of the six firms, selected as invitational prospects, was sent a letter of introduction. The purpose of this letter was to provide information concerning the objective of the study and to solicit each firm's co-operation. Appendix B provides a copy of the typical letter sent.

Five days after the letter had been mailed, each firm was contacted by phone to obtain their participation decision. At this time, additional information was provided as requested by the firms. Each of the six firms contacted consented to co-operate in the study.

Interview Procedure

A personal interview was selected as the method of obtaining desired information. This decision was made primarily because the type of question under consideration did not readily lend to specific question structuring. Additional advantages of using interviews are that the interviewer can obtain the "feel" of the firm, all information can be classified on the spot, and perhaps more complete information can be obtained.

The objective of each interview was to encourage the person interviewed to express himself freely concerning the locational procedure utilized, and the influence of highways. Extreme caution was exercised not to direct the interview by revealing any aspects of the theoretical procedure under comparison. While a complete conversational atmosphere was desirable, some structuring of the interview was necessary to insure comparative interview results.

The actual interview utilized was structured on a stimulus-response

pattern. Each person interviewed was asked two general questions to guide the conversation. The first question stimulated the discussion concerning locational procedures utilized. The second question was directed at the locational influence of highways. Each question was prefaced with a brief introduction to the reasons why the subject matter was being considered. Additional questions were asked, as necessary, to direct the progress of the interview. In all cases, these questions were structured as a request for clarification. With the help of these additional questions, all interviews remained channelled on the subject under consideration.

In discussion of the highway influence, two additional specific questions were asked in each interview. These questions related to the advertising potential and public relations resulting from location in close proximity to a major highway. Appendix C presents an outline of the interview pattern utilized.

CHAPTER VIII

EMPIRICAL CASE STUDIES

Information obtained by way of field study is reported in this chapter. The objective is to relate procedures which governed location selections. No attempt is made to generalize upon the information reported. In order to present interview results in an unbiased manner, the six case studies are developed in three general parts.

Each case is introduced with a discussion of general information regarding the firm under observation. Data concerning the product manufactured, size of the firm, markets served, and other items peculiar to the individual firm are reported. This introduction is intended to give the reader a "feel" for the firm and an understanding of the events leading up to the location problem.

In the second part, the procedure utilized in site selection is discussed. The exact procedure expressed during interviews is reported. Utilization of this non-restricted approach allows the thought process of each person interviewed to be presented. Attempts to categorize practical procedures in the framework of applicational theory could result in distortion of interview results.

In the last part of each case study, a discussion is presented of the influence attributed to highways in location selection. Answers to specific questions regarding advantages of advertising and public relations resulting from location near highways is reported. These cases are not presented to justify the applicational approach, but

rather to provide some insight concerning the relevancy of the assumptions made in formulation of the theory. Comparison of knowledge gained from examination of practical procedures is presented in Chapter IX. The influence of highways is considered in Chapter X.

Two shortcomings of the empirical approach, as used in this thesis, warrant mention. With the exception of one case, only one person was interviewed regarding each firm.[1] Use of this single interview approach allows inclusion of the biases of the individual interviewed. To some unmeasurable extent, this shortcoming was minimized by interviewing the one person who was primarily responsible for selection of the site. The untested assumption is made that this individual would be most apt to express the viewpoints of the firm.

The second shortcoming evolves from the elapsed time since the location decision was made. Depending upon the retention abilities of particular individuals, as well as the resultant success of the decision, the factors leading to site selection may be distorted. Two checks were utilized to hold this second shortcoming to a minimum. First, only firms located subsequent to 1950 were selected for observation. This reduced the span of time between location and observation to a relatively short period. Second, the general validity of interview results was checked against information obtained from the Michigan Economic Development Department. This provided some standard by which to evaluate interview results. In all cases, the person interviewed

---

[1] During the interview with Firm C, two representatives of the company were present.

readily recalled the procedures used and the general information checked with that obtained from the department. The actual amount of intentional and unintentional bias presented in the case studies remains an unknown ingredient.

Each case study is labeled in reference to the firm's size category classification. This provides the reader with some insight regarding the frequency of location problems confronted by the various firms.

FIRM A -- SMALL SIZE FIRM

The first case study is that of a small firm which owns and operates two plants. The firm manufactures delicate electronic instruments. At the present time, the product is manually assembled, no automatic equipment has been developed which can meet the necessary product specifications. The firm normally experiences a high product rejection rate which is attributed to human error, component defects, and extreme vulnerability to dirt particles during product assembly.

All production undertaken is on a work order request at specifications established by the customer. The typical customer manufactures brand items which utilize Firm A's product as a vital component in their finished product. The entire production of Firm A is sold to an industrial market. Six customers purchase 95% of the firm's production. Product shipment is normally by parcel post. An entire week's production would readily fit in the trunk of an automobile.

Five years ago, this firm started as a two man operation. Within a few months, the company's product gained market acceptance, and additional manufacturing capacity was required to meet increasing orders.

The first plant constructed was located in the hometown of the owner. In construction of the initial plant, no consideration was given to alternative locations.

After three years of operation, increased business volume forced the owner to make a decision between establishment of a second shift or expansion of facilities at a branch plant. A second shift was utilized for a short period of time. This arrangement did not prove satisfactory. The community within which the original plant was constructed could not provide the skilled labor necessary to support a multi-shift operation. Total population numbered less than 1000. In addition, female labor was not available in this town for night work. While the second shift arrangement worked as a temporary measure, continued growth required expansion of facilities.

A branch plant was located fifty miles from the main operation. Both plants now employ a combined total of 150 full time employees. The procedure analyzed in this study is that utilized in establishment of the branch plant.

Location Procedure

Faced with the problem of selecting a site for a branch plant, the owner first looked at the requirements which the new plant must meet. Of primary concern was a location in close proximity to the existing plant. Initial plans called for retention of all staff and service functions at the primary plant. Only assembly functions were to be performed at the branch plant. Consequently, the first requirement for a new plant was location in close proximity to primary manufacturing facilities.

Because of a backlog of customer orders, the owner decided to look for a plant which was available for immediate possession. This would hold to a minimum the lag prior to initial production.

The remainder of the location specifications were based upon labor requirements. The owner felt that location in an area populated with people of Dutch origin would encourage cleanliness in daily work areas. As noted earlier, dirt control is a critical factor in product assembly. Availability of female labor, at wage rates comparable with those paid at the main plant, was a prime prerequisite. Based upon these specifications, the owner began the search for a site.

The search area was strictly defined on the above specifications. The owner requested the Michigan Economic Development Department to locate an available plant within the area outlined. Five plants located in various communities were considered. Each of these plants lacked the necessary requirements, so all were rejected. During evaluation of one suggested location, the community concerned became extremely interested in obtaining the branch plant.

This community offered to supervise construction of a new plant, and provided a satisfactory site upon which the plant could be built. All of the basic requirements were available in the town; so, the owner tentatively accepted. Prior to final selection, all personnel which were to relocate at the branch plant made a trip to the community to evaluate the living conditions. Discussion of the community with these employees convinced the owner that his tentative decision was satisfactory, and final commitments were made.

Highway Influence

The owner of Firm A placed little emphasis upon the influence of highways in selecting his plant site. Although the location of the new plant is on a major highway, this was not a prime locational requirement. He indicated adequate roads were necessary to transfer workers, but other than satisfying transfer requirements, highways contributed little to over-all locational specifications. Potential advertising that could result from location in close proximity to a highway was not considered. In discussion of the advertising influence, the owner felt it would benefit his particular firm very little. No definite opinion was provided regarding community prestige resulting from location on a well traveled road. In selection of the final site, the highway factor had not been considered.

FIRM B -- SMALL SIZE FIRM

The second small firm studied owned a total of three plants. Two of the plants have been in operation for a number of years; the third plant is currently under construction. While small in terms of number of plants, this company is considered as relatively large in the industry. The new plant under construction will employ 200 people when completed.

The product manufactured is a basic ingredient in construction work. Customers vary from industrial firms to individual consumers. All customers purchase the finished product from retail stores or building supply companies. The market served is small in geographical area, but has a very high population density per square mile. Within the

market, sales are made to a variety of different customers.

Heavy weights of both raw materials and finished products has stimulated firms in this industry to locate in close proximity to markets and raw materials. An ideal site is traditionally one which provides raw materials and is close to the market served. The industry pattern has been to select a location near the market, if a site offering mutual benefits of both raw material and market proximity can not be obtained. In cases where the market is selected over raw materials, normally a deep water harbor is required. This allows the raw materials to be shipped by cheap water transportation.

