SHOPPING CENTRE LOCATION ANALYSIS:
SALES VOLUME ESTIMATING

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We accept this thesis as conforming to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA
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ABSTRACT

This thesis is concerned with that part of retail location analysis which involves estimating the sales volume potential for a proposed shopping centre. It examines the practised methods and available models employed in the prediction of potential sales volumes.

A survey of the literature dealing with techniques of sales volume estimation revealed that the theory behind sales volume estimating was somewhat disjointed, since the models and methods available emphasized different approaches and factors, and ignored or inadequately accounted for others. Furthermore, it was apparent that predictive accuracy was far from satisfactory with the presently available tools of analysis. It was felt that the problem revolved around the assumptions and factors inherent or absent in each model or method.

Since estimating a potential sales volume for a proposed centre involved estimating the number of consumers who will patronize that centre, it becomes obvious that an accurate estimate of expected consumer patronage necessitates an understanding of the factors and influences which motivate consumers in their choice of a particular retail outlet in which to purchase desired merchandise. It was felt that by examining these determinants of consumer behaviour, some light could be shed on those factors which are inadequately recognized or represented in the various methods and models examined in this thesis.

This thesis, then, first examines the validity and limitations of the many arguments, assumptions, concepts, and
factors considered to be important in a discussion of the determinants of consumer patronage behaviour. It then examines the various models and methods in order to a) determine how adequately they recognize and incorporate these arguments, assumptions, concepts, and factors in their formulae or procedures, and b) evaluate their ability to produce theoretically sound, consistent predictions.

The models and methods are found to be largely incapable of accurate and consistent predictions owing to their oversimplified and imprecise construction. Inadequately represented consumer patronage factors are presented which, if they were more explicitly recognized, would tend to improve the predictive capabilities of the models and methods. These factors are shown to be additional factors of attraction and resistance which influence the consumer in his choice of a shopping destination.

The main conclusion presented is that if these factors were more precisely defined and quantified, and more explicitly recognized in the formulae, either through restructuring the parameters or through expanding the number of variables in the formulae, the descriptive and predictive capabilities of these models and methods might be improved with a corresponding decrease in the necessity for subjective judgment.
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### PART A

**CONCEPTS AND FACTORS IN LOCATION ANALYSIS**

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CHAPTER I
INTRODUCTION

Statement of the Problem

The growth of the planned shopping centre and its influence on the retailing pattern in metropolitan areas has been well chronicled. The developers of these centres, as well as those retailers who tenant\(^1\) these centres, have long realized the critical importance of location in determining not only the success of the centre as a whole, but also the success of each individual business within the centre. For the developer, location looms as the single most important factor to consider both when studying the economic feasibility of a proposed development, and when planning the actual character, size, and tenant mix for the proposed shopping centre. Specifically, locational considerations are paramount at several different stages of the planning process: first, in scanning a broad region and pinpointing possible sites for development; second, in determining the potential sales volume of the planned centre; and third, in planning the physical facilities to fit that market potential.

The developer's prime concern in contemplating the development of a regional shopping centre is whether or not it will be profitable to him. To be profitable, lease revenues must exceed development and operating costs by a sufficient margin. Normally, development and operating costs can be reasonably accurately determined, but lease revenues depend basically on the types of stores in the centre, their number, their size, and their ability to pay rent. This ability to pay rent ultimately depends

\(^{1}\) The word "tenant" is used occasionally in this thesis as a slang verb meant to denote "occupy as a tenant" or "occupy with tenants."
on their ability to profit in this centre, and that in turn is heavily dependent on location factors. If the centre is inadequately or improperly matched to the retail sales potential existent for it, the tenants will not succeed (or some may not) and the corresponding inability to pay rent will affect the developer's revenues, possibly to the extent that he will profit little, or even lose, on the project.

It is therefore basic that the developer be concerned about choosing a location which has sufficient sales potential to support the businesses in his centre. However, even once having determined that sufficient sales potential exists in a region for a regional shopping centre, the developer has really solved only a part of the problem. The centre must then be tailored as to size, nature, tenant mix, and number of functions, to suit whatever sales potential exists and to comply with the characteristics of the potential market area.

All of these problems are functions of the location of the centre, and in order for the developer to be able to assess locational problems more accurately, it is essential that better tools of location analysis be developed.

In recognition of this need, over the years a great body of research and practical experience has been accumulated on the multifaceted problem of retail location in an attempt to build up a body of knowledge which could aid those concerned with location problems to arrive at better solutions. Geographers, marketers, and practitioners have written extensively on the subject but the information is scattered throughout a broad selection of books and periodicals. In many cases the literature focuses on different
aspects of the problem of retail location. In some cases, the emphasis is on describing complete techniques for location analysis; in others, theoretical models of fundamental relationships are developed; and in others, formal research is conducted on very specific segments of the whole problem in an effort to define more accurately the critical variables and their complex interrelationships. Various models have been developed which purport to describe those factors which are critical in the measurement of a centre's drawing power. Yet, other researchers and practitioners recognize that the models are either too simplified or are inadequately and improperly quantified because they do not give recognition to certain variables which research and experience have shown to be important in the problem.

As a result, the theory of retail location is somewhat disjointed. Methods of location analysis differ, some emphasizing certain basic factors and ignoring others, and some vice versa. Consequently, many location analyses are conducted by selecting several methods, carrying out the analysis, and then taking a compromise from each of the different solutions produced. It is felt that many of the different methods are really trying to do the same thing but no one method is correct, for each one fails to recognize certain variables which have an important bearing on the problem, and each one suffers from a necessity to resort to subjective reasoning.

However, it appears that there has been no recent attempt to analyze critically all the various arguments, concepts, factors, and techniques in retail location analysis in an effort to pull them all together and produce an improved, more comprehensive tool for analyzing the complex problems faced by the developer,
especially those pertaining to ascertaining the sales volume potential existent for a proposed centre. This thesis is primarily an attempt to examine that part of location analysis which is concerned with sales volume estimating. It is written with the developer in mind, something which most writings on retail location analysis do not do. A large proportion of the literature is written primarily from the retailer's perspective and is concerned with his problems in location analysis, but typically, the developer faces a more difficult problem. He must conduct location analyses with a view to developing a successful total retail complex. In this process, his problem is far more complex than that faced by the individual retailer, for he normally has to anticipate the location requirements of each of his future tenants if he is to have any assurance that each one will be successful and thereby contribute to the centre's profitability.

In summary, to cope adequately with the problem of retail location, the developer requires two things: a thorough detailed picture of the complexities and problems of sales volume estimating in retail location analysis, and a broad, reliable framework within which to conduct such analysis. This thesis is basically directed at these two requirements.

**Purpose of the Study**

It is the purpose of this thesis to examine that part of retail location analysis which deals with the problem of sales volume estimating in the planning of shopping centres in order to attempt to illustrate the complex interdependencies of the many variables and present a more complete picture of all the factors involved. The broad intention is to answer such questions as:
what are the factors important in such analysis, how are they related, what methods are practised, what models are offered, and what are their limitations, problems, and inadequacies. More specifically, the thesis will:

1) discuss the validity and limitations of the many arguments, assumptions, concepts, relationships, research findings, and factors deemed to be important for locational sales volume analyses;

2) discuss and analyze the various techniques and especially the models employed in shopping centre volume estimating in order to: a) determine how adequately and to what extent they recognize and incorporate the above factors, and b) evaluate their ability to produce theoretically sound, reliable, accurate predictions.

3) Then, as the primary objective of this thesis, the attempt will be made to specify which of the above factors could be added to, or more explicitly recognized in, the models and their formulae to improve their descriptive and predictive capabilities.

4) Point out where further research is required to refine the techniques of analysis.

**Methodology of the Study**

The thesis will be based primarily on a survey of books and periodical articles dealing with retail location analysis and shopping centres, supplemented to a certain extent by the experiences of a number of people associated with the author in the real estate development field.
Organization of the Written Report

The study is basically organized into two sections, one descriptive and the other analytical.

Chapter II briefly reviews the growth and development of the shopping centre movement as a major force in retailing patterns. The importance of location is then highlighted, followed by a discussion of both the necessity for location research and the growing interest in location research as a means of improving locational decisions.

Chapter III introduces the concept of a centre's trading area from which the potential customers for that centre are drawn. It begins with a statement about the basic notions inherent in Central Place theory which are helpful in developing a perspective within which to view market centres and their area of retail influence as well as the causal factors limiting that influence. The importance of the trade area concept is then presented along with a statement regarding the problems in measuring the potential which the trade area represents. It is noted that trade area delineation involves assessing how consumers will react to the various factors and influences which affect consumer motivation in the selection of a particular retail outlet. The notion is introduced that consumer patronage behaviour is governed by the consumer's perspective and reaction to certain benefit-cost factors, or attraction and resistance factors. It is these factors which govern the extent of a centre's effective drawing power.

Chapter IV is devoted to the task of enumerating, examining, and understanding the various arguments, assumptions,
factors and relationships suggested to be valid in a discussion of the factors which influence consumer spatial behaviour. The intention is to discuss and present what are considered to be the determinants of consumer patronage behaviour so that the techniques of volume estimating can be evaluated in terms of how adequately they incorporate such factors in their conceptualizations.

In Chapter V the methods, and in Chapter VI the models employed in measuring consumer patronage and predicting potential sales volumes are presented and evaluated in terms of their conceptual structure and theoretical validity. The intention is to determine whether they are capable of accurate predictions. The problems and limitations of each are considered, after which attention is turned to examining the variables and assumptions inherent in each. The remainder of the discussion considers the reasons behind their observed inadequacies and attempts to suggest how such inadequacies might be rectified.

The primary findings of the study are then briefly summarized in Chapter VII along with suggestions regarding the areas which require further research to improve the descriptive and predictive capabilities of the analytical techniques.
PART A

CONCEPTS AND FACTORS IN LOCATION ANALYSIS
CHAPTER II

BACKGROUND AND PERSPECTIVE

The term shopping centre is meant to denote a planned grouping of retail facilities, developed as a unit, often located in a peripheral or suburban location as opposed to the Central Business District (CBD). It normally provides a broad range of integrated services and planned parking facilities. This definition places no limitation on the size of the centre, but stresses the importance of coordinated planning in the development of a single retail agglomeration, when compared with the gradual development of a multitude of independent and unrelated retail outlets over a number of years.

Evolution of the Shopping Centre Movement

The planned shopping centre is a fairly recent phenomenon. Although there were a number of such centres in existence in the 1920's, it is only within the last few decades that shopping centres have become a major force in urban retailing patterns. The importance and growth of shopping centres in the United States and Canada since World War II is reflected in the following statement:

"As of January, 1965, the country had more than 8,000 such centres, with 158,000 stores doing $54 Billion dollars a year. This represents about 1/5th of total retail sales. These shopping centres provide nearly 8 million spaces for parking."

By 1967, the estimate of the number of shopping centres had grown to 10,000. Furthermore, and even more striking, the growth trend in the number of new centres appeared to be accelerating, with one projection estimating growth would result in over 25,000 shopping centres of all kinds and sizes by 1977.  

In view of the relatively recent emergence of the shopping centre as a retail institution, and in view of the astonishing growth rate in the number of such centres, it is little wonder that retailers consider the shopping centre movement to be the single, most important development in retailing in this century.

**Filling a Need**

Planned shopping centres evolved to meet the needs generated by changing environmental factors such as increasing urban population decentralization, increased use of the automobile, increased congestion in the downtown central business district of cities, the lack of adequate and convenient parking facilities in the central business district, and changed consumer buying behaviour.

Most shopping centres were built in outlying locations to profit from the opportunities afforded by exploding population growth. Following World War II, residential construction in the

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suburbs accelerated rapidly as the number of available vacant home building sites diminished rapidly in the central area of larger cities. Because of the greater distance separating the central business district from these consumers, and because of the increasing use of the automobile and the related increase in traffic congestion, it became increasingly difficult for these consumers to reach the downtown shopping core. The shopping centre flourished in recognition of the fact that consumers in the suburbs would, by choice, prefer more conveniently located, more easily accessible facilities closer to home. The new shopping centres in these low density areas were designed to draw from the highly mobile and widely dispersed population in these new growth suburban communities. Developers, recognizing that new subdivisions were rapidly expanding, and recognizing that these areas would require new retail facilities, planned their shopping centres as scaled-down versions of the downtown core: that is, they recognized the need for a broad range of services analogous to those available downtown, but on a smaller scale.

Aside from the desire to profit by developing facilities in areas of population growth, another factor in the decision to locate in outlying areas involved comparative site costs. Close-in, properly zoned sites were expensive and scarce, and it was often necessary to undertake extensive and costly demolition in

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4 Ibid., p. 70.

order to obtain a site of sufficient size. Developers therefore concentrated on outlying locations where vacant land was relatively less expensive and more abundant.

Role of the Automobile

The increasing use of the automobile in the post war era is one of the main reasons why shopping centres have become so important. Shopping centres have brought goods and services to locations geographically convenient to consumers who can shop by automobile. The automobile enabled the consumer to travel greater distances with less expenditure of time and effort.\(^6\)

It was no longer essential to position retail facilities within walking distance of every population concentration, nor was it essential that the facilities be located on train or bus routes. By the early 1960's the large majority of families in North America owned cars, with an increasing number owning two cars. Shopping centres could be reached more easily; many of the neighbourhood strip centres and local shopping areas began to lose out to the competition from the larger regional centres which were able to offer a broader range in services, selection, prices, and quality and hence the opportunity for more convenient one-stop shopping; the consumer could purchase most of his requirements in one trip at one location and do so in more modern facilities, with better parking, better accessibility, less congestion than downtown, and essentially, more convenience. Modern expressways and freeways permitted rapid transportation across

\(^6\) Kelley, *op. cit.*, p. 50.
broad geographical areas, and centres located at the freeway interchanges could attract consumers from distant points owing to the ease of accessibility afforded by the freeway.

Effect on CBD Retailing

Retailing in the downtown retail area was adversely affected by these changes in transportation patterns, residential trends, and shifts in consumer buying habits. The central business district lost ground steadily to the new retailing facilities in outlying districts. Inadequate and expensive parking downtown, severe traffic congestion, restricted accessibility, poor public transportation, antiquated buildings, poor retail promotion, and slum conditions around the central area all contributed to the decline of the downtown retail core. Some of the central business districts have managed to increase their absolute sales while losing relative position. Others have suffered even absolute sales declines. While the central business district in the large metropolitan area is not doomed to extinction, the prospects are not encouraging. Downtown retailers have been forced to drastically alter their product mix, store hours, parking facilities, promotional efforts, and so on, in the attempt to hold on to a sizable share of the market.

Yet many major retail interests, such as department stores, even though they continued to achieve satisfactory sales

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8 Ibid.
9 Ibid.
volumes downtown, recognized the opportunities opening up in the suburbs. They found it profitable, and often necessary to realign themselves in these suburban communities, in the attempt to attract those new consumers by offering modern, efficient, convenient, planned groupings of retail establishments.

Shopping Centre Characteristics

The modern regional shopping centre exhibits a number of characteristic features: an appearance of overall unity; planned landscaping; civic and cultural facilities; an extended drawing power; scaled-down duplication of the shopping facilities of downtown retail areas, with a minimum of overlapping, employing the idea of one-stop shopping; the best facilities in the metropolitan area for parking; planned alleviation of traffic congestion problems; and the widest variety and selection of merchandise and services outside the downtown retail area. Typically the land and buildings are owned by the developer and the facilities are leased to different retailers. The developer is able to control architectural design features, parking, and tenant types. An assortment of different outlets offering a balanced representation of goods and services is featured. The shopping centre is planned in advance to be an integrated harmonious unit.

The very large centres have one or more department stores, a number of variety stores, a number of apparel stores, other specialty stores, and a complete range of personal services and convenience goods.\(^\text{10}\)

\(^{10}\) Ibid., p. 101.
Shopping centre developers try to attract the best tenants in terms of profitability, merchandising skills, and credit rating. In large centres, department stores, which are the recognized leaders in merchandising expertise, are a prerequisite as tenants. The department store and the supermarket, with their powerful advertising programs, draw customers to the centre. Consequently these stores demand the most advantageous locations within the centre and more favourable rental terms. The smaller stores benefit from the traffic generated by the larger stores but pay higher rental charges. In most cases, department stores are given concessions in the rental charge to entice them into the centre, providing the centre with its major retail magnet.

The modern shopping centre is not unlike the ancient market places through history, in the sense that such market places not only served as local points for economic trade, but also served as centres for civic, political, and entertainment activities. In this same sense, the modern shopping centre can serve not only as a centre for merchandising, but as a community centre for social, cultural, and recreational activities, all of which enhance its power to attract patronage. Civic clubs, theatres, exhibition halls, restaurants, and children's activities all serve as amenities to customers on a shopping trip, thereby increasing the attractive power of the centre by making it a more attractive, enjoyable place to visit. This social aspect

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11 Ibid., p. 102.
12 Nelson, op. cit., p. 4.
along with the more familiar economic one can result in the shopping centre becoming the meeting place for the region.

In summary, shopping centres are becoming ever more important in the urban retailing pattern. As mentioned, the growth rate for new shopping centre development is high, and present indications point to a continuation of the trend. So long as new residential areas are built and occupied, and so long as existing retail facilities become obsolete or inadequate, new facilities will be developed to service new areas and replace old facilities. But the days of easy success in shopping centre development are over. More stringent governmental requirements will have to be met before the necessary approvals will be granted. Increasing competition for new shopping centre sites will necessitate better preliminary research and planning to ensure that proposed shopping centres become successful operations.

**Importance of Location**

Generally speaking, shopping centres have proved to be highly successful entities. But to assume that each new proposed shopping centre will achieve success is to ignore the fact that their success depends upon whether or not they satisfy an essential prerequisite: does a need exist for that centre in the urban retail spatial structure? In other words, success is dependent upon whether a genuine need exists for additional retail facilities in the vicinity of the proposed location for the new centre.

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The developer needs to search out the location with the best sales volume potential for the class of shopping centre he intends to build. Today's mass retailing demands a large investment in store facilities and requires both the developer and the retailer to commit themselves to a location for a long period of time. Mistakes in centre site location, and mistakes in signing up as a tenant in poorly located centres can have serious consequences for developers and retailers. Location is often the over-riding factor governing success. Even a poor merchant may be able to overcome his lack of merchandising capability through the vehicle of a good location.

While a good location does not ensure a profitable operation, it is an indispensable starting point in the life of a shopping centre, and if over a period of time a location becomes an unsuitable one, only an expensive and strenuously sustained merchandising effort will nullify the positional disadvantage and build a satisfactory return for the centre.\[^{14}\]

Of course, even with a good location, profits will not be maximized unless location analysis is undertaken to ascertain how the retailer can best tailor his merchandising policies to conform to the characteristics of the trade area being served.

The developer must follow certain procedures of site selection and business volume estimation if he is to assure the success of his centre. He may choose one site instead of another, or the estimates may help him in determining the character and type of building to construct.

Importance of Location in the Choice of Tenant Types

In order to ensure that a shopping centre will be a profitable development, the developer must be aware of the location potential which exists for each of his tenants. In the end, he is faced with the necessity of renting the property or store space to a tenant. The landlord wishes, of course, to select a retailer who will be successful. Whether, for example, he chooses a shoe store or a children's wear shop depends, therefore, upon the business volume which these two possible tenants might have and the percentage of gross sale payments he can obtain since many leases require a tenant to pay a percentage of sales as rent.\(^\text{15}\) The higher the business volume of the tenant, the more rent he will pay, and the better the profitability of the shopping centre as a whole. Obviously, to make the best choice in tenant types requires comprehensive location analysis to ascertain which tenants have the greatest potential volume in the trade area. If such location research is not conducted, the probability increases of having marginal tenancies, or outright failures, which reduce his return substantially. Furthermore, a less than optimum choice of tenancy types can limit the patronage drawn to the other establishments at the location, thereby creating less than a maximum business volume for the centre as a whole. If the developer is to have assurance that lease revenues will be maintained, he must have prior assurance that sufficient sales volume potential exists to enable the tenant to achieve satisfactory sales levels and afford the rental charge. If the

\(^{15}\) Nelson, op. cit., p. 143.
location decision is left strictly to the tenant, and if the tenant miscalculates the location potential for his type of store, he may fail and the corresponding inability to pay rent will affect the developer's revenues possibly to the extent that he will suffer losses on his investment. It is therefore basic that the developer be concerned about first choosing a centre location with sufficient sales potential for the businesses in his centre, and then second, establishing some guidelines as to the number, size, and types of stores which will optimally fit the market potential existent for the centre.

Increasing Importance of Location

The shopping centre industry has reached a level of maturity. Some areas are "over-stored;"* in many cases construction of new centres out-paces population growth; a considerable number of centres fall short of anticipated sales; and both new and existing centres are confronted with more and sharper competition. The days of wide-open opportunity for shopping centre development are gone. This does not necessarily mean that the rate of new development will slow down. The continuing growth and shifts in population, increasing consumer purchasing power, and obsolescence of older centres will continue to create opportunities for shopping centre development. It does mean, however, that the selection and evaluation of locations has become much more difficult and critical. Increasingly, in order to avoid serious mistakes and improve the probability of success, it will become necessary to further refine the techniques of location assessment, and apply better location research procedures to such management

* Term used by Applebaum meaning "too many stores."
decisions as: where to locate new centres; whether to enlarge or rehabilitate existing centres; and what type of centre should be built in a particular location.

In the past, retailers and developers have often selected locations on an opportunistic and haphazard basis, which sometimes results in unprofitable ventures. However, some developers and retailers are striving to develop better location assessment techniques. While they do not expect perfect scientific accuracy, they do hope that, with the help of research, serious mistakes may be avoided and the probability of success correspondingly improved.

Location Research - History, Status, and Prospects

The magnitude of the investment in a regional shopping centre requires a great deal of study about many market and financial factors. The site chosen, its accessibility to the potential trade area, the store tenant mix, and the collective management of the entire complex determine not only the success of the total venture but also to a very large extent the success which each individual store enjoys.

Centres which are not successful usually display one or more of the following shortcomings:
1) poor site location as a result of poor location analysis;
2) poor design - either the size of the centre is improperly related to the volume potential existent in the trade area, or the stores in the centre are improperly positioned resulting in poor linkages and traffic between stores, or the architectural features are inconvenient and unattractive;
3) poor leasing and tenant selection - either the tenants are inadequately balanced, or they are not properly selected to match the trade area, or there is an excessive duplication of function; 

4) tenants cannot afford to pay a higher rent because their volume is too low, meaning that the centre does not realize an adequate income from these tenants, and consequently suffers from a reduction in profits.

Proper economic study in advance may have avoided these problems of poor site selection, poor design, and poor leasing and tenant selection. Usually the cost of the initial location analysis is infinitesimal in comparison with the benefits or savings that can be derived from it over the life of the investment. 

The need to estimate retail sales potentials, so that retail facilities can be scaled proportionately to these sales potentials, is universal. This is especially true if the objective is to provide adequate retail facilities to the consumer without the economic waste produced by over-building in the market or mismatching the facilities to that market.

Development of Location Research

Systematic location research started several decades ago. At first, interest was very limited and knowledge was sparse, but in recent years, retailers, wholesalers, and shopping

16 Ibid., p. 324.
17 Ibid., p. 142.
18 Applebaum, "Store Location Research - Art or Science?" in Kornblau, op. cit., p. 3.
centre developers have shown increasing interest in location research. Indeed, they have realized that in order to survive, or at least to profit, they must pay considerable attention to locational considerations.

Location evaluation is complex; there is no simple magic formula, nor is there any substitute for informed judgment. But at the same time, informed judgment on matters of location requires factual information and a thorough grounding in locational criteria - in brief, it requires location research.

In the earlier centres, the developers did not use knowingly any of the body of location theory available. Neither did most of them use the early models described in Chapter VI of this thesis, nor did they necessarily feel that such procedures would produce a better decision. Many of them undoubtedly felt that location research was an infant science, and that their own retailing experience and intuition would serve as a better judgment tool than location research as it stood at that time. Indeed, they seemed to share an opinion that selecting a suitable tract for development depended more on experience than on the use of theories or formulae. Essentially these early practitioners employed tools which were theoretical in foundation although they were not consciously aware of it.

The earliest attempts to employ "research" in evaluating sites date back to about the beginning of the century. These attempts, made on behalf of retail chain stores, tried to determine the relative value of a particular site compared to other

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sites in the same business area. They centred on the volume, composition, and quality of pedestrian traffic, and the likelihood of converting most of this traffic into store customers.

The next advance in location research was initiated about 1930 by grocery chain stores, and focused on studies of store trade areas and on the market share which a store secured from its trade area. In the effort to understand these phenomena, available conceptual materials were drawn from various disciplines including marketing geography, behavioural science, statistics and economics.

The third advance in location research coincided with the spectacular development of planned shopping centres after World War II. The investors in these expensive real estate projects recognized the need for the research to support and supplement business intuition. In addition, the larger financial institutions demanded more factual information on which to base decisions regarding the soundness of their investment. Finally, many prospective tenants recognized that location studies were essential in projecting the potential for them in a given centre.

Location Research - Present Status

The third stage in location research has produced by far the greatest advances in theorizing, model building, and manipulating statistical data in arriving at projected sales potentials.

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20 Applebaum, "Store Location Research - Art or Science?" in Kornblau, op. cit., p. 3.
21 Ibid.
22 Ibid., p. 4.
These advances have been welcomed by development firms who conduct research either through their own staffs or with the help of consulting firms who specialize in location research.

Basically, commercial firms expect two things of location research: 1) they want evaluation of specific sites to determine potential sales and the probability of success at these sites, and they want estimates that are within a reasonable range of error. 2) What is more difficult, they want to select, from among the many alternative location possibilities in a metropolitan area or a larger geographic region, those locations which will produce an optimum share of the market potential, a minimum hazard of future sales erosion, and a maximum return on total investment over the long run.

Location research involves prediction. To consistently predict with a reasonable degree of accuracy, there must be a scientific basis. Therefore, accuracy of prediction will depend on the body of scientific knowledge available on the subject and the way in which that scientific knowledge is organized into a methodological framework capable of being applied consistently.

In smaller companies, the evaluation of a location is often handled by one man, whereas in larger companies it tends to be a group responsibility. The very large companies use outside consultants to supplement the research done within the firm.

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23 Ibid.
24 Ibid.
In a study conducted in 1963, William Applebaum found that the retail location effort made by large retailers, compared with the magnitude of the investment and risk in new retail developments, was very modest and often only a part time job. Few firms employed sophisticated comprehensive studies. Most firms considered only certain factors such as population (characteristics and income), competition, automobile traffic, economic aspects of the area, retail sales, and the occurrence of existing shopping centres. Few firms studied consumer preferences and shopping patterns. Few firms comprehensively studied a whole area to determine where the most promising sites were located, preferring instead to evaluate single sites without regard for whether or not this site was superior to other available alternative sites. Although most firms made sales projections beyond opening date, few projections were for more than one year after opening. Only a minority of the firms questioned made a follow-up study to determine the reasons for discrepancies between actual sales and estimated, predicted sales. Many of the companies have only limited knowledge of the published information on location research techniques.

However, there is a great and growing interest in retail location research and widespread recognition of the need for more definitive techniques and better informed analysts. Qualified staffs have emerged, outside consultants are available, and better techniques are developing in answer to the need.

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Location research is many things to many people. In the universities and the journals, it is a serious professional concern with principles, definitions, analyses, models and methods. With a limited number of research consultants, an equally serious, thorough, professional approach is the rule, although there are some who charge considerable fees for unsubstantiated guesswork presented under the name of "research." The wide range in quality grades in location research is also evident in the contributions made by scholars of economics, geography, marketing geography, sociology, and planning. Some contributions are rigorously conceived and tested and are sophisticated additions to knowledge. Others display little substance.

Generally, the calibre of most current location research reports written for industry by consultants or firms do not reflect the level of knowledge in the literature. A great deal more is known than is evidenced. There is a heavy reliance on the format followed, and in many cases, reports from the same firm several years apart may differ only as to the specific details. The approach is the same, time after time, much like mechanically filling in a checklist. This inflexibility produces such stereotyped reports that they do not adequately examine all of the variables important to the analysis of a specific location, and this in turn affects their reliability and usefulness. For example: there is often no reference to the economic climate under which sales estimates are projected; no reference is made

27 Ibid., p. 11.
to the present and future outlook for the regional economy; the competitive structure is inadequately evaluated; the methods used in projecting population or income are not explained, meaning that the data must be accepted on faith and cannot be evaluated; sources of data are either improperly identified or omitted, and in fact it is impossible to determine in many instances whether the findings are based on "facts" or are merely unsubstantiated guesses; definitions are not rigid; there is often a significant lack of information on consumer shopping behaviour patterns in the given area; and many reports appear biased in that they only include arguments which support the desirability of a site, and ignore the unfavourable aspects, which, if mentioned, might tend to influence the decision-makers negatively towards that site. Furthermore, separately conducted, practical research studies carried out on the same location problem can provide wide variations and discrepancies in their findings. This is evident in the following statement:

"They questioned the reliability of the different sales potentials estimated for the shopping centre as a whole and for the department store in particular. The executives were puzzled by the variations in the population, income, and expenditure data and projections in the several reports. They wondered whether they should get a prominent professor of marketing to "try to extract from the report some clear-cut guidelines for the Draper Companies." The president felt that "for the Delmonte project we sure could use objective guidelines, in addition to our own observations, experience, and judgment. It is a big project and there remain many unknowns. In the long run success will depend

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on the volume of sales that the shopping centre can generate. This still remains a fuzzy area."

In summary, the state of the art is not particularly satisfactory - but the demand for sophisticated research is increasing, and hopefully, as the practitioners improve their level of expertise, and as further advances are achieved in the techniques of location analysis, the quality of practical research studies will improve along with the rising demand for them.

Necessity for Further Development

The question arises, can location research be a science? Science attempts to describe phenomena and predict outcomes. Not until location research is capable of accurately and consistently predicting outcomes can it be called a science.

How successful is present location research in its ability to predict accurately? Few firms that conduct location research provide adequate budgets for follow-up research to check the degree of accuracy of the original sales estimates against actual realized sales. Furthermore, the unpredictable changes in competition and the changes in merchandising policies can cloud the evaluation of results. However, the fact that retail firms and shopping centre developers want more location research, and are willing to pay for it, suggests that they believe this research has value for them.  


30 Applebaum, "Store Location Research - Art or Science?" in Kornblau, op. cit., p. 5.
Improvements in location research are required in many areas: 1) in effectively assessing the impact of competition. Efforts have concentrated on measuring competition quantitatively, either by the number of stores, or the number of square feet, or the amount of store frontage. But what is the effect of variety and quality of products sold, price structure, merchandising strategies, age and condition of the facilities, and personnel services - all the qualitative aspects which contribute to image and consumer acceptance? 2) in knowledge of consumer expenditures and shopping habits. More must be known about consumer expenditures for different types of goods and services, by socio-economic groups and by geographic areas, and the reasons for any patterns or differences in pattern. There must be a better understanding of how and why people shop. 3) in developing better criteria for judging the optimum quantity of retail facilities required by a given area, and as a corollary, what size of centre, how many stores in that centre, of what size and what type. 4) in assessing the effects on the centre's profitability of such factors as store sizes, sales per square foot, sales potentials - in fact, every factor which affects that centre's profitability. The aim should be to provide refined analytical tools and formulas which are capable of producing accurate absolute numbers for decision-making given proper quantified inputs. As will be seen later, present location research methods are far from providing such accurate, quantitative formulas, so that assessing the effects of various factors on profitability still

31 Ibid., pp. 4-5.
32 Ibid.
requires a good deal of guesswork and subjective judgment.

5) in determining how to make better use of computers in location analysis. Their ability to store and retrieve data, and to provide faster, more economical processing of statistical information can provide invaluable aids and refinements to any computations, provided that inputs are correct, meaningful, and practical.

Summary

Planned shopping centres are increasing in importance and have evolved to meet the needs generated by changing environmental factors in a modern society. But the success of such projects is no longer assured. The demand for improved techniques of location assessment is growing in recognition of the fact that sound locational decisions are becoming ever more important to the success of such retail establishments, and presently available techniques of location assessment leave room for improvement.

The economic feasibility of a new project depends primarily upon whether that project will achieve a sufficient volume of sales after opening. The primary task of location analysis is to provide an accurate estimate of the sales volume which a proposed retail facility can expect to achieve. This involves estimating the number of consumers who will be drawn to the centre, and the discussion of this subject commences in the next Chapter.

\[\text{Ibid.}\]
CHAPTER III

THE CONCEPT OF TRADE AREA

Locational decisions are primarily concerned with two things: evaluating the sales potential of a given location, and determining the best mix in facilities and merchandise which will maximize sales. This involves studying the potential customers for the new centre. Traditionally, it has been common to assume that potential customers are drawn from a specific geographical region surrounding the centre. Such a region is known as the trade area. The following discussion illustrates this point.

Central Place Theory

Urban geographers have developed a body of theory known as Central Place Theory\(^1\) to account for the regularity in the marketing functions performed by "central places." The following discussion briefly outlines the observations and concepts on which Central Place Theory is founded.

It has long been recognized that a monotonous pattern of regularity exists in the geographic dispersion of settlements in any typical country. These settlements provided shopping, business and social functions to the townspeople and surrounding population. As such, each settlement was in actuality a market centre which developed to supply a variety of services to the

population of a particular area. They evolved as convenient locations for grouping together various services to meet the needs of the population.

Around any large city, in ever-widening circles, are a number of towns, diminishing in size as the distance from the city increases. However, each smaller settlement, or town, is itself surrounded by still smaller satellite clusters of activity. These "central places" all supply centralized market services to their surrounding populations, but on a lesser scale as their size decreases. This is the visible evidence of what theorists call a central place hierarchy: successive classes of inter-dependent market centres.

Central places form a system that includes interacting, inter-dependent parts. The larger centres duplicate the retailing functions of the smaller centres but also provide additional functions in more establishments. Each market centre has a well defined area from which it draws its customers. Larger centres draw from a larger area, and smaller centres from smaller areas. Small centres cannot perform all of the functions found in the larger centre because the market area they command is too small to support some of the functions profitably. For activities requiring very small market areas, such as food outlets, villages are able to stand alone and compete with larger surrounding places over short distances. However, for stores requiring larger minimum market areas (for example, dry cleaners), larger centres dominate the villages because they offer a function which is not

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found in villages, and in this way encourage customers to travel further than to the nearest village. Similarly, those stores requiring very large market areas (department stores) are found only in the largest centres, and consumers living near the villages and towns are forced to travel beyond them to the cities.

It is this succession of classes of centres all arranged in a hierarchical geographical pattern that forms a basic part of Central Place Theory.

Because successive steps in the hierarchy contain larger centres providing more functions for larger market areas, the number of different kinds of business types is used as an indication of a centre's status in the hierarchy.

In rural areas distance has a major impact on the choice of market centre because the travel time and cost are so great. Competing centres draw customers from the area between the centres in proportion to the attractive power of the centre. At a point somewhere between the centres called the "breaking point," consumers on either side tend to patronize the centre on their side of this hypothetical point. Differences in the attractiveness of centres merely pull the breaking point one way or the other. However, in metropolitan areas there is no such thing as an absolute breaking point since consumers are able to choose from a number of centres all within the maximum distances they are willing to travel.

In urban areas, it was felt that retail facilities followed a hierarchy of market centres (convenience clusters,

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Ibid., p. 17.
neighbourhood, community, and regional centres) comparable to the hierarchy of centres in rural areas. However, market centres in urban areas served larger populations than those in rural areas. Since the population served was larger, the geographical trade area required to support that centre did not need to be as large as in the rural situation. Furthermore, trade areas in urban areas tended to overlap to a greater extent than in rural areas.

Threshold and Range

Central Place Theory begins by examining two elements relevant to rural regions: 1) the threshold of a given kind of business; that is, the smallest market area that will support the smallest economically feasible establishment of the class; and 2) the range of a centre, or the maximum distance consumers are willing to travel to it.\(^4\)

The threshold for each kind of business is established, and then for each kind of business the number of stores of threshold size that can be supported by the market in a given area is determined. According to logical and theoretical considerations of competition, these stores would be evenly spaced throughout the area with each store surrounded by a compact minimal market area which does not overlap with the market areas for other centres. Theoretically, then, each of these stores captures a segment of the total market, and serves it exclusively. In the hypothetical case of a perfectly uniform population distribution, theoretically these stores would be regularly spaced throughout the market, and market areas would be a set of regular

\(^4\) Ibid., p. 18.
hexagons with each store in the centre of the hexagon. In this manner the total market would be optimally served. However, as the actual population distribution varies from this perfectly uniform pattern, the spatial arrangement of stores and market areas varies from such a theoretical arrangement.