The procedure analyzed in this case study is the one utilized by the firm in selecting the location for its plant now under construction. None of the present manufacturing capacity will be transferred to the new plant. The new plant, when completed, will represent a major expansion for the firm.

Location Procedure

In consideration of where the new plant should be located, the market to be tapped was given primary consideration. A complete analysis of potential markets was undertaken. This analysis provided several satisfactory markets, one of which was selected for penetration. By evaluation of transportation costs, the company determined that the suggested geographical area would allow economical operations. Within this area, a search was undertaken for a site which provided adequate raw materials. The search area contained several deep water ports which could be utilized for shipment of raw materials, if adequate natural resources were not located. Specifications were also established

regarding the size of the site needed for the new plant.

Search of the market area revealed four sites which offered some of the raw materials necessary for production. At this point, all four sites were evaluated in terms of specific transfer and process costs. The expense of extraction, transportation of additional required raw materials, and transportation of finished products to the market was charted for each site. Two of the potential sites appeared desirable. Options were exercised on these sites in order to determine if the raw materials available could meet production specifications. Extensive analysis was undertaken regarding the composition of available raw materials. Analysis pointed out that both sites were satisfactory, but that one site was superior to the other.

A tentative decision was made to purchase the superior site, if all other specifications could be met by location at this geographical point. Costs of transportation were again analyzed for the site under consideration. At this point, intangible factors were considered for the first time in the location analysis. Because of the potential economy of operation that could be realized at this site, the firm had almost definitely decided to locate prior to examining intangible considerations. Nevertheless, a detailed examination was undertaken to point out if location at the proposed site would be detrimental to the firm's development. Analysis was aimed at pointing out potential undesirable features that could result from construction in this area. This investigation pointed out that the firm would be compatible with the community.

As a result of the investigation conducted, the site was determined

to be a satisfactory location for the new plant. An area of over 1000 acres was purchased for the new plant.

Highway Influence

In selection of the final site, location in close proximity to a major highway was considered a primary prerequisite. The firm estimated that 75% of its finished product would be shipped to the market via truck. The site purchased is bounded on one side by a major highway. The person interviewed stated that no consideration had been given to advantages gained by locating adjacent to the highway. Benefits of advertising and potential public relations were given no consideration in deciding where on the site the plant would be constructed. This lack of consideration is supported by the fact that the actual plant will be 3/4 of a mile from the major highway and not visible to passing traffic. No opinion was voiced concerning benefits of advertising or potential community prestige that could have resulted from construction adjacent to the highway.

FIRM C -- MEDIUM SIZE FIRM

Firm C has participated in two recent plant locations. One plant represents an expansion of facilities. The other plant was constructed to modernize operations at an outdated plant. In total, five plants are owned and operated by the corporation.

The products manufactured are all in the electronics field. Firm C's finished product is a vital component of a variety of different products sold to industrial and consumer markets. The product is purchased by customers located in extremely different geographical

areas. Major customers are appliance firms, power equipment manufacturers, and the government.

Each of the recent location problems confronted present interesting examples of utilizing a practical location procedure. Transportation was the critical factor in location of the expansion construction. Location on major transportation routes was selected in order to reduce time, and costs of shipping the finished product to the customer. The entire operation of this new plant consists of assembly of the finished product. No basic fabrication is conducted at this location. The location selected is a considerable distance from the firm's primary fabrication operations. This decision has resulted in a strange paradox. Raw materials pass in close proximity to the assembly plant enroute to the fabrication facilities. Basic components of the finished product are then shipped back to the new assembly plant. Analysis pointed out that shipment of products in the above manner would result in more economical delivered-to-customer costs for the firm.

Construction of the modernization facilities was undertaken in the same community in which the old plant was located. After considering several different locations, the decision was made to construct in the same community primarily because of availability of trained labor. Of particular interest is the fact that the modernization construction was completed after the construction of the new assembly plant. During the interview, mention was made that location in close proximity to the assembly plant would have reduced transportation costs. In consideration of all pertinent factors, the trained labor force available offset the advantages that could be realized at other locations.

The location procedure analyzed in this study is the over-all process utilized in selection of sites for both plants. The remainder of the case study will not relate to either specific location problem.

Location Procedure

The first step completed by Firm C, in the selection of a new plant location, is to obtain a clear understanding of how the new plant will fit into the over-all manufacturing plan. Firm C finds that, with a clear idea of the basic requirements, determination of critical factors is not too difficult. Knowledge of the raw materials utilized and the markets served points out what areas will provide adequate location. With this information, selection of a search area is simply a matter of matching possibilities with over-all requirements. For Firm C, the area of potential location is easily defined. Prior to making a field search, the area is evaluated regarding transportation costs that will result from location at different specific sections of the search area. By this evaluation, some sections can be given priority in actual search, and the limits of the potential area can be closely defined. Detailed specifications are determined regarding the physical characteristics necessary for the plant. Labor requirements are clearly defined prior to evaluation of various locations. The decision to construct or purchase an existing plant is never determined until field investigation has taken place.

Within the potential location area, communities which appear to offer the necessary requirements are evaluated. General information is obtained about the community regarding size, exact location, and reputation. A surprising amount of information is obtained at business

meetings, conferences, and from news releases that concern the community. If the city appears to have the necessary requirements, a representative of the firm is sent out to investigate the community informally.

Firm C usually begins this evaluation by asking questions about the town in local barber shops, restaurants, and other places where the citizens gather. If the community appears desirable, the next step is to ascertain if the community has an official industrial representative. This representative may provide the facts which Firm C wants; so, no attempt is made to disguise the firm's interest. At this point, the desirability of the community can normally be determined. If all requirements can be met, the investigation is carried to local manufacturing firms. Discussion with local manufacturers usually completes the picture for the representative of Firm C. No formal check list is utilized, but the investigator has adequate knowledge of all necessary factors. The desirability of locating in a community is always determined prior to selection of a specific plant or site.

If the community appears desirable, available plants are visited, and potential sites for construction are considered. Where construction of a plant is determined necessary, the firm requires that the community provide a "free" site. Finding a free site has not been difficult. Selection of an adequate site completes the search.

Of interest is the fact that no particular attempt is made to match alternative communities. In the process of investigation, if the first community analyzed can satisfy the specifications of the firm, it is selected for location.

Highway Influence

Location on a highway is one requirement the potential site must meet. While rail is used to transport raw materials, trucking is the major method of moving fabricated parts and the finished product. For potential use, rail facilities are required at all plant locations. At present, these facilities are not utilized at the assembly plant.

In reference to the advertising question, the executive interviewed replied that it was immaterial in site selection. His firm, serving an industrial market, would benefit very little from potential advertising. No consideration was given to resultant public relations received from highway proximity. The opinion was expressed that the local population will find you regardless of where you are located, and will measure the desirability of employment from labor relations and working conditions, rather than appearance. Location on a back road is satisfactory if it can meet all transportation requirements.

FIRM D -- MEDIUM SIZE FIRM

Established shortly after 1910, this company has experienced steady growth at a moderate rate. Manufacturing capacity has slowly increased since the company was formed. At the present time, five plants are owned and operated by the firm.

The products manufactured by Firm D are primarily utilized for the packaging of its customer's products. Firm D sells to a number of different customers. With the exception of a few standard items, products are manufactured to the customer's specifications. At the present time, over 1000 people are employed.

The five company plants are decentralized over a large geographical area. Each plant serves markets which are in close proximity to the plant. Both the weight of the raw material and the finished product require that transportation costs be held to a minimum.

Normal expansion at one of Firm D's major plants required that management give consideration to increasing production facilities. At the present location, the firm did not have room to expand in a satisfactory manner. The decision was made to separate the finishing operations from the basic manufacturing process. The plan called for the basic manufacturing process to remain at the primary plant, with finishing and assembly to be transferred to the new plant. The procedure analyzed in this study is the one that was utilized in establishment of the branch plant.

Location Procedure

Firm D's management made the basic decision to purchase an existing plant if possible. Establishing the specifications for the new plant was relatively easy. The semi-finished product would be shipped by truck to the finishing plant. This required that the new plant be located in close proximity to current operations. The finishing plant would serve the same market that was currently being served by the primary plant. Therefore, any movement away from current operations should be in the direction of current and potential markets. Finishing operations required that the new plant must have considerable floor space. In order to efficiently house the assembly process, a long narrow plant was required.