Obviously, the consumer would rather visit a single central place for a variety of needs than travel to a separate location for each different commodity he requires. It is assumed that some larger centre (the city) performs all the functions required by consumers. Locations of centres around the metropolis are then shifted within the limits imposed by the threshold-sized trade areas (the minimum) and the outer "range" or maximum distance beyond which consumers will not travel. In other words, centres around the city occur at locations where the necessary threshold-sized trade area exists within a limited distance from the centre (limited by the range of the goods offered). This shuffling minimizes the number of centres required to serve consumer needs and leads to a hierarchy of places by size, connected in an interdependent system.

Through its concepts of threshold and range, Central Place Theory highlights the importance of the trade area in retail location analysis, and points out the fundamental problems faced by any developer or retailer contemplating a new location; does a sufficient (a threshold) trade area exist for the proposed centre within the distance limits imposed by the ranges of the goods offered at the centre? Within the range of this centre, or the maximum distance consumers are willing to travel to it, is there a sufficient trade area to support this centre?
This discussion of Central Place Theory has been intentionally brief and superficial in recognition of the observation that the theory is primarily of value as a descriptive tool rather than an analytical one, and as such it is of limited importance in a study of analytical techniques of sales volume estimating. However, it does help to introduce the concept of trade area and the importance of trade area in retail sales volume estimating.

**Defining "Trade Area"

The definition of the concept "trade area" varies according to the way the concept is applied in different situations. It can be defined as "that area from which a store gets its business - where the customers come from." The trade area is often described as a geographically delineated region containing the probable customers for the goods found in the shopping centre. It is often defined as the area of influence from which a shopping centre could expect to derive 80 - 90% of its total sales volume, this area often being divided into primary, secondary, and occasionally tertiary zones depending on the method of analysis. Stating the exact definition of a trading area (or any of its subdivisions) is difficult. There are probably as many definitions as there are stores and location analysts. To some, the primary trading area for example is simply "where the store gets most of


its business." To others, it is precisely, "where the store gets 75% of its business," and so on. Nevertheless, the point to remember is that the trade area contains the potential customers from which the retail outlet attracts expenditures. The outer limit of this trade area is considered to be that point at which the retail outlet ceases to attract customers.

**Importance of the Trade Area Concept**

There is only one way in which the final decision on the choice of location should be made. That is through the careful preparation of business volume estimates on alternative sites. From the point of view of the shopping centre developer, the decision to open a new centre must be based, in the end, upon a comparison of the amount of business volume that can be done at each location and the occupancy cost of location, together with the projection of both business volume and costs into the future. Obviously location is not the only factor determining the success of the operation or even the business volume. There are also merchandising ability, reputation, character of service, personnel, competitive cost of commodities and a great many others. However, in estimating business volume, the prime area of concern and the major challenge in location research, is in quantitatively evaluating the potential of a centre's trade area, from which it will draw its business volume.

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7 Kane, op. cit., p. 27.
8 Nelson, op. cit., p. 141.
A thorough knowledge of the character and extent of this trade area is essential. The developer of a proposed retail facility must have this information in order to evaluate realistically the likely success of the venture. Not only does the knowledge of the retail trade area provide a basis for estimating potential sales, but it also makes it possible to determine investment requirements for land, buildings and fixtures, as well as the types of tenants and kinds of merchandise offerings, promotional activities and so on.

Traditionally, determining the volume of business which can be done at a given location involves counting the potential customers in the trading area and finding out in detail how much money they have to spend and are willing to spend for the type of goods provided by the stores in the centre under study. This step provides an answer to the question of how much business is available, in total, in this trading area. The remainder of the analysis of the site has principally to do with determining how much of the total business can be captured by an outlet there.\footnote{Ibid., p. 148.} But measuring how much business is available requires first that the trade area be delineated, a subject which presents considerable difficulties, as discussed below.

\textbf{Problem of Trade Area Delineation}

Trade areas are delineated by many different methods. These include topographical features which enforce a trade area boundary, competition, driving time, and a great many other...
factors all of which are discussed in the next chapter. In fact, in location analysis, the problem of trade area delineation is so complex, that the whole economic justification for the shopping centre is dependent upon securing a satisfactory business volume for that centre, and this business volume is derived from that centre's trade area. In order to estimate the sales volume, it is therefore necessary to know the size of that trade area both in terms of its physical size, and in terms of its dollar volume size. Since the factors which shape the trade area are multitudinous, it becomes a major challenge of location analysis not only to outline that trade area but to estimate its potential volume for the centre in question. By far the most difficult problem in location analysis involves ascertaining the limits of a centre's area of influence. Traditionally, this trade area has been delimited geographically to encompass a certain area surrounding a centre. The point of contention arises over the question of how to decide where the area of influence (trade area) terminates.

So much has been written on trading areas since the turn of the century that one can trace out the historical development of traditional methods of analysis. The first attempts sought to explain the demand for retail merchandise in an area in terms of economic factors such as population and its distribution, population characteristics, income, location of existing establishments and the likes. Some authors using this approach discussed the economic base of a community for retailing in loose and informal fashion, while others more quantitatively inclined sought to develop quite sophisticated laws or formulas which when solved supplied indices of retail potential. The second basic approach
starts with the consumer and through survey data attempts to evaluate retail potential in terms of his shopping habits. This type of analysis focuses on such things as how far the typical or average consumer is willing to travel for certain types of merchandise, and generally attempts to discover underlying regularities in the manner in which he organizes his travel patterns.

Consumer Behaviour and Trade Area Delineation

Trade area delineation is a problem of assessing how consumers will react to the various factors affecting consumer motivation in the selection of a retail facility in which to purchase the various types of goods they require. The consumer intuitively computes the advantages and disadvantages of various shopping locations in terms of a benefit-cost trade-off: what satisfaction can be achieved at what cost in money, time, and energy. The costs of acquiring goods are of two kinds: 1) the direct monetary outlay for the article or service, and 2) the expenditure of money, time, and physical or nervous energy in getting to or from the place where the article or service can be obtained. The resistance to movement in space has been generalized in the term "friction of space." Friction of space is basically a cost element in the benefit-cost analysis. The importance of "friction of space" is evident in the

10 C.T. Jonassen, The Shopping Centre Versus Downtown, Columbus, Ohio, Ohio State University, Bureau of Business Research, College of Commerce and Business Administration, 1955, p. 6.
11 Kelley, op. cit., p. 51.
observation that most shopping centres draw business with an intensity that decreases generally as distance from the centre increases.\(^{12}\) A map that shows the distribution of a shopping centre's customers most often reveals a definite clustered concentration close to the centre, generally within a number of miles of it. As distance from the centre increases, the frequency of customers diminishes rapidly,\(^{13}\) a result of the fact that the increasing costs involved in travelling greater distances increase the consumer's resistance to patronizing that centre.

It is therefore the consumer's shopping behaviour which governs the potential likelihood of his patronage at the shopping centre. His shopping behaviour is governed by his perspective toward certain cost-benefit factors. To estimate the potential patronage for a proposed shopping centre, an understanding of those factors affecting behaviour is necessary. It is also necessary to understand how the consumer reacts to such factors. Only then can an analyst hope to determine the potential patronage and in addition, the potential sales volume which is likely to accrue to that centre.

**Trade Area Subdivisions**

Location analysts frequently find it useful to subdivide the trade area into primary, secondary, and tertiary (or fringe)

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\(^{13}\) *Ibid.*, p. 27.
areas. Such subdivisions are typically related to automobile travel time, or time-distance, and are particularly useful in studying proposed large planned shopping centre sites. Very few published quantitative data are available to support the validity and usefulness of travel time intervals to delineate subdivisions of trade areas.  

In defining the primary trade area, analysts arbitrarily set a ratio of store sales from that area to total store sales. The figure used is generally 50 - 70%. If the analyst uses the figure of 60% of total sales, the primary trade area would be defined as that area closest to the store, has the highest ratio of customers to population, and brings the store 60% of its total sales. Similarly, the secondary trade area can be defined as the area adjoining the primary trade area, with the next highest ratio of customers to population, from which the store gets a stated amount in percent of its sales. The tertiary (or fringe) trade area would represent the remaining portions of the store's trade.  

Centre Size Assumptions in Trade Area Delineation

The process of preparing a detailed evaluation of a proposed shopping centre necessitates the appointment of subjective judgment at two stages. The first of these involves the

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14 Ibid., pp. 27 - 29.
16 Ibid.
17 Ibid.
delimiting of the area of effective attraction (that is, the trading area of the centre under analysis) which necessitates an hypothesis as to the facilities which the centre will contain as the basis for further study. Theoretically the types of shopping centre which might be built on a site are infinite. In common practice, the analyst studies the site and the latest population census and building permit figures, drives through the trading area, looks at competitive stores and shopping centres, and then establishes a conceptual image of what seems to him to be the most likely shopping centre that could successfully be built upon the site. He begins with a hypothetical centre which he guesses might be successful; and the rest of his research is pointed towards proving or disproving this hypothesis. In other words, he selects a certain size range for the centre as a starting point for his analysis. The object of the research is then to more clearly define the optimum size to match the optimum potential available to it. The analysis will prove or disprove whether the potential is in the range assumed, or else it is much smaller or larger. But the point to be made here is that without some prior idea of how large a centre might be and what sort of tenants it might contain, it would be difficult to begin to delimit the trade area for that centre, because it is necessary to know the size in order to have some sort of gauge of the attractive power of the centre which is directly related to the size of the trade area. For example, if a neighbourhood centre

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18 Nelson, op. cit., p. 183.
19 Ibid., p. 186.
was the only size contemplated, the trade area for such a centre is much smaller than that for a regional centre because its attractive power is much less than a regional centre's. However, even after starting with the assumption that the site will likely contain a regional shopping centre, beginning assumptions as to the range of possible sizes may have to be altered in the light of trade area analysis. The procedure for making the hypothesis is to assume the most likely situation or situations with respect to the major store units and the size of the site, and then, within the limitations of those assumptions, to hypothesize the size of the centre. If subsequent analysis proves the hypothesized size should be altered, then a new size is hypothesized, and the analysis repeated. Such a procedure essentially involves successively approximating the size until the optimum is discovered. In a sense, it involves a degree of circular reasoning since an assumption must be made as to centre size before an estimate of the potential can be made after which that estimate may cause the size assumption to be altered; whereas it would be more desirable to ascertain a potential and then translate this into a sufficient centre size to adequately serve this potential. However, this subject will be discussed more thoroughly later in the thesis. The main point to remember is that delineating the trade area requires that an assumption be made regarding the size of the proposed retail facility.

20 Ibid., p. 188.
Different Trade Areas for Different Merchandise

The problem of delineating the trade area for the shopping centre as a whole is compounded by the fact that the trade area for each type of store in the centre differs according to the type of merchandise offered: consumers are willing to travel greater distances to acquire certain goods than they are for others. The supermarket, drug stores, cleaners, beauty and barber shops will draw customers (on their own) chiefly from the immediate neighbourhood. The major department store will draw customers from a much greater distance. The boundaries of these trade areas are difficult to define by a rigid formula in miles or time-distance. The distance of attraction will vary according to factors of attraction and resistance, and the consumer's attitude toward these factors.

Necessity for Refining the Delineation Procedure

In most practical location analyses, the trade area was generally delineated subjectively, on a tentative basis, so that analysis of that area could begin in detail. There did not appear to be any justifiable, scientifically accurate method for delineating. In most cases the analyst arbitrarily set some limit which meant drawing some sort of line around the centre an assumed distance from it. If subsequent analysis showed the line to be too close, the analyst just moved it farther away.

In the attempt to refine this procedure, various methods were proposed and employed which supposedly provided some

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21 Ibid., p. 212.
improvement in accuracy. Among these (all of which will be examined in detail in Part B) the most frequently used included:

1. Reilly's formula
2. Drawing driving time isopleths on a map
3. Analyzing shopping habits and preferences in centres of comparable status and conditions
4. Analyzing retail expenditure in comparable locations
5. Drawing concentric rings or probability contours on a map
6. Applying theoretical formulas

In all of these, assumptions were made regarding consumer behaviour, or the way consumers act as a consequence of their perception of (and attitude towards) various attraction-resistance factors. Only through understanding these factors and the way they affect consumer behaviour and attitudes, can any meaningful estimate of the extent of the trade area be made.

Briefly, some of those factors affecting the size and shape of the trade area include: the convenience of the location; the size of the centre; the types of merchandise sold in the centre; the manner in which they are sold; the shopping habits of the customers; the location of existing competition; the population density; the existence of unpopulated zones; natural and man-made barriers; the proximity to the central business district; the ease of access to the location; traffic patterns; and the nature of the location. A more comprehensive discussion of these factors follows in the next chapter.
Summary

This chapter has briefly examined the importance of the trade area concept and discussed the problems inherent in measuring it, both in terms of its physical size and its monetary size. It was observed that the extent of a retail centre's area of influence (trade area) is largely determined by how consumers react to various factors of attraction and resistance. To more accurately assess the potential existent for a proposed retail outlet, it is therefore necessary to understand both the factors that affect consumer behaviour and how consumers typically react to them, a subject to which the next chapter is devoted.
CHAPTER IV

BASIC FACTORS AND RELATIONSHIPS IN THE MEASUREMENT OF TRADE AREA POTENTIAL

Introduction

Before turning to the practical methods and theoretical models which have been developed to aid in the assessment of location potential, it is necessary first to examine and understand those factors affecting location potential, including those which affect consumer behaviour in the selection of a shopping location, since such factors should be recognized and included in any model or method which purports to be able to accurately and consistently predict both the expected consumer patronage and the corresponding sales volume potential at a particular location. Having once examined the importance of such factors, it remains to be determined in Chapter VI whether they are included as variables in the conceptual structure of the models, and in Chapter V whether they are explicitly included in the analytical procedure of the various methods.

When analyzing the various models and methods, it should be remembered that they are based on the premise that consumer spatial behaviour is primarily determined by the operation of the forces of attraction and resistance as related to competing retail centres:

All retail transactions are the result of individual choices based upon preferences of one type or another. Such choices regarding where to shop are the result of
individual reactions to the factors of attraction and resistance as related to available shopping facilities.¹

Market Factors

Economic Outlook

Since most location analyses attempt to provide a sales volume estimate for a date several years in the future, the economic outlook for the region can have an important bearing on the potential sales at that date for a particular location. The economic history of the area must be studied to ensure that growth has occurred, will continue to occur, and that economic health is improving rather than declining.² Normally, this economic analysis should cover the whole region of which the particular trade area under analysis is a part. The trade area itself should be analyzed to ensure that it is not a declining area. Since the economic life of a shopping centre is likely to be twenty or more years, the owners need to have an informed understanding regarding the economic conditions that are likely to affect their centre over its lifetime. Economic data such as the value of manufacturing output, the life-cycle of industry, family income levels, land values (and trends), construction activities, development of utilities, employment statistics and trends, population growth trends, and retail volume trends all provide important clues to the health and stage in the life-cycle of any area as well as indications for present and future

¹ Ibid., pp. 184-5.
² Kane, op. cit., p. 17.
purchasing power trends. The relationship here is evident: the healthier the economy, the more business available to shopping centres in the area, both today and in the future. Obviously, a good site requires at least maintenance of satisfactory economic health in an area for some time, and preferably an improving climate which will improve the centre's economic prospects.

Population

Historically speaking, the literature has repeatedly emphasized that the volume of retail sales, and the retail floor space in an area are directly related to the size of the population in that area. They emphasize that more than any other factor, population is the single most important retail sales predictor.

The number, distribution, composition, density, growth pattern, income, expenditures, and buying habits of the population all must be considered when estimating total market potential. This information is essential in computing purchasing power and sales estimates.

The proposed centre (all other things being equal) should be located at a site which lies at the centre of the greatest concentration of consumer expenditures within the trade area. It is extremely useful to plot much of this data on maps in order to facilitate the analysis. There is no more accurate and consistently

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3 Ibid., p. 22.
useful tool than the dot map of population distribution. This map is a kind of photograph of population, and can be made to show not only the precise location of existing population, but also the aerial changes in population that have occurred or are likely to occur during a stated period of time.

Population distribution, like an economy, is not a static phenomenon. The forces of birth, death, prosperity, poverty, and the economic life-cycle of the area combine to either swell or deplete population in an area. Where, how long, and to what extent population changes have been occurring are of paramount concern to location analysts. Why they are occurring should be partially or fully investigated in a full study of the area economy.

New residential building trends must be analyzed to determine where new construction is likely to occur, or where new tracts of land for homesites are available. This new construction will add population in areas presently less populated. The proposed site should be close enough to this construction to serve the population growth expected there. But a degree of caution is necessary. Locating a centre in a rapidly growing suburban area may seem on the surface to be an excellent idea. Naturally, the desirable trend is to locate in areas of growing population, but an addiction to growth areas can be dangerous and short-sighted. Analysis must be conducted to determine if the expected growth in sales projected to arise as a result of supposed population growth will in fact take place. For example,

5 Kane, op. cit., p. 40.
6 Ibid., p. 42.
7 Ibid., p. 43.
a centre may be proposed for an outlying suburban area on the edge of a major city. It may be felt that the centre should be developed on a sufficient scale to take advantage of anticipated population and sales growth, and that the centre will not realize its full sales potential for a number of years until this anticipated growth takes place. However, analysis may show that the centre will remain eccentric, not central, to the centre of the population. For example, the greatest proportion of the population growth may occur on one side of the proposed site with vacant homesites being filled in rapidly, whereas on the other side, homebuilding may be restricted because of poor soil conditions or zoning restrictions. So, even though the population of the immediate area is projected to increase by a substantial percentage, care must be taken to ensure that the proposed centre is not located on the outer fringe of this growth. It should instead locate between this growth area and already built-up areas. In fact, the new centre should be located between this new growth area and any existing competitive retail facilities. In this way it will intercept business which would otherwise go to the existing facilities. 8 Furthermore, if the new centre does not locate in this fashion, it is possible that new competing facilities will be developed there instead which will themselves intercept the business. This illustrates the danger of locating on the fringe of a populated area, especially when there are still sites available on which competitors may develop competing centres. By studying population distribution maps with an eye

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to area growth trends, highway developments, and possible new competitive sites, the hazard of being short-circuited can be reduced.

Population within the trade area should be considered in terms of families, since the population count is used in conjunction with the calculation of expenditure on retail goods taken from a family expenditure survey.

The first step is to arrive at an accurate count of the population residing in the trade area and to assign it to the various segments of that trade area. The most accurate method is an actual count of dwelling units, made by counting physical structures for single family houses and mail boxes for multiple dwellings. An actual count is virtually always necessary for a new shopping centre because the surrounding area is likely to be one of recent residential growth, and available population statistics will be very inaccurate. If population statistics are available in enough detail, these can be used instead which, of course, is less costly. Population can be determined by: counting building permits, taking aerial photographs, referring to the last census and adjusting it. Population figures are then analyzed according to:

1. Number of families.
2. Age-sex ratios, either in total numbers or per 1,000 population, with classification by major age groups.
3. The number of persons per family.

Changes in population occur through natural increase or decrease or through migration. The population figures must be updated if they are to be useful at all. Several methods are
used such as: birth-death rates, in and out migration, new dwelling units in construction and the past growth rate (however, the straight-line projection of population growth requires an assumption that the many forces contributing to population change will remain constant). 9

In many cases projections are available from private planning offices or university research departments - these projections may be very accurate or incredibly wrong but should nevertheless be studied. Only short term projections, of five years or less can be made with any confidence. This statement should not be disturbing, because for the location analyst it is not as critical to know exactly how much as it is to know exactly where significant population change will occur. Potential growth areas can be detected by going to the Municipal Assessors Office and finding out where land is being plotted for future residential development. Plans for the extension of public utilities such as water, sewage and gas lines can provide an even longer range clue to growth areas. 10

Income

In any trading area the population must be determined first and then the average income for that population determined, since these two variables indicate the total number of dollars available in that trade area for consumption expenditures. By applying some kind of an average for the percentage expenditure

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9 Kane, op. cit., p. 47.
10 Ibid., p. 55.
for each type of merchandise it is possible to ascertain the trade area potential spending power for each type of merchandise. (This thesis will not be concerned with discussing detailed practical problems in data collection. Rather it will be concerned with what types of information should be ascertained and why that information should be ascertained.)

The principle importance of ascertaining income levels within the trade area is their use as a part of the determination process involving the likely future shopping centre expenditure patterns of area residents. In other words, it is well known that a certain percentage of personal disposable income is spent on shopping centre-type merchandise. Determining the per-capita income then enables the researcher to ascertain the dollar value for that percentage normally spent on shopping centre merchandise.

Every populated area has a certain level of personal income, and this level has a direct relationship to the amount people spend for various products of all types. In order to see how the varying pattern of income levels relates to a proposed location, the analyst should construct an income map.

For each close-in segment in the trading area, a table should be prepared showing the breakdown of families by size and income. These data can be secured from a sample of the population through an interviewing technique. In areas farther from the proposed site, an average family size, and an average income figure for that segment is usually adequate, though it is subject, of course, to somewhat greater error because an average may represent either many families roughly similar in

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11 Ibid., p. 57.
income or size or two groups of families considerably different in income or size. The average family income can usually be taken from the latest census and then adjusted for income changes since that date. Information may also be available from the local planning commission, city planning commissions, employment offices, and various publications. In new growth areas, spot appraisals can be made showing the relationship between dwelling value and income. Only in very highly transient or retirement areas are there likely to be very wide discrepancies. In an apartment area, rent levels are a good indication. In any event, spot interviews could be made in some of the outlying areas, with more comprehensive interviewing being conducted in close-in areas. To ascertain whether the locality under study shows variations from the national average, checks should be made with any regional department or newspaper or any other person or people who may have carried out similar market research previously.

**Employment**

The analysis of employment within the region of the trade area links population figures with income expenditure, since the future spending power available to a new shopping centre will be related to these factors. For major regional shopping centres with a large trade area, a wide range of local factors will affect the existing employment structure (for example, a diversified employment structure, or a highly specialized one, as in the case of a large motor vehicle manufacturing centre). Several other factors should be considered when analyzing employment:
1. Unemployment - account should be taken of local employment projections, and consideration given to such factors as seasonal or emerging permanent unemployment arising from the closing of an industry.\(^{12}\)

2. Character of employment - a count must be taken of the incidence of shift work, including the hours worked, since these may affect local shopping hours. The incidence of female workers should also be studied, since these consumers may be obliged to shop at unusual hours or close to their place of work.\(^{13}\)

3. Future location of industry - major new industries under construction and those for which planning permission has already been granted should be assessed in terms of type, location, and number and type of workers.\(^{14}\)

**Purchasing Power (Disposable Income)**

The volume of retail trade is as much dependent on the wealth of a district or community as upon its population. There is a strong correlation between the purchasing power for an area and the retail sales figures for that area. The obvious explanation for this is that with more money to spend, more money will be spent on retail goods. Therefore, ascertaining the total purchasing power will provide a good predictor of the amount of retail sales to be expected from that population.

The amount of money available in the trading area for various types of goods depends upon the income level of the area.

\(^{12}\) Ibid., pp. 20 - 22.


\(^{14}\) Ibid., p. 69.
Once the income level has been ascertained, it should be possible to calculate the potential for each product-type.

Total annual trade area retail expenditures for each product-type are normally calculated by multiplying the income of families in similar income groups by the average retail expenditure percentage factor for each product-type (commonly published by a government agency which gives percentage-of-income expenditure factors for each product-type). For example, the calculation could proceed: number of families, multiplied by medium family income for that income group, multiplied by the percentage expenditure factor for a particular product-type equals the retail expenditure for a particular product-type. The preceding analysis is intended to show two things: 1) the total retail expenditure in the area for all goods, and 2) the total retail expenditure for each type of good. These expenditure patterns can vary according to differences in prices, variations in shopping habits, and differences in income levels. At lower income levels, the percentage of family disposable income spent on certain higher-priced "shopping" goods such as furniture and appliances may be different than that for higher-income families. However, sales of convenience items are not affected to any great degree by differences in family income levels. These are goods, such as food, that are required daily as necessities, and there is a minimum amount which must be purchased regardless of the family income level. Sometimes income variations within a trading area can be ascertained by driving the trading area and noting the difference in housing conditions.15 Knowing the general annual

15 Kane, op. cit., p. 60.
income level for the trading area, and knowing the percentage expenditure spent on each product-type, the potential can be adjusted above or below a particular expenditure level according to whether housing conditions are above or below average. Averages are often useful when working with thousands of people, hence an average income translated into an average expenditure produces an estimate of total potential that can often be relied upon. Once the potential of the whole trading area has been determined, it is safe to subdivide the area according to significant variations in expenditure potential that are apparent.

**Distance**

"Distance takes time," costs money, and tends to inhibit consumer shopping movements. It is said that people would prefer to buy the great majority of their goods near their homes if they were able to do so. The greater the distance, the greater must be the attraction to pull trade.

A. **Distance as a Travel Cost**

Among the factors that have been frequently mentioned as affecting the spatial patterns of consumer behaviour, travel costs have probably received principal consideration. Clearly, a consumer's travel behaviour is influenced by the expense, in time and effort as well as money, that he perceives to be involved in selecting among various retail centres offering the goods and services desired. These anticipated costs of travelling,

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the time and effort involved in preparing for and actually making the trip, are regarded as exerting a force that contracts the distances consumers travel to satisfy their needs. With increasing distance from the centre, the consumer perceives his cost in visiting that centre will increase sharply. This reflects the existence of opportunity cost: with only so much time to devote to any number of activities in a given period, too much time spent in the pursuit of one activity has to be realized at the expense of other activities.

Trip frequencies tend to decline as the distance required to make the trip increases. Conversely, trip distances tend to be lower as trip frequencies increase. The most obvious reason for this involves travel costs which occur because there is a friction component of space that can only be overcome by the expenditure of time and effort. The effect of this friction is to restrict travel distances in the interest of limiting travel costs.

B. Distance in Driving Time

The dependence of many large suburban regional centres on the motorized shopper has led increasingly to the definition of trade area boundaries solely in terms of driving time. The early use of the concentric ring technique has now largely been replaced by the isochron or isopleth method, with contour lines linking places of equal driving time from the subject location. This technique is in answer to the observation that distance in miles does not adequately represent the degree of inconvenience experienced by consumers. For example, a five mile drive on the freeway requires far less time and effort and frustration
than a drive of the same distance through congested city traffic. Travel time is thought to provide a better indication of travel costs as perceived by the consumer.

Normally speaking, most shopping centre developers when defining the extent of their proposed trade area, arbitrarily assume a certain driving time distance from the centre. In most cases there is no particular justification given for the choice of a particular driving time distance, except to say that it is based on "experience" aided by intuition as to the maximum distance within which consumers will be attracted to the centre. Estimates of the maximum driving time commonly range from ten minutes to over an hour depending on the location, a range which leads one to suspect that the choice of any one particular driving time is likely to be open to considerable question. In many cases the limit chosen is based on the proximity of competing retail facilities, and the limit set at the point where it is assumed that the subject trade area flanks the trade areas of other centres. However, even in this assumption there is still no justification for selecting one time limit over another as the point where consumers cease to be attracted to the subject centre. This subject will be discussed in greater detail later in Chapter V, but for the time being it will suffice to note that the problem of ascertaining how distance affects consumer spatial behaviour is really a question of ascertaining what travel costs consumers are willing to sustain in the pursuit of shopping satisfaction - and quantifying an answer to this question remains the greatest stumbling block in location research today.
C. Distance vs. Merchandise Desired

Early writers recognized that the type of merchandise sought by the consumer had a marked effect on the distance he was willing to travel to acquire it. Reilly noted that:

leading style and specialty stores... handle lines of merchandise that people are willing to travel some distance to secure.\(^{18}\)

Consumer perception of travel costs is associated with rewards arising from the satisfaction of fulfilling a need for various goods and services. These rewards vary in degree according to the type of merchandise sought. Such rewards can exert an influence which tends to lengthen the distance a consumer is willing to travel. Thus there is a tendency for the consumer to balance the attraction of rewards arising from higher degrees of satisfaction against a tendency to economize on travel costs.

It is assumed that in making a trip the consumer seeks to keep it as short as possible in order to avoid higher costs than are necessary. On the other hand, the trip has a definite reason for being made, namely some requirement of the consumer for which a satisfaction is sought. The more selective this requirement (and the more important the object or objects sought after are to the consumer) the greater the probability of incurring more travel time, and consequently greater costs, in seeking satisfaction.\(^ {19}\)

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D. **Distance vs. Price of Merchandise**

Consumers tend to travel farther to buy higher priced goods than they would to buy lower priced goods. Such higher priced goods, partly because they consume a proportionately larger share of the consumer's disposable income, are of greater significance to the consumer who is therefore more willing to shop around and expend a greater effort and travel farther in the attempt to ensure that he gets "his money's worth."

E. **Distance vs. Class of Goods**

On the other hand, consumers are not willing to travel so far or expend as much time and effort in the pursuit of goods such as convenience items which are of lesser monetary and social significance to them. Consumer shopping surveys conducted over many years have shown that for convenience goods, geographical convenience is considered by consumers to be the most important factor in their choice of stores in which to shop. The consumer usually chooses outlets from among those most conveniently situated near the home. Only thereafter do the factors of merchandise and value and service come into play. Therefore, the trade area boundary for convenience goods is considerably nearer to the centre than is the boundary for higher order goods, or in other words, the area of effective attraction does not extend as far from the centre for convenience goods as for higher order goods. 20

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20 Nelson, op. cit., p. 212.
F. Distance vs. Breadth of Selection

In addition to the class of goods, another factor affecting the consumer's perception of travel costs is the breadth of selection in merchandise. Presumably, the greater the number of selections offered at a retail facility, the greater is the consumer's expectation that his shopping trip will be successful at that facility. Consequently it appears logical that consumers will show a willingness to travel greater distances for any good or service as the breadth of selection increases. This would appear to be especially true in the case where the consumer wishes to "shop around" for an infrequently purchased, more significant item. Broader selection provides more opportunity to "shop around" for the "right" choice in style, quality, or price.

There are a number of other factors which modify the consumer's attitude toward distance and the most important of these will be discussed below under their respective headings.

Accessibility, Traffic, and Transportation

One of the chief reasons for choosing a particular site is to secure the maximum accessibility and thereby to have available as much of the business potential as possible. The store or centre must be accessible to large areas and large population distributions if it is to secure a larger retail volume.

21 Ibid., p. 51.
Alternative sites must be analyzed in terms of the major access roads in the area, in order to ascertain whether these access roads have sufficient capacity and are properly located to tap the potential market in the area, and whether they are of sufficient capacity to permit the higher traffic use that will be demanded of them when the centre is completed. It is also necessary to make sure the consumers will be able to easily enter these access routes in order that it will be easier for a greater number of consumers in the trading area to shop at the centre.

A site that has good accessibility is one that can be easily reached by customers, which implies short distances and ease in driving. It is a relative term, often used in a comparative sense to describe a site that is more easily reached than another.

Traffic congestion can reduce the sales that a centre gets from more distant parts of its trade area, a result of the fact that consumers are forced to expend a greater amount of time and effort to battle their way through this traffic congestion as the distance increases from the centre. Greater traffic congestion increases the time required to reach the centre, and consumer resistance to patronizing a centre increases as the time and effort required increases. If traffic friction is high, drawing power will be more intensive, or in other words, the centre will draw from a smaller area.

23 Ibid., p. 85.
Road surface conditions also affect accessibility. Site approaches that are unpaved, pot-holed, narrow or steep give poor accessibility. Similar problems in accessibility arise if access must be obtained by turning left off a highway without the aid of a traffic light.

Such problems in accessibility are basically related to the road networks near to, and serving, the centre. Poor access can severely restrict the actual patronage, especially if competing facilities have easier access. In this case, expected projected sales volumes may never materialize if they have been derived with no adjustment for the poor access. If the access is poor enough that it takes 3 or 4 minutes longer in driving time to reach the site as compared to another, loss of patronage may well be the result. The effect of poor accessibility is that it increases the "nuisance" cost to the customer, or increases the effort he must make to visit a particular site. If he is shopping for convenience goods, where the effort threshold is low, he may not make the effort, and may instead visit a competing location. The effect is not so pronounced with higher-order goods, for the customer will normally expend a greater effort for these non-convenience goods anyway. However, the effect is still likely to be noticeable, only just to a lesser extent.

The significance of small time-differences is, of course, related to the size of the trade area of the centre, the trade area for each type of product, and the distribution of population. In the case of convenience goods, which enjoy a smaller trade area

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24 Ibid.
than higher-order goods, a few minutes in driving time may include a significant part of the trade area and could have serious consequences. In the case of higher order goods, a few minutes driving time would have less significance but still some effect.

Traffic flow patterns affect retail outlets in that these flow patterns can create considerable friction and thereby hamper a site's accessibility. Being located on an artery that is heavily congested is not merely a problem in physical congestion; it is psychological as well. Automobile shoppers do not enjoy the prospect of driving along a route which is jammed with through traffic. Locating so that access can be achieved easily off efficient, uncongested arteries, can significantly enlarge the centre's trade area, since the time expenditure required to reach the centre is less from greater distances.

Driving time depends primarily on the existing road network, and is affected by road capacity. Major regional centres are large traffic generators, which could give rise to acute difficulties if heavy concentrations occurred on roads of inadequate capacity.

The creation of high speed limited access by-pass highways around the city, carrying through traffic, has established a new criterion of accessibility. Typically, these high speed by-passes are intersected, perhaps with great separations, by many of the major streets in the community. Accessibility to the by-pass, then, or to a place where motorists can get off the by-pass (an interchange) would be necessary if the customers were to have easy access to the shopping centre. Furthermore, since large centres produce tremendous traffic problems, good
accessibility from a series of radial highways or streets or major arteries with a minimum of congestion becomes a most desirable locational criterion.

Of course it is necessary to know the exact location of new highways or freeways and what areas they will feed. The location analyst should ascertain the exact location of access points, outlets, and interchanges, the exact location of overpasses and underpasses, and the exact location of frontage roads. This is necessary if he is to know if a new highway will in effect become a barrier between the site and a portion of the existing trading area. Anyone selecting a retail site must know what the preliminary detailed plans are for such new roads so that these can be taken into account.

The relationship of the new highway to the potential trading area is what must be weighed. If the road cuts through a populated area and has access ramps throughout, it may create good accessibility. But if the highway itself represents the outer boundary of the trading area the location becomes undesirable. If only 10% of the traffic on the highway is of a local trading area nature, and the balance is composed of people in the middle of a trip, it is unlikely that those people will shop at the centre. In this case, a high traffic count means virtually nothing when estimating volume sales projections.

26 Kane, op. cit., p. 66.
27 Ibid., p. 63.
28 Ibid.
Street and highway construction must always be weighed by asking oneself what the changes will do to the whole pattern of movement within an area: Will established shopping districts be strengthened or weakened by the new roads; will new focal points be created that will attract major retailing facilities; will the new road open up the trading area, or will it slice it in half; will local or through traffic use it; what competitors are likely to be attracted by this development; exactly when will the road be completed, and how does this relate to the timing of planning.

The traffic artery patterns and traffic light locations can severely alter the trade area of a centre, in that customers from different directions will find the existing road and traffic light networks more or less time consuming and therefore more or less convenient. Being located on the wrong side of the highway can cause shoppers to patronize a competing facility which is farther away but easier and less time consuming to reach. For example, shoppers from the east of a centre may be able to drive directly to a centre located on the north side of an east-west freeway, without having to turn left or wait for traffic lights. Those shoppers to the south of the centre may have to enter and exit from several traffic arteries, wait for several traffic lights, and make a left turn off a busy highway interchange onto a congested feeder road. So for these shoppers, even though they live closer to this centre than the shoppers living to the east, the time required to reach the centre may be considerably greater, and they may elect to choose a competing centre which may be farther away in distance, but more convenient and less time consuming to reach. In this case, the shopping centre trade area
will not extend as far south as it does east.