A few unsuccessful attempts were made to locate an existing plant

which could meet the firm's specifications. One of the firm's executives, returning from a business trip, noted a vacant plant when driving through a small town about fifty miles from the primary operation. A cursory examination was made on the spot. The plant appeared to conform to the necessary specifications.

At a later date, a more detailed evaluation was made of this community and the available plant. The climate of the town appeared satisfactory. A necessary work force of 150 people could be obtained at desirable wage rates. Examination of the plant indicated that minor modifications would render the plant suitable for the finishing and assembly operations. All necessary utilities were available. The location appeared satisfactory in reference to market proximity. Based on the results of this analysis, a 90 day option was obtained on the plant. This provided adequate time for completion of a detailed market survey.

A survey was completed to measure the desirability of the new plant in reference to present and potential markets. The proposed location proved to be extremely desirable. Good transportation facilities were available to all markets. Based upon the findings of the market survey and the initial community-plant evaluation, the plant was purchased. Firm D took extreme caution not to reveal its identity until the purchase agreement was signed.

Highway Influence

The new finishing and assembly plant is located on a major highway. A direct route to the primary manufacturing operation facilitates movement of semi-finished products. All finished products are shipped

to customers via truck. One of the major advantages of the new location is a network of roads which provides ready access to the major markets.

In selection of a plant, no consideration was given to increased advertising or beneficial community relations that could result from location in close proximity to a major highway. No opinion was voiced concerning these potential benefits.

FIRM E -- LARGE SIZE FIRM

The first large firm studied is one of the largest corporations in the United States. The basic product of Firm E is one line of automobiles sold on the American market.

Corporation E has a staff department which is responsible for selecting the specific site at which new plants will be located. This department has participated in the location of 33 major plants, in all parts of the United States, within the last 15 years. In total, 38,000,000 square feet of floor space has been added since the end of World War II.

Firm E treats the location of each plant as strictly a custom operation. This is necessary in order to assure proper consideration of all facets peculiar to each particular plant. Yet, in the selection of each location, there are basic principles which are followed in selecting the specific location. These principles serve as a guide to determine which department is responsible for each step in the selection procedure. The location procedure analyzed in this study represents the general location principles followed by the firm.

In order to explain the location procedure utilized by Firm E, a brief review of corporate organization is necessary. Corporation E is completely decentralized with respect to operations. The firm has more than 15 operating divisions. The operating divisions utilize two basic types of plants--automotive assembly and basic manufacturing. Each operating division is an autonomous profit center charged with the responsibility of making sure their plants are correctly located and have the capacity to produce the scheduled amount of goods.

The trend of plant location within the firm has varied for the two basic types of plants. Automotive assembly plants are typically located in close proximity to the market served. Experience has proven that parts can be shipped long distances at cheaper rates than assembled automobiles. The trend for basic manufacturing plants has been to locate in close proximity to the source of raw materials.

Location Procedure

The first step in the location procedure is taken long before the actual planning of any specific plant. Corporation economists have made careful studies of the economic and population trends of the United States. Based on the conclusions of this analysis, forecasts have been made of the automotive's industry trend, as well as Firm E's trend within this industry. The Sales Department utilizes these forecasts to determine what type of units will be sold, how many of each type, and in what part of the country they will be sold. This information is then provided to the operating divisions.

Each division evaluates its manufacturing facilities in reference to the unit forecast provided by the Sales Department. If they

do not have the facilities to produce the required units, it is their responsibility to request approval to construct additional plants. Plans are formulated regarding the size of plant needed, the general location, and the date the plant should be completed. Prior to construction, final authorization to spend the money must be obtained.

In order to provide a dollar estimate for the required facilities, specifications are forwarded to the Manufacturing Facilities and Plant Engineering Departments. These two departments develop a project appropriation request for the consideration of the Board of Directors. If this request is approved, the search for an appropriate site begins. From this point on, the procedure of locating the plant is carried out by numerous departments, under the general guidance of the Staff Department responsible for selecting the specific site.

The first task in site selection is to pin-point the places in the general search area that will provide minimum transportation costs. This analysis provides a list of preferred areas which are examined in detail. Requests for potential sites are then sent out to industrial development representatives of utility and railroad companies operating in the preferred areas. General site specifications are included with these initial requests. The typical site desired contains approximately 200 acres of land, about 4000 feet by 2500 feet, with a four lane highway on one side, and a mainline railroad on the other. The minimum size community acceptable is one with a population of 50,000. Most of the sites offered can be eliminated without field examination. Company files are checked in detail for all information regarding potential sites and their respective communities. By a process of elimination,

all potential sites can usually be reduced to about five possibilities. These sites are selected for field examination.

Detailed field surveys are made concerning all sites remaining in the selection picture. Analysis is made of the community structure, both tangible and intangible. All costs of acquisition, set-up, and operation are charted for each site. A complete evaluation is made of the labor climate. In short, a most comprehensive analysis is completed for each site.

The results of these detailed surveys are then placed on a large chart for purposes of comparison. Quite often, almost equal dollar evaluations are determined at each site. If this is the case, the final selection is based on the results of intangible factor analysis. The cheapest site is not always the best; so, considerable attention is given to all aspects of each investigation. On the basis of the facts present, one site is selected and recommended for purchase. If the site selected is approved, the plant location problem is complete. At this time, the identity of the firm is revealed for the first time to the residents of the community selected.

Highway Influence

In the words of the executive interviewed, the influence of highways is becoming "bigger and bigger." As noted earlier, the typical site selected by this firm requires a four lane highway on one of the long sides of the site. If possible, the firm also desires to have secondary roads located at each end of the site. One major plant was located at a specific site because a promise was made to construct a major intersection at the corner of the lot, which would provide

exceptionally good access to the plant.

The advertising potential of locating in close proximity to a major highway was considered as one of the reasons for the prerequisite of a four lane highway. Considerable doubt was expressed concerning the direct value of such advertising. Indirectly, the firm feels their product image is increased by such locations.

Likewise, the public relations aspect of highway location is considered in determining the site specifications. While the firm does not feel that such locations develop the attitude among the public of a good place to work, they do feel that over-all public relations are increased by construction of desirable plants.

FIRM F -- LARGE SIZE FIRM

The second large firm studied is an example of a relocation that was stimulated by forces of expansion, modernization, and decentralization. Faced with the need for modernization, Firm F decided to expand facilities utilized for the production of a relatively new product. Coupled with this decision to expand was the influence of a new management policy, placing emphasis upon decentralization of manufacturing facilities. As the first step in implementing this policy, the decision was made to seek a location that was geographically separate from existing facilities.

Firm F manufactures a series of products which are basic components in the products of a number of different industries. With the exception of a few replacement parts, all production is sold to an industrial market. The largest group of customers is the automotive industry.

In total, 12 plants are owned and operated by Firm F.

The plant relocation, studied in this case, specializes in the production of one product. This product has gained market acceptance rapidly. Increased production has made this item one of the major product lines of Firm F. This particular product is almost totally sold to the automotive industry. Other manufacturers of transportation equipment do use the product, but their orders represent a small percent of total production. As a result of the concentration of the automotive industry in a few states, over 90% of this product line is sold in a small geographical area. Production is normally undertaken on a work order request. Although the basic product performs the same function for all customers, modifications are needed for each type of vehicle.

Location Procedure

The area in which the new plant was to be located was easily determined. Transportation costs required that the new location be in close proximity to the major market served. Based upon this requirement, a search area was outlined. This area included parts of three different states. In consideration of whether to construct a plant or purchase an available plant, management initially decided to search for a constructed plant.

The specifications which the new plant must meet were established in detail. Experience obtained from production of the new product provided a good estimate of what additional equipment would be required. Floor space needed for initial production was estimated. Forecasts of expected growth were analyzed in order to determine additional land that must be provided for normal expansion.

Several pieces of large electroplating equipment, programed for use in the new plant, required an abundance of power at the site selected. Labor was also considered in terms of the initial specifications. Firm F has consistently attempted to attain cordial and co-operative employee-employer relations. While conscious of the effort necessary to develop this relationship, location in an area with a desirable labor record was a prime prerequisite. Based on these specifications, the search for an adequate site was undertaken.