In assessing the road patterns within the trade area, the following should be considered:

1. Traffic arteries - the number of lanes, width, and direction of major routes;
2. Intersections - the location and capacity of major intersections in the trade area, especially those close to, or serving the site;
3. Traffic flows - traffic rates at various times of the day and days of the week;
4. Mobility factors - speed limits, traffic lights, stop signs, road surface conditions, hills, sharp corners, congestion, choking due to on-street parking;
5. Accessibility of main arteries - including capacities of freeways and the ease of entrance and exit from such freeways;

Private and public transportation capabilities of the area should be considered. Private transport studies should consider: the number of automobiles per family in the area; travel times from various parts of the area to the site; adequacy of proposed parking facilities; and general traffic conditions and accessibility to the site. The study of public transportation services would include the cost, travel times from various parts

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29 Jones, op. cit., p. 51.
of the area, route coverage of the area, frequency of schedules, and the potential service if the new centre were built.  

Another consideration is the manner in which accessibility is affected by the amount of traffic flow into the shopping centre itself. If there is customarily a long line of shopping centre traffic taking a left turn to enter the site (cutting across traffic in the process) this makes it more difficult for drivers to enter the site even if a traffic light is provided to stop oncoming traffic.

In planning the parking for a shopping centre, it may be advantageous to eliminate a few parking spaces in order to increase the accessibility to the remaining parking spaces. In this case parking and accessibility are really one in the same problem in that they are both concerned with maximizing convenience for the consumer. Money expended in improving access to the shopping centre through construction of storage lanes and the like is as well spent as it is on parking stalls. The shopper can't park until he can get into the lot, and he will not come again if he has trouble getting out.

Different Trade Areas for Different Goods

Previous studies have shown that stores located in the same shopping centre but selling different goods and services draw their business from the same general trade area - but that the drawing power and market penetration is not necessarily the same for each store.

30 Ibid., p. 52.
A. Convenience Goods

Convenience goods are usually of small unit value, are purchased frequently, are often purchased on impulse, and are those which the consumer usually desires to purchase with a minimum of time and effort at the most convenient and accessible store. They are those goods that consumers will not go out of their way to obtain.

B. Shopping Goods

Shopping goods are typically higher in price than convenience goods, and price and quality are of greater importance to the consumer. They are purchased less frequently and the buying decision usually takes longer to make. Some of these items require major purchase decisions and involve major income expenditure. For this reason, price and quality considerations are important and consequently much shopping is done to obtain the best value possible. Style goods are a form of shopping goods and in many cases carry connotations of status to the consumer, the result being that a particular consumer is willing to spend more time, effort, travel farther distances, and spend more money in order to obtain goods which are more important to him.

If the assumption that the frequency of purchase is related to the type of goods sought is valid, we would expect that, in general, customers residing close to a centre will buy food on each visit to the centre; that customers are willing to travel farther to obtain general merchandise which is not readily available to their satisfaction nearer their home; and that the customers more distant from the store may buy their food elsewhere.
and come to the centre only to purchase general merchandise.\textsuperscript{32} It follows that the general merchandise stores will have a larger proportion of customers residing farther away from the store and that the general merchandise primary trade area will, therefore, be larger.

The actual physical area of the general merchandise primary trade area becomes proportionately larger than that of the convenience goods outlets as the density of population declines.\textsuperscript{33} One main reason lies in the fact that even though straight line distance proportions may be the same, the increasing radius of the circle encompasses a broader area. Drawing power is affected by competitive conditions within the surrounding primary area, differences in highway patterns, density of traffic friction, density of population, and accessibility. All other things being equal, it is probably true that the size of the convenience goods trade area remains in proportion to the shopping goods trading area. However, in areas of lower density, the drawing power for each type of goods extends over a broader area. This is mainly because of time-distance factors. In other words, in areas of lower population density, greater distances can be travelled without a greater expenditure of time and effort owing to a lesser degree of traffic congestion. Generally speaking, we would expect some sort of ratio to apply between time-distance for the convenience goods items as compared to time-distance for shopping goods items. For example, shopping goods customers

\textsuperscript{32} \textit{Ibid.}, p. 230.

\textsuperscript{33} \textit{Ibid.}, pp. 230 - 31.
might spend twice as much time travelling to a facility as would convenience goods shoppers, and this would apply regardless of the population density. However, this is altered by the various factors outlined previously; namely, competitive conditions within or surrounding the primary trade area, differences in highway patterns (accessibility), and the intensity of traffic friction. In general though, we may conclude that drawing power is affected both by differences in the type of merchandise and also by population density.

C. Specialty Goods

The consumer's willingness to travel to a certain outlet offering a specific item for purchase is affected by his willingness to substitute other items offered at other locations more convenient to the consumer. Specialty goods are not as prone to substitution as convenience goods. Consumers looking for specialty goods are looking for something special. Therefore, they are more willing to shop around for them in order to find "just the right thing." As a result they are normally willing to expend more effort in searching for these goods, and are willing to travel greater distances, especially if in doing so they believe there is a greater likelihood of finding the right article. The larger the unit of purchase or the amount of money involved, the greater the element of style inherent in the merchandise, and the more that item is significant to the consumer, the farther the consumer will travel to buy it. It follows that the effective trading area for specialty goods is larger than that for convenience goods which are not so important to the consumer and for which the consumer is more likely to accept a substitute rather
than expend greater effort searching for something which is not really of great importance to him.

Furthermore, the less frequently a particular commodity is purchased, the more people there must be in the trade area to support an outlet selling only this commodity. Because the commodity is sold less frequently, and because more people are needed to support a facility selling only this commodity, and because there are fewer stores per capita that sell this commodity, people wanting to buy it must travel further to get it.

Demographic Factors

The analyst and the developer should know whether they are dealing with the families of factory workers or with those of executives, with young, large families or with older, smaller ones. Therefore we are dealing with (1) income level, (2) occupational type, (3) age levels, and (4) family size. Also important is ethnic background. For example, if certain sections of the trade area are populated with people of European descent, certain particular tastes in clothing apparel, furniture, groceries etc. may be prevalent. The presence of such groups must be related to merchandising plans and tenant types in the new centre.

A. Income Groups

The lower income population will spend a relatively larger proportion of their disposable income for food than the higher income groups, and on the other hand, the high income group will spend more for luxuries proportionate to their purchasing

34 Kane, op. cit., p. 55.
power. Centres serving higher income groups often tend to benefit from higher per capita sales as a result of the higher disposable income per capita. Analysts seeking to estimate a sales volume potential for a new centre must be aware of the income levels prevalent in the trade area. They must also advise the developer of predominant income groups in the area so that merchandise and tenant mix can be planned to maximum advantage. Higher income groups are normally in a better position to afford higher priced, higher quality merchandise, and in fact often prefer to patronize a centre offering this merchandise even if it happens to be more distant from them than another centre whose merchandising policy is directed toward lower income groups.

Upper income families are often in a better position to travel farther and more often to shop than lower income families owing in part to their higher disposable income and the higher incidence of two cars in this group. This group is normally more interested in the higher priced items and will travel farther to ensure satisfactory selection in price and quality. Hence, a centre in which can be found higher priced goods that appeal to the upper income families may expect to attract patronage from greater distances than a centre whose stores carry lower priced goods. If, however, the trade area is predominantly composed of lower income groups, then merchandising policies must be appropriate to this group or the centre will not attract the potential patronage it could if the merchandise mix were better matched to the character of the trade area.

The suburban shopping centre serves a market quite different from that of the downtown retail core. To a greater degree, the suburban centre market is composed of younger people,
younger families, and larger families. The merchandise requirements for this market vary accordingly: smaller sizes in clothing, children's wear, and household furnishings are more in demand. The prevalence of young consumers requires that a completely different merchandising approach be followed as compared to older people. With young growing families, home furnishings needs are higher and their purchases of higher order goods are higher. Consequently, the shopping centre which is proposing to serve this market must necessarily tailor its tenant and merchandise mix to suit this market, or its anticipated attractive power and corresponding sales volume potential may not materialize.

Income class, governed by the occupation of the head of the household, is responsible for considerable variations in expenditure. In the lowest income group, retail expenditure accounts for a considerable amount of the family income, the proportion of this amount decreasing with the corresponding rise in incomes and depending on the type of trade.  

The viability of a major regional centre is heavily dependent on sales of durable goods, in addition to sales by convenience outlets, such as supermarkets. Consequently, a great reliance is placed on purchases of durable goods by the higher income groups, which have a greater percentage of car owners and more flexibility in shopping habits. The special importance of these factors is emphasized in regional shopping centres where potential trade from very low income groups is often disregarded.

35 Jones, op. cit., p. 45.

36 Ibid.
in the economic analysis, even if this amounts to over 50% of the trade area. 37

B. Incomes, Social Class, and Age Groups

Bucklin has produced some interesting findings regarding the role that demographic factors play in consumer patronage behaviour. He found, among other things, that:

1. Consumers from neighbourhoods with above average incomes and social status showed a much higher propensity to shop in the downtown core than in secondary suburban centres.

2. Consumers from below average neighbourhoods and lower social status were more inclined to shop in the suburban centres; and this propensity diminished with rising social status and income levels.

3. Consumers were more likely to shop in suburban centres when shopping in the evening, but tended to prefer the downtown core for daytime shopping trips.

4. Shoppers with children tended to prefer suburban centres, and also preferred one-stop shopping at the suburban location.

5. The more shopping stops a consumer was willing to make, the more likely that

consumer would patronize the downtown core.

6. On price considerations alone, shoppers were more likely to shop downtown locations in anticipation of better price satisfaction.

7. Suburban centres outranked the downtown core on convenience.

8. Advertising by downtown merchants had a much greater effect on a consumer's shopping destination than did suburban centre advertising.

9. Consumers were far more likely to shop downtown for apparel.

The above factors must be taken into account when estimating the probability of consumer patronage, because such factors affect different consumers differently in their perception of the attraction of a particular outlet and in their willingness to sustain travel costs to visit that outlet. For example, the existence of high priced lines of merchandise at a particular centre may heighten the attraction of that centre as far as high income groups are concerned who would also be more willing to travel to that centre. However, these same high priced lines of merchandise may very well lessen the attractive power of that centre for low income groups who will therefore be less likely or less willing to sustain travel costs to shop at that centre.

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The suburban shopping centre enjoys certain advantages over the downtown retail core and vice versa. Several studies have shown that consumers prefer one outlet over the other depending on different aspects of each. One study found that consumers tend to prefer shopping centres for the following reasons (in order of descending importance): convenience, parking, general enjoyment, one-stop shopping, selection, and sales and bargains. On the other hand they prefer downtown locations for these reasons (again descending in importance): selection, convenience, enjoyable experience, sales and bargains. In comparing downtown with suburban shopping centres, the downtown core was preferred over the shopping centre in terms of selection, enjoyable experience, and sales and bargains; but the shopping centre ranked ahead of the downtown core in terms of convenience, parking, and one-stop shopping. Another study found that consumers preferred shopping centres for the ease of reaching the centre, for the treatment by sales people, for general shopping comfort, and for the ease of handling adjustments; whereas they prefer the downtown shopping area for choice of merchandise, prices, and the range in sizes and colours of merchandise. It is evident that such preferences have an effect on the patronage expectancy, but from the earlier discussion it should also be evident that such preferences will show variation according to


the inter-relationship between demographic factors and the attractions offered by a particular outlet.

Geographical Factors

Geographical barriers can limit the trade area and limit consumer patronage. The trade area can be cut off at natural or man-made barriers which are either physically or psychologically so obstructive that nobody will go beyond or around them with any measurable regularity. A river or freeway with no crossovers for several miles can be such a barrier. Other barriers would include heavily congested arteries, slum districts, industrial zones, railway lines, and unpopulated regions. Recognition of the effect that such barriers can have on consumer spatial behaviour is essential in any locational analysis.

Visibility of the site and centre from the surrounding road network is generally considered important, especially in smaller centres which are less likely to advertise or sponsor promotions. To be hidden is considered a disadvantage because of the loss of advertising appeal afforded by good exposure.

If a centre is located adjacent to a major highway, but is not visible from that highway, its attractive power is reduced because it does not appear to be accessible. Furthermore, being situated in the middle of a jungle of retail facilities, such as a retail strip development, normally reduces visibility and lessens the stand-out advertising effect which in turn lessens the attractive power of the facility.

\[41\] Kane, *op. cit.*, p. 15.
Competition

In appraising the sales potential of a new location under consideration, establishing that there is a sufficient amount of total business available in the new centre's anticipated trade area is only part of the task. It is also necessary to size up the likely sites of new competition as an indication of whether a satisfactory share of the total sales potential can be attained. Appraisal of competition is also needed for proper planning regarding the specific location, the type and size of centre to build and the merchandising and operating policies to meet the needs and wishes of customers. The location analyst then is concerned with competition at several levels: the broad market area, each major centre which is in competition with his own, and the competition confronting the individual site. In each case the analysis of competition involves determination of who is competition; the amount of competition, such as the number of centres or stores, the sales volume and square feet of selling area; and the quality and effectiveness of competition, comprising such factors as physical facilities, operating and merchandising practices, management, personnel, and consumer acceptance.

The developer should have a fairly complete up-to-date inventory of the retail competitive facilities in the market area. This information is used to evaluate the specific site, to analyze individual competing companies, and to determine which

areas are over-served in certain functions and which areas of opportunity are still left open.

Competition is the aggregate of all retailing facilities which together share the total market potential — in other words, all retail facilities which sell the same types of products. Any attempt to quantify competition requires extensive field surveys where various elements such as store size, tenant similarities, parking, age, etc. are mapped and classified, and areas of current and future store concentrations can be observed. When the competition map is superimposed on a population density map, it becomes possible to determine which parts of the general area are underdeveloped and which parts are overdeveloped per capita with stores. If the trade areas of the various competing outlets are delineated, the relative merits of sites for proposed stores become clearer which is of assistance in the task of choosing the general area for a new centre.

A. Saturation

When shopping centre developers speak of store "saturation" they mean a condition where there is just the right amount of store facilities in an area both to serve customers satisfactorily and to yield a fair return on investment to the store operators. In this case, store saturation is desirable. However, this condition is an ideal which does not usually exist,

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44 Ibid.
since ordinarily an area is either understored or overstored. When an area is understored, there are not enough facilities to serve the potential customers satisfactorily. Existing shopping centres are crowded and customers are not served well, but the centres yield a good return on investment. Operators see the existing vacuum and the opportunities it offers, but often face a difficult task in expanding present facilities because of a lack of space adjoining the existing centre. In such cases, they must look elsewhere for a site on which to develop a new centre, which can result in two inefficient centres serving an area where one larger centre would have been more desirable. This points out the critical necessity of planning for growth when contemplating a centre, and consequently securing the required land for expansion while it is still available, even if it must lie unused for a period of time.

When an area is overstored, the stores are not crowded, and facilities are abundant, but the centre operator is likely not getting a fair return on investment.

It is obvious then that a key consideration for developers, when contemplating a new centre, is to determine whether the area is understored or overstored. If his development when completed still leaves the area understored, he must realize the potential danger of new competing centres being built to satisfy the excess potential, and this may endanger his profitability and return on investment. Obviously, also, he must avoid constructing a centre in an area which is overstored, for

46 Ibid.
he will likely never realize a satisfactory return on investment unless the existing facilities are so obsolete that his new centre will effectively capture a disproportionate share of the trade. Normally, if store facilities are expanded beyond the needs of an area, productivity will be reduced. This will show up as lower sales per square foot of selling area and in lower profits.

B. Under-supply of Modern Stores

The need for new facilities can be due to a lack of adequate, modern stores, even though there is an abundance of old, obsolete stores. When the existing competitive facilities are obsolete, the developer of the new centre knows that such competition is not really as great as it would at first appear on the basis of retail square footage in an area. The new centre would likely draw many of the customers away from such obsolete facilities.

C. Future Strategy of Competitors

Any analysis of competition would be incomplete without taking into consideration what possible future measures the competition could take. This requires not only an evaluation of existing sites, but also an insight into potential sites which are ripe for development, and an awareness of population growth patterns and store development policies and site selection patterns. It is not safe to assume that the current competition

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is the only competition that will face the centre in the future. This means that the developer must analyze competitors' plans to renovate old facilities or develop new ones, and must evaluate potential sites which are large enough to permit new shopping centre development. Of course a centre can be unique and have a long life-span. It can be unique in several ways: when it is the only retail facility of its type serving a given market area; when it is the only one of its kind in the total choice of goods and services it offers; or when it has a "monopoly" location, so strategic and favourable that it cannot even be approximated by a competitor (in some cases it may be that the centre site was the last readily available piece of land suitable for development and to acquire a competing site would require excessively expensive development). All of this information is required by the developer and each of his tenants if they are to know the current market potential and have some idea of the future market potential available to them. Basically, the competition for each tenant-type proposed for the new centre should be analyzed to determine whether or not sufficient potential exists for the tenant in the new centre, and also what potential does exist which can then be translated into square footage store size for each tenant in the centre.

D. Competition by Class of Goods

A large shopping centre will have two concentric trading areas. One will be a trading area for the convenience goods facilities roughly equivalent in size and in shape to what it would be if the convenience facilities stood there alone.\(^{48}\)

\(^{48}\) Nelson, op. cit., p. 212.
Therefore, this trade area should be outlined on a map as if the shopping goods facilities were not present at all, and all competitive retail stores within this area should be measured as if the study were being made for a separate convenience goods centre. The reason is that the supermarket will draw business from approximately the same trading area that it would have if the department store and other big stores were not in the centre, and secondly, it would secure additional business from incidental shopping for groceries by people living beyond the inner area whose principal purpose in coming to the centre is to visit the larger stores. However, the opposite may be true in some cases, especially if it is more difficult to visit this centre than a relatively close-by non-congested convenience goods centre.

E. Assessing Competitors

In the larger trade area and for a number of miles in every direction beyond it, all major shopping centres should be measured. Also, any major shopping goods outlets, other than shopping centres, should also be measured. Measurements would include: Gross and net space, effectiveness, and dollar volume potential. The ability of the new centre to compete successfully with existing competition must be analyzed - it is also necessary to analyze whether or not existing competition will be able to compete successfully with the proposed new centre. The following should be analyzed for each competitor:

\[49\] Kane, *op. cit.*, p. 79.
1. Availability of parking
2. Accessibility of the store
3. The congestion problem
4. The attractiveness of the store front
5. The price, quality and quantity of merchandise involved
6. The existence or lack of air conditioning and escalators
7. Merchandising ability of the store
8. Attractiveness of the decor
9. Age of the store

Age and appearance are important items to consider because every store, even the biggest and showiest, will progress into a shop-worn old age if not renewed periodically. Old age can be characterized by physical deterioration: lack of floor space, shabby shelving and fixtures, faded paint, worn floor tiles, inadequate parking, weather-beaten signs, and a decline in employee confidence.

The locational pattern of the competition presents strategic questions to the analyst. As he studies competitive positioning in relation to his own location, he will begin to get a final impression of what the property is worth. Perhaps the main questions to be asked at this juncture are: Can more people in the trading area get to our site more easily than that of any other centre? If not, how many people can reach us without passing our competitors first? Will our locational advantages be as good ten

Ibid., p. 127.
years from now as they are today?

The types of operations the new centre must compete with are a vital matter, especially in relation to the type of store that is planned. Does the competition stress low price, high quality, customer service, special trading stamps, late hours, Sunday hours?\(^5^1\)

Once competitive facilities have been plotted and tabulated, subjective judgments must be made on the centre's trade interception potential, the power of the proposed centre to capture some measure of the business normally given to the other centres.\(^5^2\) The assessment of the degree of interception should be based on the characteristic that shoppers will not go past one centre to another having equal facilities, and will patronize the nearest centre (all other things being equal).\(^5^3\) Greatest interception will occur with the customers of other centres whose normal route passes the subject location, and the extent of this potential must be gauged from the survey of competition outlined above.

All such questions regarding the competitive climate within which the proposed centre must operate will have a direct bearing on the potential consumer patronage and the potential sales volume which will be available to the new centre.

\(^5^1\) Ibid., p. 79.
\(^5^3\) Nelson, op. cit., p. 54.
Market Share

Of equal importance to the necessity of estimating the total potential retail expenditure in the trade area is the necessity to evaluate a centre's prospects for penetrating this trade area and capturing a satisfactory share of the market expenditure potential. It is this share which is considered to be the centre's potential sales volume. Market share is the proportion of total potential sales that a store or centre captures from a given area.

To estimate what percentage of the total retail expenditure of the area will be attracted to the projected shopping centre is a very difficult task, and is commonly subject to errors in judgment. The developer desiring to open a centre in a new location, and who has the experience of sales volumes realized in other centres, often compares the population and buying power of the trade areas of operating centres with that of the trade area for the new location. Various methods of ascertaining market share are discussed in later chapters but the determination of market share commonly involves studying the reputation of the tenants, size of the centre, competition, access, transportation facilities, income distribution, the nature and extent of merchandise offered in the centre, and in fact most of the other factors mentioned in this chapter.

55 Ibid.
Site Factors

There are various factors concerning the centre itself which, if considered when planning the facility, can create locational advantages for the centre which in turn enhance its attractive power.

Location itself is not the only factor determining the level of success of the operation, or even the business volume. Centres that offer the best retailing facilities can expect to outperform their inferior competitors. If a developer can develop the dominant, most attractive facilities in the area, then he can expect to achieve a higher level of sales than if poorer facilities were developed. Therefore, the planned character of the new facilities can have an all-important bearing on the centre's expected sales volume.

The following can be considered attractive aspects of the centre: store sizes and centre size; attractive design and layout (attractive decor, good inter-store circulation, covered malls, air conditioning); store and tenant-types; merchandise mix, merchandising ability of the tenants, breadth of selection, range of sizes, colours, and styles; regularly competitive prices and market-oriented pricing policies; the reputation of the centre and the reputation of its principal tenant; the image of the centre as to whether or not it is high or low quality or is an attractive and enjoyable place to visit; the adequacy of the service; adequate parking; amenities such as restaurants, rest-rooms, and community facilities; the hours of business; and the advertising and promotional programs. All of these can influence the level of business volume which the new centre can expect to achieve.
Store Size and Centre Size

As long as the developer is not restricted by land availability, zoning restrictions, or monetary considerations, the size of the centre should be closely related to the buying potential of the area to which it belongs.\(^{56}\)

The larger centres offer a breadth and depth of assortment which serves as a magnet for drawing a large volume of customers and drawing them from greater distances. With extreme size, a centre may attain a position of area dominance, and shoppers tend to be more attracted to a shopping facility as the size of that facility increases.\(^{57}\) If a centre is considerably larger than any of its competitors, then its trade area will likely be more extensive than the trade area of a smaller centre especially if the larger centre offers more functions. But the degree to which a large centre will enjoy a broader trade area is of course conditioned by locational factors such as traffic congestion, road patterns, competition, etc. Generally speaking, the larger the centre and the more functions offered, the more extensive will be the trade area.\(^{58}\) If a new centre is planned too small to handle the potential volume within its trade area, it may at first be very successful, but eventually larger centres offering more functions to serve the potential customers will draw customers away from the smaller centre leaving it with a smaller than optimum trade area.

\(^{56}\) Kane, op. cit., p. 121.

\(^{57}\) Saul B. Cohen and W. Applebaum, "Major Considerations in Evaluating a Store Site," in Kornblau, op. cit., p. 94.

trade area and reduced drawing power. In such a case, the centre should either have been planned as a smaller neighbourhood or community centre, or its merits as a larger regional centre should have been considered. 59

A. Centre Size and Cumulative Attraction

The theory of cumulative attraction or cumulative generation states that: "A given number of stores dealing in the same merchandise will do more business if they are located adjacent or in proximity to each other than if they are widely scattered." 60 Up to a point cumulative increments to a centre's attractive power arise when more stores are grouped together. It will be noted later that there is an upper limit to the number of stores which can be grouped together beyond which inefficiencies occur. A grouping of stores attracts a total sales volume which is larger than the sum of the sales volumes each one of them would attract separately, owing to the extended trading area and increased market penetration which results from their mutual association in the shopping centre. Of course an adequate market potential must exist for each store in the centre or their inclusion in the centre will not augment that centre's attractive power.

The combined drawing power of all stores in a regional centre determines the trade area and volume of customer business. Although the outer limits of a centre's trade area are determined by the drawing power of its most powerful store, every store in

60 Nelson, op. cit., p. 58.
the centre draws business from all parts of the trade area with an intensity which diminishes at a different rate with increasing distance owing to the varying distance thresholds for different classes of merchandise. This is also reflected in variations in the share of market potential achieved. The tenant cannot always assume that the trade area for his store will be extended as a result of being associated with other stores, since their drawing power may be no greater than his own. However, generally speaking, most smaller retail outlets do increase their drawing power by associating with a large department store in a regional centre. Furthermore, they often find that their share of the market (market penetration) will be higher due to the higher drawing power of the centre as a whole.

B. Maximum vs. Optimum Centre Size

Over the years, the tendency has been to construct ever larger centres.* This tendency is the result of an attempt to find the optimum overhead point - the point at which average overhead and operating costs are lower per dollar of sales. The competitive factor is also somewhat involved (on the theory that other things being equal, people prefer to patronize the largest mart, which has, presumably, the largest selection), as well as the belief that invulnerability increases with size.

It is clear, however, that no one size or design will prove to be the most effective for all neighbourhoods and all situations. There is also certainly some point at which increased size will not result in lower operating costs, in fact, at this point operating costs will increase.

* Although there is recent evidence to suggest that this tendency has diminished.
The answer to this question of optimum size is critical as far as location is concerned. It is not only a question of the cost of the parcel of land involved, but also a question of locational factors connected with size. A very large centre must have a very much larger trading area than a small one, and the need therefore for access to large populations implies a set of site characteristics quite different from those of a neighbourhood supermarket. The most important factor in the size decision is the determination of the optimum number of square feet of selling area required to service the potential trade area. Too large a facility will have low sales per square foot, and too small a facility will not be able to serve the population, will become very congested, and will not be able to take advantage of all the business that it might be able to get if it were the optimum size.

C. Size vs. Available Potential

The size of a planned centre should be most directly related to its projected sales potential, but competitive size, anticipated trading area, growth and other circumstances of location must be factored into the decision as well. Furthermore, the size of each tenant's operation must be geared to the market potential for his type of operation. It is apparent that if one of the individual tenants in the centre has occupied space which is too large for his sales volume potential, then his rents are too high for the volume potential, and his profitability, therefore, will

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61 Ibid., p. 38.
62 Ibid., p. 146.
suffer, endangering his ability to continue to pay rent, which in turn endangers his ability to remain as a tenant. Of course in this case the developer stands to lose rental income which would inevitably affect his profit level. Therefore, it is very important that the individual tenants in the centre occupy only that space which can provide an optimum sales potential per square foot of area. Questions must be answered such as: Will more space increase the volume potential, will there be enough space to display that range of goods necessary to capture the maximum potential available in the trade area, and basically, what is the proper amount of space required to handle any given estimated volume potential? Also, is there a good population growth potential in the trading area? If there is, there might be no choice but to build the larger facility now or else face the bother of expanding in two or three years, or even more dangerously, face the prospect of competition moving in and building facilities designed to capture the untapped market potential which cannot be handled at this facility. A centre size that is just right today but will be too small in a year represents as serious an error as building it too small to begin with. A projection should therefore be made of possible business increases over the period of the lease, and the centre designed to handle this anticipated increase in volume.

D. Sizing for the Future

In practice, shopping centres are often developed to handle the future market potential, not the existing potential.\(^63\)

\(^{63}\) Ibid., p. 145.
Such centres are sometimes unprofitable in the beginning, because the trade area is still in a growth process, and sales and profits may be substantially below the projected potential. However, in a year or more the increased population in the trade area and the increasing familiarity of the centre in the area often result in additional sales that are sufficient to permit the achievement of profit goals.

E. Size vs. Required Minimum Sales Per Square Foot

Perhaps the most sensible method of determining the optimum store space for each tenant would be to determine what sales level per square foot each tenant feels is the necessary minimum before their operation can become profitable. Each national department store and each experienced local chain store should have a fairly clear idea on the sales per square foot level that must be attained before the operation will be profitable. Taking these sales per square foot figures, it is possible to estimate the size required by dividing the sales volume projection for that facility by the necessary sales per square foot figure to arrive at the number of square feet necessary to serve that volume potential. However, it must be noted that this process involves circular reasoning, since that volume potential is itself based on a prior size assumption.

F. Tenant Size vs. Affordable Rent

The proposed rent has a large bearing upon store size too, because the rent should be no more than a certain percentage of the tenants expected sales. So, for example, if a retailer's
expected sales are $50,000 per month, and from past experience he knows that he can pay no more than 5% of that in rent, then dividing through by the rent per square foot will give him the number of square feet that he can afford to rent. (An example would be: a store has $30,000 per week potential and needs $2.50 per square foot to be profitable, so $30,000 divided by $2.50 equals 12,000 square feet.) Therefore if the weekly sales volume potential is determined, and the analyst or the developer has ascertained the weekly sales per square foot that each tenant type must require to break even and make a profit, then he divides the weekly sales volume potential for each tenant by each tenant's break-even sales per square foot to get the number of square feet for break-even operation. There is no sophisticated formula for anticipating the number of square feet of selling area required to handle a potential volume, but rather the analyst makes an empirical survey of retail types and determines from this survey what sales per square foot levels are considered necessary in practice.

In summary, the centre size and the space that each tenant occupies should coincide with the projected potential of the trade area. However, it must always be remembered that the size assumed for the centre has a direct bearing on the sales volume that will likely materialize. Therefore, when estimating potential sales volumes for a proposed centre, the estimate will depend to some extent on the prior size assumption: alterations in this size assumption can alter the attractive power of the centre which will in turn affect the consumer patronage estimate and the corresponding sales volume estimate.
Design and Layout

In order for the developer to ensure that his shopping centre is attractive and therefore will draw larger business volumes, it is necessary that his layout be convenient and effective. For example, the department store should not be located across the parking lot from all the other stores. The major generator in the shopping centre must be so placed that entrances and exits from the shopping centre will force the pedestrians to walk past the other facilities in the centre in order to reach the major generator. If this is not done these other stores will be by-passed and will not be very successful. The centre as a whole will be less successful and possibly unprofitable.

Various types of tenants must be placed together so that dead areas are not created, and the centre arranged for shoppers' convenience. Store facilities should include various service shops (barber and beauty for example) in order that the centre provides some of the services associated with a shopper's goods shopping trip. They too must be properly located in the layout of the shopping centre. They should not be in a high traffic area, because they are not high volume producers, so they would not maximize the profitability of the centre in a high traffic location.

The design of shopping centres is inevitably tied to a selection of tenant types which must be so arranged as to generate pedestrian traffic throughout the centre. The dominant tenant is usually anxious to gain what he deems to be the most desirable location. In a shopping centre, if the department store

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64 Ibid., p. 236.
hogs the road frontage and has its own parking lot, there is no natural pedestrian flow back past the other stores in which case these stores suffer. Also, it would be unwise to place the department store at the entrance to the centre because the pedestrians would go no further down the mall and the various facilities placed in the mall would receive very little traffic flow past their windows. The best layout is one in which the facilities are arranged so as to create a flow-through situation from one entrance to the other entrance on another side of the centre. Similarly, in a two level shopping centre, if one floor is without a major magnet, then the consumers will not take the trouble to visit that floor. Obviously, the layout of the centre can certainly affect the profitability for each tenant, but it can also have a large affect on creating a pleasing image in the minds of the consumers who visit that centre, a fact which increases the consumer's enjoyment of shopping at that centre, and consequently enhances the centre's attractive power.

This thesis is not concerned with the actual placement of the individual tenant types within the shopping centre, except to say that poor layout examples such as the preceding can alter the attractiveness of the shopping centre and thereby harm its drawing power. Therefore, it is extremely important that the shopping centre developer employ an architect who is thoroughly familiar with the principles of successful shopping centre design so that he will ensure that the layout enhances the shopping centre's drawing power and is not detrimental to it. Generally

65 Ibid., p. 243.
speaking, store selection should be made in accordance with the volume estimates determined in the economic study, and the arrangement should ensure compatible groupings since they enhance the centre's drawing power.

Bright, attractive, colourful decor, modern aesthetic design and materials, covered malls, air conditioning, and spaciousness also enhance the centre's attractive image which affects its drawing power.

Store Types - Tenant Types

In each shopping centre, there is theoretically a best selection of tenants which will generate the most business and produce the most income. Although in many cases this will not be possible, the developer should nevertheless attempt to come as close to this ideal as possible.

In judging tenants, the developer should examine their advertising budget, apparent aggressiveness, completeness of stock, reputation, merchandising ability, stability, generating power, pricing policies, their various offerings, and whether or not they are geared to supply goods to the low income, middle income or high income groups that are found in this particular trade area.

Every shopping centre has what are known as key tenants and secondary tenants. The key tenant in a regional shopping centre would be a department store, and the key tenant in the smaller centres might be a supermarket. Smaller tenants pay higher rent charges per square foot than key tenants, since key tenants are given a concession to enter the centre as a tenant in the first place.
Apart from the key tenants, the type and required area of each tenant will be directly related to: 1) The amount of trade done in any particular good by the key tenant. 2) The estimated potential sales as calculated in the economic survey.

A. Tenants vs. Potential

Location findings have a major bearing on which tenants should be included in the centre, in the sense that it must be determined that potential exists for that type of tenant in that centre, and then beyond that what amount of space is required for that tenant in the centre. The developers should conduct a market survey of the competition existing for each function which he plans to include in his shopping centre in order to insure adequate sales potential still exists for the tenant type that he is proposing to include.

B. Tenants as Attractors

The tenant types available in a centre will have a major bearing on the centre's attractive power in its trade area. Perhaps the most overriding consideration is that the tenant offerings within the centre match as closely as possible the potential in that centre's trade area. The better the match, the more attractive the centre will be to its trade area. The more attractive the centre, the more business will accrue to the centre. If the tenant selection does not match the trade area, this will be detrimental to the centre's attractive power.

In selecting major tenants for a shopping centre, it is important to realize that better known tenants very often have better consumer acceptance since many of the people in a trade
area already shop at their stores in other locations. Furthermore, it is also important to realize that the advertising programs carried on by these better tenants may have a significantly broader coverage in the market area because of their locations elsewhere in the general region, and this higher-powered advertising can have a significant impact on the drawing power of the centre. If the tenant is well known to shoppers in the area, and if he already has an extensive advertising program, then he will likely play a significant role in drawing customers to this centre, and will have better market acceptance which improves the new centre's probability of success.

C. Tenant Mix

A balanced tenant mix means that there is an ideal group of different types of stores in the shopping centre. The tenant mix is important for two reasons. First, the success of the centre depends greatly on the shopper being able to find the variety of items that he requires in a one-stop shopping expedition. Therefore there is a great advantage to having as many types and lines of merchandise as possible available to that shopper. Secondly, the variety of merchandise and tenants in a centre must be balanced so that there is not an excessive duplication of goods and services.

Interviews with consumers in the trade area are invaluable in determining their attitudes towards various types of

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goods and where they shop for them. If it appears that good facilities are lacking for certain quality and price ranges in women's clothing or furniture and appliances for example (as evidenced by the large percentage of shoppers leaving the area to shop elsewhere for these items) then the survey points out tenant-type potentials and produces information which can be invaluable in planning tenancies, merchandise mix, quality range, price range, and breadth of selection, all of which have a direct influence on the centre's attractive power.

Merchandise Mix

Merchants have recognized differences between consumers shopping in downtown and suburban centre stores. Families in the suburbs are typically home-owning, home-entertaining, child raising, informal, and youthful consumers. They need sportswear and casual clothing, children's wear, home furnishings, appliances, and household convenience items. These items are more in demand in the suburbs. The suburban consumers typically are from different income classes, have different tastes, and require different merchandising policies if their patronage is to be captured. They will be attracted to the retail outlets which tailor their merchandise selection to this market. Obviously then the centre's ability to attract consumer patronage is dependent on its ability to match its merchandise selection to the character of the market it wishes to attract.

As mentioned previously, the greater the number of selections offered at a retail outlet, the greater is the consumer's expectation that his shopping trip will be successful. Consequently it might be expected that consumers will show a willingness to
travel greater distances for any good or service as the number of offerings increase at a particular facility. Furthermore, the greater the breadth and depth of selection in quality, styles, colours, sizes, and prices offered, the more attractive will be the retail facility which offers this selection.