In an effort to locate an available plant, all attention was focused upon communities which offered manufacturing facilities. Numerous plants were analyzed, but none met the necessary specifications. The normal procedure of analysis was to look at the plant first. If the plant appeared satisfactory, the community was given cursory examination. If the results of both of these brief evaluations appeared promising, additional investigation was to be undertaken. This additional investigation proved unnecessary. Only one plant appeared at all desirable; other factors ruled out purchase.

Disappointed in an attempt to purchase facilities, the decision was made to construct a new plant. The desired type of building was designed. The plans outlined the needs of initial production facilities as well as potential methods for expansion. This new plant was designed so expansion construction could be undertaken without work stoppages. Based upon analysis of building plans, exact specifications for the site were determined. When all of the new specifications had been ascertained, field investigation was once more undertaken.

Field search now assumed a different complexion. Communities

which appeared to offer the basic requirements were selected for field examination. This required that some communities, earlier by-passed, had to be given additional consideration.

The first step in evaluation of a potential community was to consider the sites which would fulfill the necessary requirements. If a site was available, and the town appeared desirable, a detailed evaluation was undertaken. The community was measured in terms of available facilities and costs of operation. As noted earlier, power facilities and labor climate were afforded careful attention. Local tax structure was given detailed consideration. In addition to checking each community for tangible requirements, consideration was given to other benefits. Such factors as school systems, churches, police protection, fire fighting facilities, and living conditions were analyzed.

Field analysis pointed out several communities that provided the necessary requirements in varying degrees. Location in any one would have allowed economical operations, but the decision was made to continue search for a better location. After evaluation of more potential locations, an extremely desirable community was discovered. No attempt was made to directly compare this location with the others evaluated. Based upon experience accumulated during the total field analysis, selection of this community was almost automatic.

Highway Influence

Firm F placed substantial weight on the highway facilities available in each community. In evaluation of various sites, only those which had ready access to at least one major highway were considered. All shipment to and from the new plant utilizes trucking facilities.

Similar to the assembly plant located by Firm C, Firm F's new plant has rail facilities available which are not presently used. The executive interviewed stated this was only smart business--future developments may make rail transportation the primary means of distribution.

Firm F did not consider the benefits of potential advertising when selecting their site. During discussion that followed the advertising question, the executive interviewed expressed the opinion that this is not influential to firms selling to an industrial market.

Consideration was given to community prestige in determining the way construction would be undertaken on the selected site. The plant was well landscaped and parking lots were placed close to employee entrances. This increased the attractiveness of the new plant. Firm F did not feel location had to be on a major highway to achieve acceptance as a good neighbor. As a matter of fact, Firm F's new plant faces on a secondary road, 1/4 of a mile from the nearest major highway.

SECTION FOUR

CONCLUSIONS

CHAPTER IX

COMPARISON OF THEORETICAL AND PRACTICED PLANT LOCATION PROCEDURES

The objective of Chapter IX is to measure the extent to which practical location practice reflects applicational theory. The comparison made in this chapter represents the primary concern of this thesis. The central problem restated is as follows:

> To what extent are suggested theoretical procedures of plant location utilized by businessmen in selection of their plant sites?

Section Two presented location theory in procedural perspective for use in comparative analysis. Applicational theory was defined as a framework for considering location problems. This framework consists of two procedural steps that can be utilized to guide executive decision making.

The first procedural step suggested is general delineation. During general delineation, management makes a microscopic self-analysis of current and projected manufacturing operations regarding three categories of influential factors: (1) cost, (2) competitive, (3) intangible. From this analysis, the factors which will be most critical in any particular location problem can be determined. Based upon this analysis, general specifications are formulated. These specifications guide the remainder of the deductive process of site selection.

The second procedural step is specific delineation. Specific delineation consists of three additional steps necessary to reduce the

geographical area of concern to a specific site. Location specifications are used to evaluate alternative regions, communities, and sites.

Section Three presented six empirical case studies. In consideration of these cases, emphasis was placed upon the reported procedures of location. For Firms C and E, the general location procedure was noted. In all other cases, the procedure utilized for selection of a specific plant was elaborated. No attempt was made to generalize upon the information reported. Observations were presented in a general, but consistent, format rather than in the framework of applicational theory.

This chapter generalizes upon observations made during empirical study. First, generalizations are presented in reference to the procedural steps of applicational theory. This will provide insights concerning practical utilization of the suggested procedural steps. Second, conclusions are made concerning comparison of over-all theoretical and practical procedures. This provides some insight concerning the relevancy of application theory.

GENERALIZATIONS CONCERNING PROCEDURAL STEPS OF APPLICATIONAL THEORY

General Delineation

1. The extent to which location specifications were established varied among firms studied. Each firm did formulate some specifications prior to conducting a field search.

2. Specifications for location contained varied details regarding requirements which the specific site must meet. Firms B, E and F established the most detailed requirements.

3. Only one firm, corporation E, conducted an evaluation in proportion to that suggested in applicational theory.

4. Pre-search analysis undertaken by all firms was sufficient to establish the general area in which the new plant should be located.

5. None of the firms studied made a detailed cost analysis of their operations prior to relocation. Neglect to consider this phase of analysis may be the result of the expansion characteristics of firms studied.

6. Each firm expressed little difficulty in determining factors critical to their location problem. This may indicate that a detailed analysis of all factors is not necessary in location, or possibly that secondary location factors were neglected in establishing location specifications.

7. In all cases, one group of factors appeared most critical in formulation of specifications. With the exception of Firm A, these factors concerned some aspect of transportation costs.

8. In formulation of specifications to guide site selection, primary emphasis was placed upon the influence of cost and competitive factors. Cost factors were considered in detail by all firms except Firm A. Competitive factors were noted by all firms. Consequently, no plant was located on purely a least-cost analysis.

9. Only two firms gave detailed consideration to intangible factors during the general delineation stage of location procedure: Firms A and E.

10. Each firm rigidly maintained its pre-search specifications as guides throughout the remainder of the location procedure. The only

exceptions to this rule were noted when Firms A and F could not locate satisfactory plants. This provides some insight regarding the value of detailed analysis of objectives and requirements.

11. In establishment of location specifications, only Firms C and D gave detailed attention to their potential growth requirements.

12. No relationship is observed concerning the frequency of plant location problems confronted by firms, and the extensiveness of the pre-search evaluation completed. At least one firm in each size category conducted a somewhat detailed analysis.

Specific Delineation--Regional

1. Selection of the general region for plant location received the least amount of direct attention in the location process.

2. None of the firms studied conducted field investigation in more than one general region for any specific plant. Consequently, the regional cost comparisons suggested in applicational theory were not utilized.

3. Specifications resulting from pre-search evaluation were sufficient to reduce location possibilities to one relatively small geographical area. This may indicate that the search area for most firms is strictly dictated by the critical factors of location.

4. All firms did outline a specific search area prior to conducting field investigation.

5. Only Firm E suggested that more than one region would be considered for the location of a specific plant.

6. Only Firms C and E attempted to isolate smaller preferred location areas within the larger search area prior to field investigation.

7. No relationship is observed concerning the frequency of plant location problems confronted by firms, and the geographical area considered. Firm E's procedure indicates that firms serving a national market may consider substantially larger areas when selecting locations.

Specific Delineation--Community and Site

1. The point, in the selection process where community and site analysis is completed, varies substantially among firms. Consequently, generalizations concerning community and site delineation steps are considered simultaneously.

2. All firms made intensive community and site studies prior to selecting locations.

3. The extent of analysis undertaken varied among firms, but no relationship is observed between frequency of location problems and intensity of evaluations.

4. All but one firm felt it was necessary to locate satisfactory sites prior to evaluating communities. Firm C alone felt it was necessary to select a community prior to searching for a site.

5. The number of different communities and sites analyzed varied extensively among firms. Firms B and E required that some alternative locations be given consideration. Those firms searching for ready constructed plants only evaluated communities offering the necessary facilities. For example, Firm B evaluated only one community. Those firms which required a specific type of site evaluated only those communities offering potential locations. Only Firm E required that all communities with satisfactory sites receive complete evaluation.

6. Four firms completed field analysis prior to selecting a

site. Two firms, B and D, optioned property prior to completing community analysis.

7. All firms, in making initial community evaluations, placed primary emphasis upon the availability of facilities and the cost of operation.

8. The detail of site and community cost analyses varied among firms. Firm A only considered costs of acquisition and labor. Firm E considered complete costs of acquisition, set-up, transportation, and operation.

9. All firms considered some intangible aspects of potential communities prior to final site selection. Firms A and E were the only firms which had established definite requirements prior to the evaluation of specific communities.

10. Emphasis placed upon intangible factors varied among firms. All firms agreed that a community would be rejected if it proved undesirable. Once again, only Firms A and E had qualified what specifically was an undesirable community.

CONCLUSIONS REGARDING COMPARABILITY OF THEORETICAL AND PRACTICAL PLANT LOCATION PROCEDURES

1. All firms studied completed each of the four procedural steps of applicational theory suggesting the basic relevancy of the applicational approach.

2. The general delineation stage of applicational theory presents a broad framework for determining factors relevant to all types of location problems. Each of the firms observed established locational specifications based upon particular principles suggested in applica-

tional theory. Only one firm made an evaluation in proportion to that suggested. Investigation points out that firms tend to emphasize the influence of cost and competitive factors when forming specifications, while generally neglecting the influence of intangible factors when forming specifications. This points out a basic inconsistency in the practical procedures observed. All firms considered intangible factors prior to final site selection, and indicated they would reject a site that did not fit their "vague" intangible requirements. Generally neglected was the initial cost analysis of present facilities suggested in theory. Specifications were formulated without the benefit of this analysis. In conclusion, comparison points out that the general delineation phase of applicational theory presents a relevant framework for considering customized location problems.

3. The specific delineation phase of applicational theory presents a framework for guiding the deductive process of selecting a specific site. Each of the steps suggested in this stage of applicational theory was completed by all firms studied. Each firm defined a search area, evaluated one or more communities, and analyzed one or more sites. The extent of evaluation completed at each stage and the pattern of analysis varied among firms. Observation of case studies suggests that the specific delineation phase of applicational theory presents a framework that is too rigid for customized location problems. The concepts of analysis for each stage are valid, but the suggested order of evaluation is not adaptive to the problems of various firms. As noted earlier, only one firm evaluated communities prior to studying available sites. The applicational approach should be modified

to make community and site evaluations co-extensive. The multiple analysis assumptions of theory are relevant, but not extensively used. This is to say that various regions, communities, and sites may be analyzed simultaneously, but this is not necessary for successful solution of a location problem. In conclusion, the specific delineation phase of applicational theory is relevant in concept. Modifications noted above should be considered regarding the order of the procedural approach.

4. Based upon analysis of practical location procedures, with due consideration for the rigidity noted above, applicational theory is determined to be a relevant guide to the solution of plant location problems. While no particular procedure studied was as complete as the suggested theoretical approach, practical procedures did follow the conceptual framework suggested in theory. All practical procedures utilized concepts relevant in applicational theory. In accord with the data presented throughout this thesis, applicational theory is tentatively considered as a practical and relevant guide for executive decision making.

SUGGESTIONS FOR FUTURE INQUIRY

Suggestions for continued inquiry flow freely from a study which attempts to present a broad coverage of a detailed field. From the viewpoint of the author, some of the most significant and relevant suggestions are presented below. Investigation in the field of plant location has revealed areas which appear to need additional understanding. Empirical inquiry concerning these suggestions will expand plant location knowledge currently available.

Suggested Areas for Additional Study

1. As indicated earlier, transportation appeared to play a prominent role in five of the six cases analyzed. Assuming that this influence is universal, additional understanding of the implications of this broad field appears paramount to understanding successful location. For example, the railroad sites required, but not used, by Firms C and F are particularly interesting. Undoubtedly, from the viewpoint of potential expansion, this is a sound decision. Investigation into the bargaining power with trucking companies resulting from the availability of rail as a distribution alternative may be interesting and beneficial.

2. The influence of labor organization upon location presents an area for additional understanding. Assumptions concerning the undesirable influence of labor unions are readily expressed in location literature. As pointed out in development of applicational theory, some benefits can be realized by a high degree of labor organization. Additional information concerning labor influence upon location is needed in order to ascertain what relevancy supports these assumptions.

3. Detailed investigation of the influence of taxation upon industrial location is needed. As pointed out during theoretical considerations, this influence appears to be secondary. This generalization was supported by the few case studies analyzed. Current political debate is not consistent with these generalizations. For advancement of locational knowledge, complete implications of tax influence should be ascertained.

4. While no relationship was observed concerning frequency of location problems confronted and intensity of investigation, a slight

relationship was observed regarding volume of business and intensity. Additional inquiry concerning intensity of investigation undertaken by firms enjoying different volumes of business might provide insights to understanding problems of location.

5. During investigation of firms studied, the secrecy element in location problems was handled differently. Firm C felt no pressure to conceal their interest in a particular site. Firms D, E, and F were cautious to maintain maximum security concerning intentions. Investigation concerning the implications of premature announcement would help to classify the relevancy of maintaining maximum security.

6. Three firms studied mentioned the implications of locating in a community which had been previously "black-balled" by a firm. The general opinion was that these communities should be avoided at any expense. Two firms actually by-passed satisfactory sites because of this factor. Additional investigation of the validity of these assumptions appears relevant for the affected community as well as for firms passing up locations desirable from all other aspects.

7. The demands of some firms that communities should provide inducements for location opens up an interesting area for consideration. Observations pointed out that this demand varied according to two factors--size of firm and type of industry. Large volume firms appear reluctant to accept this type of inducement. Industries which extract little from the community in terms of potential purchasing power, but which provide additional purchasing power in the form of industrial payrolls appear to demand more inducements from the community. One such inducement noted in the studies completed was the demand for

free sites on the part of some firms. An interesting observation is that these sites were only granted in smaller communities. Investigation into all implications of community inducements appears beneficial in determining the desirability of such gifts.

Evolution of Applicational Theory

This thesis has attempted to present an approach to location from the perspective of the individual firm. The framework suggested appears relevent; but, at best, the potential of an applicational theory has merely been surfaced. In this section, the author has taken the liberty to idealize the optimum development of an applicational approach. The relevancy of complete attainment of this ideal is left for the individual reader to evaluate. Idealization is based on the assumption that competition in the American economy will continue to grow. The future executive is viewed as facing location problems more frequently, with less time for evaluation, and more need for perfection.

Additional investigation regarding critical location factors is the first prerequisite to extention of applicational theory. The broad concepts presented in this thesis must be developed in detail. Only by complete elaboration of all factors considered, during general delineation, will the knowledge necessary for establishment of sound specifications be obtained. Suggested are more detailed investigations of distorting influences in least-cost analysis. The concepts of competitive and intengible influences must be expanded to provide insight into the forces at work. Provided this more detailed body of knowledge, an executive will be better able to isolate the factors critical to his specific location problem.

Additional empirical inquiry is necessary to provide more insights concerning the procedural aspects of applicational theory. The relevancy of the applicational approach stems from the practical orientation of theoretical concepts. Only if an executive can readily see a guide for implementation will a detailed knowledge of critical factors be of benefit.

Assuming attainment of the expansions noted above, the next step in achievement of optimum application theory is to depart from general concepts toward the development of methods of analysis. The practicality of applicational theory will expand as the executive is provided means for evaluating critical factors at each step of delineation. This development should first take the format of general tools for implementation, such as check-lists for determining critical factors. Each suggested check-list must be tested and evaluated. At this point, theoretical development by empirical inquiry must be supplemented and possibly replaced with experimentation. When methods of analysis are attained, the executive will be provided with direction in formulating and implementing location specifications.

Next, applicational theory should be narrowed to specific industry models. This advancement can only be accomplished after a complete body of verified knowledge has been obtained. The dangers of departing from a general application approach must be measurable. Specific industries should be studied in detail regarding all location factors relevant and peculiar to that industry. At this point, a science of plant location begins to evolve. All factors can be measured in reference to critical causes. The dollar effects of conformance or departure

can be measured and evaluated. To the extent that this cause-effect relationship is developed, plant location errors can be controlled and held to a minimum. Advancements in the field of operations research may make this method of analysis a vital tool for considering plant location problems. Only by achievement of such an advanced state of understanding will executives be provided with a body of knowledge assuring maximum relevancy as a guide for decision making.

CHAPTER X

ANALYSIS OF HIGHWAY INFLUENCE

In Chapter X, the secondary problem under analysis in this study--highway influence--is considered. This secondary problem resolves to the following question.

> What priority was given to highways as influential factors in selection of final sites?