A. Merchandise Mix and Attractive Power

Each tenant in the shopping centre must tailor his merchandising, stock selection, prices and styles carefully to the income and buying habits of the people in the trade area. He must know whether these consumers are on "champagne budgets" or "beer budgets." He must appeal to the specific character of the market he wishes to attract through merchandising policies affecting the quality, price, assortment, and depth of his selection.

Consumers typically shop locally for convenience items; they patronize higher-order centres for such items as furniture and appliances where more choice in style, price, and quality are necessary; and they patronize highest-order centres for clothing or such status items which demand great care in selection. Price, quality, and selection vary according to income class as determinants of consumer patronage. Higher income groups may be more quality or style conscious and they will tend to search out and patronize those outlets which offer either a broader selection in styles and qualities or higher-priced, higher-styled, better quality items. Lower income classes who are more restricted budgetarily may be more price conscious and their shopping patronage will reflect their more pronounced price-consciousness. A centre's
ability to attract patronage will depend on its ability to adjust its merchandising appeal to match the factors which motivate consumers in the trade area.

**Pricing Policies**

It is necessary to acquire data on prices actually in force in the area, and then ascertain what prices should be charged by the tenants in the proposed centre to be competitive with others in the trade area. If they are higher, this may detract from the attraction of the centre, but if on the other hand they are competitive and compatible with the character of the trade area, this will enhance the shopping centre's drawing power.

**Image**

The image which a shopping centre projects has a definite effect on the centre's drawing power, although the exact effect is difficult to measure. Two essentially identical stores with essentially similar market potentials, but with different images, will have different business volumes. Similarly, the share of the market secured by one centre in its trade area can be completely different from that of a similar type of centre operating within an identical trade area. This reflects the fact that the image of the centre can affect the centre's drawing power and market share.

The consumer's image of a centre is formed on the basis of many factors, including the centre's age, promotional programs, merchandise mix, prices, services, personnel and physical facilities. The physical characteristics of the centre including
landscaped areas, fountains, ponds, sculpture, advertisement booths, restaurants, benches, interior and exterior architectural design, lighting, modern store fronts, and colour all increase and enhance the attractiveness of the centre.

When a centre's image is unique, and customers like it, the trade area for that centre is likely to extend farther and market penetration is likely to be more intense. If many stores in the centre develop an image which is unique and pleasing to the customers, the entire centre will benefit from the resulting increments to attractive power.

Parking

Since the outstanding characteristic of the shopping centre is the availability of free parking, it is appropriate that the parking requirements be studied as part of the process of analyzing the centre. The need for parking is well recognized, partly because parking spaces are a visible tangible asset of the facility, but mainly because the consumer often equates good parking with ease of accessibility by automobile.

A. Adequacy of Parking Facilities

The main consideration in determining the amount of parking to be provided should be that the parking facilities be adequate to handle the peak load of any average week.\textsuperscript{67} Without this capacity, the centre will suffer a loss of patronage as consumers will find it too difficult to get near the centre in these

\textsuperscript{67} Nelson, op. cit., p. 252.
peak volume periods. On the other hand, sometimes there is a dis-advantage in having too much parking since a large bare parking lot makes the shopping centre look unsuccessful and unattractive.\textsuperscript{68} Generally speaking though, up to a point, each additional parking space can contribute to more sales for the centre. If the centre can handle additional business, and there is not enough parking to handle that business, then the provision of additional parking space would increase the sales volume of the centre. Obviously, then, adequate parking facilities are absolutely necessary if the centre is to attain its maximum potential sales. The shopping centre developer, then, would be wise in providing an allowance for expansion in parking facilities, in case it becomes obvious after opening that initial parking provisions were inadequate and were hindering the centre's ability to achieve its maximum potential.

The parking requirements for the centre can only be ascertained after analyzing the following factors: the size of the centre, the types of tenants, and the merchandise offered; the size of the trade area; the incidence of car ownership; and the extent to which patronage depends on the motorized shopper (and the extent to which inadequate public transportation coverage of the trade area necessitates automotive transport).

Parking lots should be specifically designed.\textsuperscript{69} They are more advantageously placed if they are in front of the centre or visible from the main approach arteries where shoppers can see

\textsuperscript{68} Ibid., p. 253.
\textsuperscript{69} Ibid., p. 258.
that they are accessible. Entrance and exit from the lot and ease of circulation within it are as important as an adequate size. Shoppers should not have to walk great distances from their cars to the nearest store. All of these considerations can be invaluable aids to maximizing the sales potential for the centre, since they provide greater convenience to the shopper and thereby reduce the friction or costs of making that shopping trip which in turn makes the centre a more attractive place to visit.

Amenities

To be a successful venture for the developer and to produce the highest business volume for the tenants, a shopping centre should be designed to be more than just a group of stores with free parking. It is extremely difficult to alter the normal circulation patterns of consumers, and the opportunity to park will not accomplish this alone. There should be in addition a number of amenities which create more pleasant and desirable surroundings.

Restaurants, places to sit down, play areas for children, rest rooms, bright and colourful new store fronts, planting and fountains, and music are all designed to make the centre a more convenient, pleasant place to shop.

Special attention in the planning stages can be given to details which would tend to make the centre a place which serves the community, a market place to which people will come not only for shopping, but for social and recreational activities

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70 Ibid., p. 253.
71 Ibid., p. 247.
as well. With the incorporation of community facilities, the centre plays more than a strict economic role, and in this way offers more in the way of attractions. Auditoriums are sometimes included to strengthen the identity with the community and community relations. Skating rinks, bowling alleys, theatres, and large covered malls suitable for large public gatherings are common. Such facilities often facilitate promotional programs, bazaars, and special events which do much to enhance the attractive power of the centre. The centre assumes some of the character of the old-style market places in the sense that it offers interesting diversions. Such amenities have an amazing impact on consumers as far as the image of the centre is concerned, and increase its attractiveness and attractive power. The greater the attractive power, the more likely the centre will do more business, and if the amenities help to increase that attractive power they are usually worth far more than their cost.

**Hours of Business**

The hours of business adopted by a centre can have a significant effect on the drawing power of that centre. It must be realized that today more and more women are working after they are married, and in many cases they can only shop in the evenings or on weekends. If a store wishes to remain competitive with other stores who offer evening or weekend hours, it must also offer those hours or the likelihood increases that it will not realize the full sales potential available to it.

An important characteristic of retailing is the time convenience in shopping. Stores must ascertain the hours of the day or week when it will be convenient for their customers to buy
the goods and services they want. It is usually advantageous for the shopping centre tenants to carefully consider what hours they will remain open for business, a decision which will depend on many factors including the types of merchandise offered, the economic and social classes of the clientele, and the character of the location. Each tenant will make his own decision but it is to their advantage to collaborate on the decision so that the centre, as a whole, can offer services over specified daily periods. Typically, when the department stores are open so are the other stores.

Restricted shopping hours can in many instances restrict patronage if the family car is not available during those hours for shopping trips. More and more shoppers are demanding evening hours due to the fact more consumers only have time to shop in the evening or after work. In North America, the preference for evening shopping hours is illustrated by the following survey findings: "the duration of the stay was 51 minutes as compared with 29 minutes during the day; 31% of all shopping trips were made after 6:00 p.m.; in community centres, up to 60% of all trade was done after 6:00 p.m.; and in regional centres up to 40%." The percentage of trade done on each day of the week is highest on Thursday, Friday and Saturday owing to two factors, the first being the longer hours normally provided on those three days, and secondly, the traditional shopping pattern which emphasizes end-of-week shopping. Evening hours can create some shift problems

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72 Jones, _op. cit._, p. 54.
73 Donald L. Curtiss, _Operation Shopping Centres_, Urban Land Institute, Washington, D.C., 1961, pp. 6 and 188.
for the various tenants of the shopping centre but if they do not open in the evening, they run the risk of losing business to other retailers who do remain open.

Obviously then, convenient shopping hours can have a significant bearing on the ability of the centre to attract its full potential patronage.

Advertising

That considerable benefits can accrue from an effective, powerful advertising and promotional program is well recognized although it is a difficult problem to measure the benefits quantitatively.

The types of customer appeals used in the centre's advertising program are normally geared to the character of both the trade area and the centre itself. Price, quality, variety, or service may be stressed in media advertising through magazines, trade journals, newspapers, direct mail, radio, and television. Special events, bazaars, holiday promotions, and seasonal promotions are common centre-wide events. All such appeals attempt to attract more consumers to the centre.

Since the potential sales volume estimate for the centre is dependent on the attractive power of the centre, and since the attractive power can be increased with an effective advertising program, a certain effectiveness in advertising must be assumed when gauging the new centre's attractive power which will in turn become a key determinant in the derivation of the sales volume estimate.
Summary of Factors

In this chapter, the intention has been to enumerate and examine the various arguments, assumptions, concepts, and relationships thought to be valid in a discussion of the factors which influence consumer patronage behaviour. The material developed here will be referred to throughout the remainder of this thesis, and was presented with the intention of specifying the "building blocks" which analysts and model builders should consider as "raw materials" when developing procedures and models to aid in the process of sales volume estimating.

In view of the length of this chapter and the involved discussion on a great variety of separate topics, and for the sake of clarity, the main points have been extracted and briefly summarized below.

A. General Considerations

There are a number of regional and demographic factors which affect the sales potential available to a new centre. These would include:

1. Economic outlook - the health and growth of the regional economy.
2. Population - the number, distribution, composition, density, growth pattern, income, expenditures, and buying habits of the population.
3. Income levels - they affect the percentage of income spent for various products of all types. The expenditure patterns of consumers vary
with their income level, which directly affects expenditures for different product classes.

4. Employment - the character of employment in the region affects purchasing power, spending patterns, shopping habits, and merchandise requirements.

B. Resistance Factors

Of the factors and influences which affect consumer spatial behaviour, some tend to inhibit consumer patronage. Such factors can be described as resistance factors.

Distance takes time, costs money, and retards trade movements. Any circumstances which will increase the costs of making a trip (costs in the sense of time, effort, money, inconvenience) will lessen the likelihood that a consumer will undertake the trip. Resistance tends to increase as distance increases and trip frequencies decline. Trip distances tend to be lower as trip frequencies increase. Distance in time units more aptly represents the costs perceived by the consumer in making the trip. The impact of distance varies according to: the type of merchandise sought; the selection, quality, pricing, and depth of merchandise sought; the degree of importance to the consumer of certain required goods; the degree of selectivity in the purchase decision; the social significance attached to certain shopping requirements; psychological blocks caused by various geographical barriers; and consumer willingness to substitute other merchandise. Accessibility, traffic congestion, and road capacities can alter the effect of distance.
The number of competitors, their merchandising policies, size, age, quality and effectiveness, attractiveness, and parking facilities all affect the patronage and sales volume which a proposed centre can expect to capture.

C. Attraction Factors

The attractive power of the centre varies according to: the extent to which merchandise offerings match the character of the trade area and the demands of the consumers; store sizes and the overall size of the centre; attractive design and layout; tenant-types; merchandise mix, breadth of selection, range of colours, sizes, and styles; competitive and market-oriented pricing policies; reputation of the centre; the projected image of the centre; adequacy of parking facilities; amenities; hours of business; and promotional effectiveness. The attractive power of the centre varies with the above factors, but the importance and effect of each varies in turn according to the family size, age groupings, income status, and social status of the consumers in the area.

(Although it has not been explicitly stated, it should be apparent that many of the above considerations are aspects of effective shopping centre management. It should therefore be evident that the attractive power of the centre can be enhanced with good management.)
PART B

TECHNIQUES IN LOCATION ANALYSIS
CHAPTER V
METHODS FOR DETERMINING TRADE AREA POTENTIAL

Introduction

It is one thing to understand what a trading area is and what factors are important in the measurement of that trade area, but it is quite another matter to apply this knowledge in the case of a centre yet to be built. Having reviewed the basic conceptual factors and interrelationships which influence consumer patronage behaviour, the task now is to examine the various practised methods of defining the potential trade area and estimating the sales potential for a proposed centre. Specifically, the purpose is to determine how adequately the preceding factors and interrelationships are recognized and quantified in the methods, and also to what extent these methods are capable of generating reliable, accurate results based on sound, objective measurements. With this objective in mind, the following discussion will briefly survey a few of the commonly practised approaches.

Generally speaking, the methods to be examined follow a sequential procedure which includes: the establishment in advance of a tentative trading area for analysis; the assumption of a tentative conceptual image of the proposed shopping centre for the purpose of estimating the attractive power of the envisaged facilities; the determination of the total disposable income of the residents of the area through population studies, income analysis, and consumer expenditure studies; an analysis of competitive drawing power; the study of consumer movements, habits, attitudes, and characteristics to determine the likelihood of
patronage from various parts of the trade area; and the relation of the findings to the subject site, culminating in an estimate of the sales volume potential for the proposed centre.¹

Market Share Method

As previously discussed in Chapter III, the first step in the research program necessitates setting up a likely hypothesis (or a range of hypotheses) as to the most likely size and character of the proposed facilities in order to estimate the attractive power of those hypothesized facilities. This is necessary before the trading area can be delineated, since the boundary of a centre's area of influence (trade area boundary) depends on the size and character of the facilities and their ability to attract patronage. If subsequent research indicates that the initial assumption as to the size of the envisaged facilities was incorrect, then the analyst is supposed to adjust his initial assumption. He begins by "guessing" what size and type of centre will be successful, analyzes the potential for that size, and if necessary alters his initial guess successively until the optimum size is discovered. However, after having made this initial assumption, the problem is to define the limits of the trade area in accordance with the hypothesized attractive power of the hypothesized facilities. It is at this stage that subjective judgment enters into the decision. In most cases the analyst using this method must arbitrarily decide on a boundary for the trade area.² Usually the practise is to draw

¹ Nelson, op. cit., pp. 183 - 232 discusses many of the traditional methods of sales volume estimating and describes the above sequential procedure at some length.
² Ibid., pp. 188 - 90.
on a map several driving-time isopleths which radiate out from the subject site, and then arbitrarily decide which driving-time isopleth is likely to represent the maximum distance consumers will be willing to travel to the centre. Seldom is there any particular justification given for the choice of any particular driving-time distance, except that the choice is supposedly based on "experience" and intuition as to the maximum distance within which consumers will be attracted to the centre given a certain hypothesized attractive power of the subject site (not quantified) and given the presence of other competing facilities (also not quantified). These estimates of the maximum driving-time can vary widely, for example from ten minutes to over an hour depending on the location, a range which raises the suspicion that the choice of any one particular time is open to considerable question. In any case, the trade area is subjectively and arbitrarily delimited according to such a procedure in conjunction with other factors such as geographical barriers, proximity of competing centres, and local accessibility factors. Generally speaking the analyst sets the limits of the trade area at a point beyond which he feels the business volume coming to the centre will be insignificant or immeasurable.\(^3\) Supposedly, if in subsequent field work, the analyst decides he has made a mistake and the trade area boundary should be farther out from the centre (normally as a result of personal interviews which indicate that consumers beyond the initially assumed boundary would indeed be interested in patronizing the centre) the analyst simply resets the boundary farther away. Regardless of the analytical procedure, and especially if comprehensive extensive

\(^3\) Ibid.
personal interviews are not conducted, it is difficult to place much confidence in a trade area boundary determined in such an arbitrary manner. Nevertheless, this is the first step in the procedure, the basics of which are outlined below:

Step 1) Define the trade area by subjectively estimating the drawing power of the hypothesized facilities (by guessing the attractive power of the centre and guessing the distance in physical or time units that consumers will be willing to travel in response to that attractive power, as discussed above).

Step 2) The trade area is subdivided into census districts or smaller subdivisions depending on the amount of detail desired and the budgeted research expense, or according to various geographic and social economic characteristics. The size, growth, and quality of the trade area are analyzed along with population growth, income levels, and the area's general state of economic health.

Step 3) The population in each segment of the trade area is determined as accurately as possible. Depending on the year for which sales volumes projections are being made, future changes in population are projected on the basis of employment trends, natural increases or voluntary migration, and public policy on planning and housing generally.

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4 Jones, op. cit., pp. 66 - 68.
5 Nelson, op. cit., p. 191.
6 Ibid., p. 197.
Step 4) Interviews are often conducted throughout the trade area to determine: a) attitudes toward existing and proposed facilities in terms of satisfaction, b) shopping habits and patterns of patronage, c) attitudes towards pricing and merchandise selection, or what is demanded in this area, and d) socio-economic factors such as employment status, income status, social status, family size, and age groups.  

Step 5) Accessibility studies are conducted to ascertain: a) time-distance from the proposed site to each section of the trade area, b) road networks and their traffic capacity, c) automobile incidence and the adequacy of public transport facilities, d) the location of each spending unit in relation to existing retail facilities and the proposed centre, and e) the ease of travel to existing retail facilities and the proposed centre.  

Step 6) Existing retail facilities must be assessed. Data on competitive stores must generally be gathered in field studies. Information may include: location of the competitive facilities; type of location (for example single store, neighbourhood, community or regional centre); historical data about the stores' or centres' growth rate and the aggressiveness of each competitor; the age, quality, design, condition, and appearance of each store or centre; square feet of competitive selling

7 Ibid., pp. 198 - 209.  
8 Ibid., p. 211.
area; merchandising policies including the quality variety, pricing, special lines featured, private brands, and advertising practices; store hours; parking facilities; consumer acceptance of each facility; share of the market captured by each outlet; and the estimate of the sales volume achieved by each outlet, a subject which presents its own special problems in measurement. To digress for a moment, this subject is briefly considered below before the discussion returns to Step 7 in the general procedure.

Interviews in the biggest centres are frequently helpful in establishing the general trade area limits for those centres. In making sales estimates of a competitive facility, the analyst often conducts customer interviews to obtain consumer loyalties, preferences, indications on pricing which are favourable to that market and general opinions on the various competitive outlets available in the region.

The most difficult problem in evaluating competitive stores is estimating sales. The analyst has no reliable set of tools with which to generate sales estimates, but through systematic effort must attempt to estimate as accurately as possible. The number of customers patronizing an outlet provides some indications as to sales levels. The technique of counting customers is sometimes employed in order to

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9 Ibid., pp. 211 - 213.
compare the number of customers with that of another store, the sales of which are known.\footnote{10}

It should be noted that these methods are of course very subjective, which indicates the lack of more precisely defined quantitative tools with which to evaluate competition. Obviously, the more quantitative data available to the analyst, the better the likelihood that he can produce an accurate estimate of the impact of competition.