The first part of this chapter is devoted to a brief discussion of the general influence of highways upon industrial location. Examples of intensive industrial development in areas adjacent to new highway construction are noted. The general reasons why industry attracts to these new areas are reviewed. The second part of this chapter reports observations made from case studies concerning the consideration given to highways during selection of plant sites. In addition to reporting general highway influence, attention is directed to the consideration given to advertising and public relation benefits which can result from location near a highway. The value placed upon each of these factors in selecting final locations is noted.

HIGHWAY INFLUENCE UPON INDUSTRIAL LOCATION

Numerous studies can be found in current literature to support the statement: Where highways are constructed, industry mushrooms. These studies point out that land values increase and industry is attracted to new locations made available for plant sites.

The "Magic Semicircle" is one good example of a highway which

has attracted industrial development. Located near Boston, Massachusetts, the land adjacent to route 128 has experienced amazing industrial growth. Since 1947, twenty-eight new plants owned by twenty-five different companies have been constructed in this area.[1] Over 100 million dollars has been invested in these new industrial and commercial enterprises.[2]

The land recently made available by the New York Thruway has been utilized for similar industrial development. The first section of this highway was opened in 1954. Despite this short period of operation, major enterprises have earmarked some 150 million dollars for new or improved plants along the thruway.[3] These enterprises will have a 100 thousand dollar annual payroll and will employ 30 thousand persons.[4]

The areas adjacent to the well established Pennsylvania Turnpike and the newer Ohio Turnpike have experienced this same phenomenal infiltration of industry. In Ohio, a 60 million dollar tractor plant is being erected adjacent to the new road. This plant will employ over 1500 persons.[5]

Similar industrial development can be observed along the Gulf Freeway, the numerous California freeways, and almost along any other

---

[1] Frank Prendergast, "Boom on Highway 128," Industry, (June, 1955), Reprint, p. 2.

[2] Thomas Mac New, "Industrial and Business Expansion Will Follow The New Superhighways," Automotive Industries, (December, 1956), p. 82.

[3] B. D. Tallamy, Speech presented at the 1956 Ohio Highway Engineering Conference, Columbus, Ohio, (April 4, 1956), p. 4. (Mimeographed).

[4] Ibid.

[5] Mac New, op. cit., p. 84.

new highway which provides desirable land for industrial use.

The reasons for this mass movement to new industrial lands are many. Rising labor costs have created a need for efficient operation which many times can only be obtained in horizontal one-story factories.[6] Along with the need for more space is the vital requirement for quick and economical transportation to the market. Requirements for a constant and economical flow of raw materials can better be satisfied by adequate highway facilities. Availability of labor is another reason for location in close proximity to major roads. One California firm feels that location on a freeway has made selection of desirable personnel less difficult. Prior to freeway construction, prospective employees, living some distance from the plant, were reluctant to travel long distances to work.[7]

One writer ably summarizes the highway influence in the following quote:[8]

> Industry spends millions for new plants, which have to be placed where they can be easily reached by workers and suppliers, and in addition will have ready access to markets. It is only economically sound that industry desires to locate on the vast conveyor belt that lies before us.

Advertising and more desirable public relations are two additional benefits that some firms feel result from location in close proximity to highways. The fact that some companies consider highways to possess

---

[6] Prendergast, op. cit.

[7] John F. Kelly and Edward P. Reilly, "Industry and Frontage Roads," California Highways and Public Works, (July-August, 1954), p. 5.

[8] Mac New, op. cit., p. 85.

immeasurable advertising value is pointed out by a plant survey conducted in California. That survey attempted to ascertain the benefits enjoyed by firms which had selected a location adjacent to the freeway. Six of the nine plants located on the Santa Ana Freeway reported that their location is an asset to the business from an advertising standpoint.[9]

Desirable public relations resulting from highway locations are pointed out by the observations of a chemical manufacturer. He reports a twofold beneficial effect from his recent location on a major road. (1) The prestige of his company has increased by the attitudes developed among the large number of people that pass his plant each day. (2) Securing employees is easier because people like to become identified with a well known company.[10]

Common sense dictates that the major benefits of increased acreage, movement of raw materials and finished products, and convenience of labor mobility, resulting from location in close proximity to highways, be accepted as relevant. Of concern in this study is the priority given to these benefits in selection of specific sites. In addition, some indication is desired concerning the universality of advertising and public relation benefits noted. If considered, what priority is placed on selecting a location which provides these benefits?

---

[9] Kelly, op. cit., p. 6.

[10] Yaseen, op. cit., p. 156.

GENERALIZATIONS AND CONCLUSIONS CONCERNING HIGHWAY INFLUENCE IN SITE SELECTION

In selection of the firms studied, no attempt was made to obtain plants located near a particular type of highway construction. Consequently, no observations can be made concerning the type of highway and the degree of influence.

As a means of ascertaining the universality of advertising and public relation influences, two direct questions were asked during interviews.[11] Each interview contained a brief summary of the reasons for requesting highway information. This presentation prefaced the general discussion of highway influence and served as an introduction. No mention was made of advertising or public relations benefits. Until directly asked the two questions, the person interviewed was not aware of the interviewer's interest in these factors. In evaluating the observations and conclusions regarding advertising and public relation benefits, the reader's attention is again directed to the fact that only two firms studied, B and E, sell to a consumer's market.

Observations Concerning General Highway Influence

1. With the exception of Firm A, all firms studied felt that location in close proximity to a major highway was a prime prerequisite. These firms would not consider locations that did not offer adequate highway facilities.

2. Specific requirements concerning desired type of highway facilities were established by only one firm. Firm E stated in its

---

[11] Appendix C, "Interview Outline," presents the two questions asked during each interview.

specifications that it was necessary for a four lane highway to border one side of any potential site.

3. Each plant studied is located on or near a major U.S. highway. Firms B and F are the only companies that are not directly adjacent to a major road.

4. Only Firm B can not be seen by passing traffic.

5. With the acception of Firm A, truck transportation is one of the major means of distribution. The consensus of opinions was that this mode of transportation will increase in importance during future years.

6. Consideration given to highway influence in selection of sites did not vary according to the number of location problems confronted by the firm. No relationship was observed between the size of business volume and the consideration given to highway influence.

Observations Concerning Advertising and Public Relation Influence

1. Advertising benefits, resulting from location in close proximity to a major highway, were not considered by five of the six firms studied.

2. Firm E did consider advertising when establishing site specifications. Some doubt was expressed by this firm regarding the direct value of this type of advertising.

3. The two firms serving a consumer market reacted differently to the benefits of advertising. As noted above, Firm E gave attention to this influence when establishing specifications; Firm B did not. When completed, Firm B's plant will not be visible to passing traffic.

4. Firms B and D expressed no opinion regarding possible advertising

benefits that could have been realized.

5. Firms A, C, and F expressed the opinion that serving an industrial market made consideration of the advertising factor unnecessary.

6. Two firms gave consideration to the public relation aspects of location. Firm E considered this factor during establishment of specifications. Firm F gave some consideration during construction of their plant on the selected site.

7. Three firms, A, B, and D, did not express opinion regarding public relations benefits.

8. Firms E and F felt that some desirable public relations result from location in close proximity to highways. Firm F felt that this benefit could be realized without location on a major road.

9. Firm C feels that benefits of public relations result from factors other than location on a major road. If your firm offers a desirable place to work, people will find you regardless of your location.

10. Although the two firms considering public relation benefits happened to be the firms which participated in the largest number of location problems, no relationship between size and consideration can be inferred. Each firm gave the problem consideration from different viewpoints. Consequently, no relationship is observed between frequency of search and value placed upon advertising or public relation influence.

Conclusions Concerning Highway Influence

1. Location in close proximity to a major highway is a factor considered in location. The highway needs must be satisfied for

successful location. No firms had to reject a site because of inadequacy of roads. Therefore, the influence of highways is considered as paramount, but not critical.

2. The advertising benefit resulting from location was considered by some firms. Normally, this factor is viewed as an extra benefit which can be realized at almost any location. No weight is placed upon advertising during selection of specific sites. Some difference in the value placed upon this factor is indicated between firms serving industrial and consumer markets.

3. The influence of public relations resulting from location adjacent to a highway is very vague. Considerable doubt was expressed concerning the value of attempting to locate in order to realize this benefit. Beyond doubt, this is not a factor in location. What benefits that can be realized appear to be independent of the type of road to which the plant is adjacent.

SUGGESTIONS FOR ADDITIONAL INQUIRY

1. The basic necessity of locating in close proximity to a highway is paramount for most firms. Additional study concerning the benefits that can be realized from location adjacent to different types of highway construction appears beneficial. As noted in the study observations, only one firm specified that a four lane highway was desired. Industrial development that was reviewed earlier has all taken place in close proximity to limited access roads. Additional inquiry into the reason for this trend may indicate some factors that all industries should give consideration when selecting a site.

2. The results of this study do not agree with those of the California survey concerning the advertising benefits resulting from location in close proximity to a highway. No generalizations can be safely made concerning the markets served by the California firms. Consideration of these opposing results suggests two areas for additional inquiry. (1) Study of the type of market served may provide some insight into the value of locational advertising. (2) All California firms were located on limited access roads. Michigan firms were primarily located on unlimited access roads. Additional inquiry into advertising benefits resulting from location on different types of highway construction may provide some insight into the basic inconsistency between these two studies.

3. No specific suggestion can be made regarding additional inquiry into the aspect of public relations. At this point, a very thorough analysis of all studies available should be completed to ascertain if this factor has been considered in other location problems. If additional study is warranted, this detailed investigation should point out topics for consideration.

APPENDICES

APPENDIX A

OUTLINE OF LOCATION PROCEDURE UTILIZED BY FANTUS FACTORY LOCATING SERVICE

The objective for presenting the following outline is to illustrate for the reader one method of handling details of location analysis within the procedural framework of applicational theory. This outline represents the major areas considered by Fantus when confronted with a location problem. Formally labeled: "Standards of Industrial Analysis," the following outline is divided into four phases. During site selection only the first phase is completed by the client.

I. ANALYSIS OF PRESENT FACILITIES

- A. Brief Historical Outline
- B. Market Analysis
- C. Principle Raw Materials
- D. Labor
- E. Utilities
  - 1. Electrical Power
  - 2. Coal or Oil
  - 3. Gas
  - 4. Water
- F. Workmen's Compensation Insurance
- G. State Taxes and Laws
- H. Local Taxes
- I. Present Plant Analysis
- J. Specifications For New Plant
- K. Plans For Construction of New Plant

L. Locational Preference

M. Cost Relations (Optional)

N. Computation of Present Costs

1. Transportation

2. Labor

3. Plant Overhead

4. Utilities

5. Taxes and Insurance

6. Miscellaneous

II. TERRITORIAL DELINEATION

A. Chart Markets

B. Chart Raw Materials

C. Chart Comparative Earnings in Industry

D. Chart Living Costs of States Under Consideration

E. Compare Labor Backgrounds of States

F. Comparative Labor Laws

G. Comparative Corporation, Real and Personal Property, Income, Franchise, and Other Taxes.

H. Comparative Workmen's Compensation Insurance Rates

I. Politics

J. Comparative Net Debt and Budgets of States

K. Climate and Other Statistical Information

III. COMPARATIVE ANALYSIS OF FINALLY SELECTED COMMUNITIES

A. Location and Population

B. Description of Community

C. Transportation

1. Railroads
2. Highways and Motor Carriers
3. Waterways
4. Airlines
5. Intercity Bus Lines

D. Existing Industries

E. Labor Supply

F. Utilities

G. Water and Sewer Systems

H. Municipal Services

I. Taxes

J. Housing

K. Living Conditions

L. Banks

M. Climate

N. Community Co-operation or Inducements

O. Employer Experiences

P. Site Analysis

1. General
2. Physical Characteristics
3. Transportation Facilities
4. Cost Estimate-Purchase

IV. PRODUCTION AND DISTRIBUTION COST COMPARISON

A. Presents a comparison of potential delivered-to-customer cost of each selected community with present location.

B. Presents comparison of non-recurring costs and intangible factors for selected communities.

APPENDIX B

INTRODUCTION LETTER

July 3, 1958

Name
Address
City and State

Dear Sir:

We are in the process of completing a study concerning plant location procedures. As you probably know considerable attention has been given to various aspects of plant location in theoretical literatures. Unfortunately very little of this theory has been concerned with procedures of location. Research completed to date has for the most part not been substantiated by empirical inquiry. The purpose of our study is to expand the body of knowledge currently available concerning procedures of location. By procedure, we mean the actual steps taken during the process of selecting a new plant site.

Your recent decision to locate a plant in _____ has been brought to our attention through the co-operation of the Michigan Economic Development Department. We believe your experience can be a valuable asset to our study. For this reason we would like to invite your co-operation.

What will be required of you in this research? Essentially we would like one hour of your time. Donald Bowersox, a graduate student who is conducting this research under my supervision, would like to make a trip to your plant to conduct a patterned interview. The purpose of this interview is to obtain information concerning the procedures you utilized in locating your plant. Our objective is to make observations which can be used to test the relevancy of current theoretical assumptions. Your identity will be treated in the degree of confidence you desire.

Mr. Bowersox will be traveling in your area during the week of July 7-11, and would like to call on you at your convenience. Looking forward to your co-operation, I am

Sincerely yours,

Arthur E. Warner, Acting Head
Department of Insurance, Law
and Real Estate Administration

AEW/hga

APPENDIX C

INTERVIEW OUTLINE

1. Introduction
   - A. General discussion of reasons for requesting interview and objectives of research.
2. Procedural Discussion
   - A. Brief explanation of desired information concerning locational procedures utilized by the firm.
   - B. First general lead question: What procedures did you follow in selecting your plant site at _____ ?
   - C. Direction questions as needed.
3. Highway Discussion
   - A. Brief explanation of reasons for interest in highway factor.
   - B. Second general lead question: In selection of your site--what relevancy did you place upon locating in close proximity to a major highway?
   - C. Direction questions as needed.
   - D. Specific questions:
     1. Advertising--In selecting your site, did you consider the potential advertising that can result from location on a major highway?
     2. Public Relations--Do you feel that location on a major highway will increase the community prestige of your firm?

BIBLIOGRAPHY

BIBLIOGRAPHY

BOOKS

Alderefer, Evan Benner, and Michl, H. E. Economics of American Industry. New York: McGraw-Hill, 1942.

Alderson, Wroe. Marketing Behaviour and Executive Action. Homewood: Illinois: Richard D. Irwin, Inc., 1957.

Bigham, Truman C, and Roberts, Merrill J. Transportation. New York: McGraw-Hill, 1952.

Breese, Gerald. Industrial Land Use in Burlington County, New Jersey. Princeton, New Jersey: Bureau of Urban Research, Princeton University, 1951.

_____. Urbanization in Metropolitan Areas Affected by the Building of Large Industrial Plants. Princeton, New Jersey: Bureau of Urban Research, Princeton University, 1953.

Carlson, Albert S. Economic Geography of Industrial Materials. Baltimore: Reinhold Publishing Corporation, 1956.

Chamberlin, Edward H. The Theory of Monopolistic Competition. Cambridge: Harvard University Press, 1950.

Cotterhill, Carl H. Industrial Plant Location, Its Application to Zinc Smelting. St. Louis: American Zinc, Lead and Smelting Co., 1950.

Dennison, S. R. The Location of Industries and The Depressed Areas. New York: Oxford University Press, 1939.

Florence, Philip Sargent. Investment, Location and Size of Plant: A Realistic Inquiry into the Structure of British and American Industries. Cambridge: Cambridge University Press, 1948.

_____. Industry and the State. London: Hutchinson University, 1957.

Floyd, Joe Summers. Effects of Taxation of Industrial Location. Chapel Hill: The University of North Carolina Press, 1952.

Fisher, Ernest M., and Fisher, Robert M. Urban Real Estate. New York: McGraw-Hill, 1949.

Friedrich, C. J. (trans.) Alfred Weber's Theory of Location of Industries. Chicago: University of Chicago Press, 1928.

Greenhut, Melvin L. Plant Location. Chapel Hill: University of North Carolina Press, 1956.

Hague, D. C., and Newman, P. K. Costs in Alternative Locations: The Clothing Industry. Cambridge: Cambridge University Press, 1952.

Holmes, Gerald E. Plant Location. New York: McGraw-Hill, 1948.

Hoover, Edgar M. Location of Economic Activity. New York: McGraw-Hill, 1948.

_____. Location Theory and The Shoe and Leather Industries. Cambridge: Harvard University Press, 1937.

Howard, John A. Marketing Management. Homewood Illinois: Richard D. Irwin, Inc., 1957.

Isard, Walter. Location and Space Economy. New York: John Wiley and Sons, Inc., 1956.

Kelley, Eugene J. Shopping Centers--Locating Controlled Regional Centers. Saugatuck: The Eno Foundation For Highway Traffic Control, 1956.

Locklin, D. Philip. Economics of Transportation. Chicago: Richard D. Irwin., 1947.

Losch, August. The Economics of Location, (Trans. 2nd. ed. revised.) New Haven: Yale University Press, 1954.

Martin, James and Morrow, Glen. Taxation of Manufacturing in the South. University: Bureau of Public Administration, University of Alabama, 1948.

McLaughlin, Glenn E. The Growth of American Manufacturing Areas. Pittsburgh: University of Pittsburgh Press, 1938.

Neilson, A. M. Economic and Industrial Geography. New York: Pittman Publishing Company, 1950.

Nelson, I. C., and Smith, R. C. Transportation Factors in the Location of the Cast Iron Pipe Industry. Washington, D. C.: United States Department of Commerce, 1947.

Smith, J. Russell, and Phillips, Edgen M. Industrial and Commercial Geography. New York: Henry Holt and Co., 1946.

Yaseen, Leonard C. Plant Location. New York: American Research Council, Inc., 1956.

LOCATION ARTICLES AND PERIODICALS

Atkins, Robert M. "A Program for Locating The New Plants," Harvard Business Review, Vol. 30 (November-December, 1952), 113-21.

Borloon, Marvin J. "Second Transportation Revolution," Harpers, Vol. 214 (March, 1957), 37-48.

Business Week. "Welcome for Industry Varies With the Town," (March 30, 1957), 134-44.

Dun's Review and Modern Industry. "Location Analysis," Vol. 67 (April, 1956), 59-113.

Factory Management and Maintenance. "Plant Site Selection Guide," Vol. 115 (May, 1957), 182-84.

Fortune. "Where to Put Your Plant," Vol. 54 (July, 1956), 100-04.

Fulton, Maurice. "Plant Location 1965," Harvard Business Review, Vol. 33 (March, 1955), 40-50.

Greenhut, Melvin L. "A General Theory of Plant Location," Metroeconomica, Vol. 7 (1955), 59-72.

_____. "Integrating the Leading Theories of Plant Location," Southern Economic Journal, Vol. 18 (April, 1952), 526-38.

_____. "Observations of Motives to Industrial Location," Southern Economic Journal, Vol. 18 (October, 1951), 225-28.

Harris, Chauncey. "The Markets as a Factor in the Localization of Industry in the United States," Annuals of the Association of American Geographers, Vol. 44 (December, 1954), 315-48.

Iron Age. "Location--What Planned Sites Offer," Vol. 177 (April 26, 1956), 58.

Isard, Walter. "The General Theory of Location and Space Economy," Quarterly Journal of Economics, Vol. 43 (November, 1949), 476-506.

Katona, George, and Morgan, James N. "The Quantitative Study of Factors Determining Business Decisions," Quarterly Journal of Economics, Vol. 66 (1952), 67-90.

Kryzanowski, Witold. "Review of the Literature of the Location of Industries," Journal of Political Economy, Vol. 35 (April, 1929), 278-291.

Lester, Richard. "Effectiveness of Factory Labor: South-North Comparisons," Journal of Political Economy, Vol. 54 (1946), 60-75.

McLaughlin, G. E. "Industrial Expansion and Location," Annuals of the American Academy of Political and Social Science, Vol. 242 (November, 1945), 25-9.

Muncy, D. A. "Land for Industry: Neglected Problem," Harvard Business Review, Vol. 32 (March, 1954), 51-63.

Nations Business. "Transportation Faces a New Era," Vol. 44 (December, 1956), 34-35.

Ormond, H. H. "How Ford Selects Plant Sites," American Business, Vol. 16 (June, 1946), 12-13.

Predohl, Andreas. "The Theory of Location in Its Relation to General Economics," Journal of Political Economy, Vol. 36 (June, 1928), 371-89.

Railway Age. "Freight Rates Up 107% in 11 Years," Vol. 143 (August 26, 1957), 14.

Regan, Philip H. "Industrial Foundation and Community Progress," Harvard Business Review, Vol. 30 (November-December, 1952), 69-83.

Renner, George T. "Geography of Industrial Location," Economic Geography, Vol. 23 (January, 1947), 167-89.

Science News Letter. "Selecting Factory Sites," Vol. 60 (December 8, 1951), 358.

Shaffer, Helen B. "New Sites for Industry," Editorial Research Reports, (December 19, 1956), 889-904.

Smithies, Arthur F. "Optimum Location in Spatial Competition," Journal of Political Economy, Vol. 49 (1941), 423-39.

Valavanis, Stefan. "Losch on Location," American Economic Review, Vol. 45 (1955), 637-44.

Wood, Charles P. "Industry Now Has Wider Choice in Plant Location," Factory Management and Maintenance, Vol. 104 (April, 1946), 843-46.

HIGHWAY ARTICLES AND PERIODICALS

Atlantic Road Builder. "New Jersey's Freeway Parkway Will Develop Exclusive Residential and Industrial Sections," Vol. 1 (September, 1946), 6-37.

Hollinshead, E. D. "Migration of Industry," Urban Land, Vol. 16 (November, 1957), 1-6.

Kelly, John F. "Industry and Freeways--Spectacular Industrial Growth Adjacent to Eastshore Freeway," California Highways and Public Works, Vol. 33 (May-June, 1954), 22-29.

_____, and Reilly, Edward P. "Industry and Frontage Roads--Property Owners Acclaim Santa Ana Freeway an Advantage to Industrial Business," California Highways and Public Works, Vol. 33 (July-August, 1954), 1-6.

Mac New, Thomas. "Industrial and Business Expansion Will Follow the New Super Highways," Automotive Industries, Vol. 115 (December 1, 1956), 81-88.

Mc Conochie, William R. "Freeways Can Save Urban Transit," Urban Land, Vol. 16 (September, 1957), 1-3.

Prendergast, Frank. "Boom on Highway 128," Industry, (June, 1955), Reprint by Associated Industries of Massachusetts, 1-6.

Suggitt, Frank W. "Land Use Changes Linked to Highways," Journal of Soil and Water Conservation, Vol. 7 (November, 1956), 284-88.

Volpe, John A. "Controlled Access Highways Aid Growth of Industries," Better Roads, Vol. 26 (August, 1956), 27-28.

Zeigler, Charles. "Controlled Access Highways Stimulate Industrial Development," Better Roads, Vol. 26 (July, 1956), 23-24.

MISCELLANEOUS

Adkins, William G. "Effects of the Dallas Central Expressway on Land Values and Land Use," Texas Transportation Institute, Bulletin No. 6, September, 1957.

Federal Reserve Bank of Chicago. "Growth and Prosperity in Five Midwest Cities," Annual Report, 1955.

Kansas Industrial Development Commission. "How You Can Attract New Industry to Your Community," Topeka, Kansas, 1944.

Meloan, Taylor W., Pinnell, George W., and Spencer, Charles H. "Industrial Location Analysis of Linton, Indiana," Indiana Business Information Bulletin, No. 24, Bloomington, Indiana, 1955.

New Jersey Department of Conservation and Economic Development. "Industrially Yours New Jersey--A Guide to Plant Location," Trenton, New Jersey, 1950.

Philadelphia City Planning Commission. "Industrial Land Use Plan for Philadelphia in Relation to Metropolitan Area Development," Philadelphia, 1950.

Stopler, Wolfgang F. Economic Development, Taxation and Industrial Location in Michigan. (Unpublished tax study prepared for special legislative citizen tax study group), Ann Arbor, 1958.

Tallamy, B. D. "Limited Access Highways: Economic Boosters," 1956 Ohio Highway Engineering Conference, Mimeographed speech, April 4, 1956.

United States Chamber of Commerce. "The Community Industrial Development Survey--The First Step in a Community Industrial Expansion Program," Department of Manufacture, Washington, D. C., 1954.

_____. "Finding Prospects for Community Industrial Development," Department of Manufacture, Washington, D. C., 1954.

Weeks, Sinclair, and Green, J. C. "What Will Industry Mean to My Town?" Washington, D. C.: United States Chamber of Commerce, Office of Technical Services, 1955.

ROOM USE ONLY