\footnote{10} The most common approach involves measuring the square footage of store area, which is then multiplied by a conversion index in order to arrive at a sales figure. For example, a conversion index of $5.00 per square foot may be applied against the number of square feet of selling area to arrive at an estimate of sales. Conversion indices are usually based on typical industry performance, or on the experience of individual tenant-types in the centre, or on subjective "feel" or intuition. However, whatever the conversion index used, the analyst must adjust the sales result thereby obtained to reflect other factors such as the store's association with other generative businesses nearby, the merchandise offerings, store age and appearance, and effective promotional efforts.

The hazard in the conversion index approach is that for individual stores a conversion index may be far off the mark. Therefore, a good deal of caution should be exercised when applying such conversion indices. In the final analysis, an accurate sales estimate seems to depend largely on the analyst's experience, skill, ingenuity, and judgment.

Step 7) Total disposable income of each section of the trade area is calculated either by multiplying per capita income data for each section of the trade area by that section's population or by multiplying average family income by the number of families. The resultant figure is multiplied by a percentage factor to arrive at the "disposable" portion of that income, or that portion available for retail expenditure after the payment of taxes, mortgages, insurance, etc.

Step 8) Retail expenditure factors (which are based on national averages of the percentage of disposable income spent on each type of merchandise) are applied to the total disposable income to obtain the percentages of that income normally spent on each type of merchandise. These are totalled for each section of the trade area and indicate the total retail expenditure potential of the trade area for the types of merchandise offered in the proposed facility.

Step 9) With the aid of subjective judgment, percentage factors are arbitrarily assigned which represent the total volume of trade in each area for each class of merchandise which will go to the proposed centre. Sometimes two percentage factors are applied, one for convenience goods and the other for shopping goods. The summation

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of these estimates gives the total sales volume projection for the proposed centre.\textsuperscript{12}

Step 10) The estimated sales volume for the proposed centre is translated into required selling area in square feet by dividing the expected annual volume by what is considered to be an acceptable sales per square foot figure.\textsuperscript{13} For example, if in a given year successful regional centres tend to require between $50 - $70 per square foot of selling area to achieve satisfactory profits, then the annual volume estimate is divided by

\textsuperscript{12} These percentage factors are based on the analyst's intuitive judgment as to how effective the proposed centre will be in capturing a share of the potential market. The analyst basically distributes the potential among the various competing outlets including the proposed centre. Since there is rarely (if any) justification on quantitative grounds for the choice of any one particular percentage factor as the exact proportion of the potential expenditure which the proposed facility will capture, the factor chosen must be viewed with considerable caution. It is common for such arbitrary market share percentage factors to be grossly in error as a result of inadequate and unquantified judgments as to the proposed centre's drawing power. Often these factors are chosen without any explanation as to how they were derived or why a particular figure is more suitable than another. A research report which for example uses a market share percentage factor of 14.5\% but does not mention the justification for the choice of such a precise figure can only be viewed with total distrust.

The market share or market penetration achieved by a centre in a particular area will depend on that centre's attractive power and on the factors which influence consumer patronage behaviour (in fact, most of the factors mentioned in Chapter IV). The distance of an area from the centre, the appeal of the subject centre, and the relative appeal of all competing facilities are a few of the factors which affect the subject centre's trade area penetration. Accurate assessment of the effect that the new centre will have on the patronage behaviour of the trade area customers is an extremely difficult task and one which demands more precisely defined and quantified techniques if the choices of market share percentage factors are to be accepted with any measure of confidence.

\textsuperscript{13} Nelson, \textit{op. cit.}, p. 225.
a specific figure in this range to produce an estimate of the total selling area required to successfully handle this anticipated volume. Similarly, industry averages of the sales per square foot considered necessary by each tenant-type for successful operation are sometimes applied to the volume expectancy for each tenant-type to ascertain the selling area which each tenant-type can successfully occupy in the new centre. Again, there is a considerable danger in applying such averages to any particular situation, and it should be recognized that the procedure produces approximate solutions only.

Vacuum Calculation Method

In this method, primary and secondary trade areas are outlined around a site based on arbitrary pre-selected travel time limitations and natural barriers.¹⁴ Data on population, income, and the total business volume available in the trade area are developed. Then all the stores and centres within or close to the trade area are physically measured so that their volume capacity can be determined. The method for doing this is to assign each competing retail facility a certain sales per square foot based on national averages for that type of facility and then multiply this figure by the square footage of each facility to determine their volume capacity. The dollar volume capacity of the stores and centres within or close to the trade area are

¹⁴ Ibid., p. 151.
then subtracted from the total volume available in the area. The balance or "vacuum" represents the potential for the proposed new centre.

This technique basically attempts to show which areas are under-served with retail facilities. But assigning proportions of total sales to each competitive outlet on the basis of normal or average sales per square foot ratios assumes that the new facility will only pick up the excess expenditure potential. It does not properly consider whether the new facility will in fact capture a sufficient proportion of the potential expenditure to render certain existing outlets unprofitable. It assumes that the existing outlets will continue to attract normal volumes after the new proposed facility opens, a conclusion which is not always borne out by reality. Furthermore, the method implies that the proposed facility's attractive power has no bearing on the expenditure which that facility will receive. It will supposedly only receive the residual expenditure, regardless of that attractive power, or time-distance factors, or accessibility, or the convenience of the new location. This conclusion on logical grounds appears to be absurd. Any sales volume estimate based on this approach would have to be viewed with considerable caution.

Analog Method

One way to determine the trading area and the sales volume potential within it for a proposed centre is to know what kind of a trading area an existing centre of similar size, location

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15 Jones, op. cit., p. 65.
type, and operating characteristics commands, preferably one under the same ownership as the proposed centre. If trading area models of existing centres are available to the analyst, the task of defining one for a proposed centre becomes less difficult, since the analyst may be able to delineate the potential trading area boundaries with better accuracy through the use of analogs. An analog is a visible equivalent of an envisaged situation, and so by using analogies the analyst applies knowledge of existing situations to undeveloped situations that appear to be closely similar.

An analog is the quantified experience, or performance record, of an existing retail facility, in relation to known market factors, consumer shopping behaviour patterns, and store characteristics. These analogs are used as benchmarks for predicting the sales of proposed new stores which are similar in essential respects to the analog sites.\textsuperscript{17}

The virtue of this projection method is that it is based upon quantified aspects of the trading area in combination with the known performance of other similar outlets in similar situations.

Analogs do not provide a magic formula - no two situations are exactly alike, and the available analogs must therefore be interpreted and tempered by the store location analyst in the light of his subjective judgment.\textsuperscript{18}

\begin{itemize}
  \item \textsuperscript{16} Kane, \textit{op. cit.}, p. 31.
  \item \textsuperscript{18} Ibid.
\end{itemize}
This method for estimating potential sales volumes depends on both quantified experience and subjective judgment. The less quantified experience available, the more it becomes necessary to rely on subjective judgment. Quantified experience refers to results obtained from measurements of retail sales in relation to known market factors, consumer patronage behaviour, and retail facility characteristics. Analogous situations of similar facilities and similar market factors, when statistically quantified and related, can become benchmarks for reference when conducting sales volume analyses on new, but similar situations.

An analog might include the following information:
- location of the outlet,
- type of outlet,
- size of outlet,
- annual sales volume,
- sales per square foot,
- income levels in that trade area,
- main method of transportation used by customers,
- number of customers within various time-distances from the centre,
- the drawing power of the centre with increasing distance from the centre,
- market penetration (market share) achieved,
- per capita sales,
- total expenditure potential,
- and the quantity, quality, and competitive position of competing outlets in terms of their market shares.

The location analyst would then examine those analogs collected for competing facilities or similar facilities and would select those analogs most closely approximating the factors of the new proposed location. By averaging the analogs which are actual case studies of similar, actual situations, and then modifying or adjusting these averages to fit the variations in the proposed site as compared with the previous ones, the analyst estimates

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19 Ibid., pp. 234 - 240.
the expected patronage, the expected per capita sales, and the total sales volume for the subject centre.

In many cases the analog technique cannot be used since there are either no analogs with which to compare, or the analogs are too dissimilar to permit adjustments of any accuracy. There is no theoretical content to the method: reality is recorded with no attempt to explain causation. Therefore, if the reality described in the analog is grossly dissimilar to that of the subject site, there is no theoretical explanation of how to compensate for the differences. Therefore the method demands that a close approximation of the subject site be available. In fact, the method was advocated as a result of the recognition that theory had not yet developed to the point where it could accurately quantify the myriad factors influencing consumer patronage. Therefore, without attempting to theorize, the method merely advocates comparing a proposed situation with an empirically observed one and adjusting the actual, observed situation to account for the differences between it and the proposed situation. Provided these differences are not too extreme, and provided suitable analogs are available, and provided subjective judgments are accurate, the method could provide a reasonably accurate prediction. However, analogs are seldom available in sufficient detail, variety, or suitability, and consequently a considerable number of subjective judgments are usually necessary which increases the probability of error.
Limitations

A. Rigid Sales Level Assumption

One criticism of the vacuum calculation method is its apparent failure to allow for the increasing efficiency in the use of floor space, in terms of sales per square foot. In other words, the method assumes that the various existing centres are already at maximum sales and would not be able to handle increased sales volumes without expanding facilities. It also assumes that the new facility will only capture the residual potential which is supposedly under-served, which is why the method tends to produce a more conservative sales volume estimate than the market share method, which generally gives an optimistic assessment of sales potential. This is mainly because the market share percentage factors assigned in the market share method for the drawing power in each trade area segment normally produce higher estimates of trade capture than when the existing sales potential is allocated to all existing competitors first and only the residual considered as potential for the new centre.

B. Expensive and Lengthy

In the market share method, the depth of the preliminary research provides useful information which can be used in the design of the shopping centre and in planning the promotional techniques, but the length of time and expense required for any research of this type is a disadvantage especially where competition for potential sites and markets is high. It involves considerable field surveys and consumer research studies which are expensive and require experienced interviewers, particularly in
the assessment of shopping habits and preferences. In assessing
the competition, establishing the relative efficiency and attraction
of each competing retail facility by survey methods even if
only on a sample basis is lengthy and depends on effective interviewing and data processing. Furthermore, often the analysis
takes little account of such factors as increased car ownership,
or of different expenditure patterns and shopping habits in the
various income groups.

C. **Necessity for Subjective Judgment**

The number of assumptions made often places the validity
of the results in doubt, and also emphasizes the necessity of obtaining accurate data. The main problem, however, occurs in the
calculation of the trade area limits and the correct market share percentage factors. There is usually very little theoretical justification in the reasons for either the choice of a particular driving-time for the trade area boundary, or the choice of market share percentages. The analyst merely intuitively weighs the various factors to arrive at a "guesstimate" of drawing power and market penetration. While the field work and original research are directed primarily toward increasing the accuracy of judgment for these estimates, and although these estimates are based on local circumstances, they are still arbitrary, subjective judgments.

Estimating the business volume for a new outlet involves predicting what individuals will do when they are offered different alternatives from those they had before. From the preceding discussion, it appears that there is no way of eliminating the use of judgment. The necessity for subjective judgment at various stages in these methods reflects the lack of more precisely
defined quantitative tools.

D. **Danger of Cumulative Errors**

In using the methods discussed in this chapter, the analyst is forced to make assumptions especially in the areas of market share percentages, trade loss to competing retail facilities, market shares in the event of new competing outlets opening nearby, and the actual limits of the trade area. That a danger exists for making cumulative errors is evident in the following discussion.

When trying to estimate the potential volume of a trade area, the analyst must first of all establish a tentative trade area that can be analyzed, at the same time creating a conceptual image of the completed shopping centre in order to determine the strength of attraction which would be exerted by the hypothesized facilities. It appears that only after taking such steps is it possible to accurately determine the population residing within that tentative area which then enables the calculation of the total income and the potential shopping centre expenditures as a proportion of that income. (The attraction of the centre also of course plays a large part in determining the market share that the new centre is likely to achieve within that particular defined area.) However, if the initial trade area boundaries which are set arbitrarily are grossly in error then all of the resulting data on population and income within that area are also grossly in error. For example, first of all the trade area limits are estimated which then means that the potential customers and the total expenditure potential are confined to that estimated area. These estimates in turn are multiplied by estimated market share percentage factors to arrive at an estimated potential expenditure.
from that area for the new centre. This is a pretty sketchy process involving the danger of cumulative errors in judgment, which probably accounts for the fact that many volume estimates differ significantly from the realized results after opening.

E. Sensitivity of the Volume Estimate to Driving Time Assumptions

Differences in the assumption made regarding what driving-time limit to set when delineating the trade area can have a profound effect on the measurement of potential volume. The volume potential is extremely sensitive to changes in this driving-time limit. For example, if the driving-time limit is changed to fifteen minutes from ten minutes, this is a 50% increase in straight time-distance, but a considerably larger increase in the size of the enclosed area owing to the fact that the area of the circle increases proportionately faster than its radius. Therefore, in this example, the time-distance has increased by 50% but the area enclosed within that time-distance has increased by more than 100%. Therefore, the total potential expenditure within fifteen minutes driving-time is more than twice as large as that within ten minutes driving time. Obviously, if such small changes in the driving time assumption can produce such wide variations in the trade area size (and therefore the total retail expenditure) then it is difficult to place much confidence in a sales estimate which is based on a particular trade area boundary driving time assumption since the results are so sensitive to variations in that assumption.
Summary

The market share method, vacuum calculation method, and analog method are a few of the more common methods employed in analyses of sales volume potential. The analog method involves adjusting the data derived from analogous trade areas to fit the subject situation. The market share method subjectively delineates the trade area according to arbitrarily assigned driving time limits in conjunction with intuitive judgments regarding competitive facilities and other attraction-resistance factors. The method then requires a subjective assignment of the derived trade area potential to all the competing facilities within attracting range of the subject site. The vacuum calculation method also subjectively delineates the trade area but then ascertains the current retail volume achieved by each existing competitor and only allocated the residual portion of the total potential to the proposed facility.

Each method has shortcomings, especially in the reliance on arbitrary and subjective judgments in the areas of delineating the trade area and assigning market shares. The lack of more precise, objective, quantitative measurements lessens the degree to which the results can be accepted with confidence. Furthermore, extensive field surveys are often necessary to improve the accuracy of those subjective judgments.

In an attempt to overcome some of the shortcomings discussed above, various researchers have proposed the use of models expressed in mathematical formulae as a means of generating estimates more quickly and consistently based on more objectively quantified measurements. These models are discussed in the next chapter.
CHAPTER VI

MODELS FOR DETERMINING TRADE AREA POTENTIAL

Introduction

A model can be described as follows:

A model literally consists of "named" variables embedded in mathematical formulae (structural relations), numerical constants (parameters), and a computational method often programmed for the computer (algorithm).\(^1\)

Models attempt to identify primary variables which are sufficient to describe a relationship, while recognizing that any one factor or several different factors may affect the weighting of those variables. The probability model attempts to describe to what extent something is likely to be the effect of some other causal variables. If it is not an exact "deterministic" relationship, the probability model allows for the influence of unknown factors by stating the effect in terms of a proportionate occurrence of that outcome. In this sense, the probabilistic models do not produce the exact effect of a number of causal variables, but rather state the likelihood of that effect occurring. The difference between likelihood and reality is a function of conditional factors which affect the causal variables and produce a different result.

Models then attempt to describe average uniformities in behaviour which can be expressed in mathematical form. The mathematical equations are structured relationships of abstracted

variables, and on the average, behaviour is expected to occur as described in these mathematical formulas.

**Early Models of Retail Gravitation**

Reilly and Converse

Over the past several decades much attention has focused on the gravity concept of human interaction. Early models of this type were analogies to Newton's Universal Law of Gravitation which in general terms stated that the force between two masses was directly proportionate to the size of each mass and inversely proportionate to the square of the distances separating them. This is expressed in the formula:

\[
F = \frac{GMm}{d^2}
\]

where \( F \) = force, \( G \) = a universal constant (gravitational constant), \( M \) = one mass, \( m \) = the other mass, and \( d \) = the distance between the masses.

In general terms, the gravity concept of human interaction displays its similarity to Newton's law by postulating that interaction between two centres of population concentration varies directly with some function of the population size of the two centres and varies inversely with some function of the distance separating them.

Most of the "laws" of retail gravitation in marketing literature are based to a large extent on the studies begun by Reilly in 1927.\(^2\) Reilly's studies were conducted over a three

year period with the object of discovering some method for measuring the retail influence of a city (or the amount of trade drawn from its surrounding areas). Converse has offered a number of refinements and extensions to the results obtained by Reilly.\(^3\) Basically, the combined efforts of Reilly and Converse are summarized in the six equations described below. Each equation is examined along with a brief discussion of the methodology by which empirical support for them was derived.

The original law was stated by Reilly:

Two cities attract retail trade from any intermediate city or town in the vicinity of the breaking point approximately in direct proportion to the population of the two cities and in inverse proportion to the square of the distances from these two cities to the intermediate town.\(^4\)

Mathematically this statement can be written:

\[
\frac{Ba}{Bb} = \frac{Pa}{Pb} \times \frac{Db^2}{Da^2} \tag{VI - 1}
\]

where \(Ba\) and \(Bd\) = proportions of retail trade from the intermediate town attracted by cities A and B respectively; \(Pa\) and \(Pb\) = the populations of cities A and B; and \(Da\) and \(Db\) = the distances from the intermediate town to cities A and B.

Converse and his associates developed an equation known as the breaking point formula, written:

\[
Db = \frac{Da + Db}{1 + \sqrt{\frac{Pa}{Pb}}} \tag{VI - 11}
\]

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\(^4\) Ibid., p. 9.
where $D_b = $ distance from city B to the breaking point, or that point where trade ceases to be attracted to city B and is instead attracted to city A.

In addition, Converse developed another law of retail gravitation, stated:

A trading centre and a town in or near its trade area divide the trade of the town approximately in direct proportion to the population of the two towns and inversely as the squares of the distance factors, using as the distance factor of the home town.

Mathematically, this is expressed:

$$\frac{B_a}{B_b} \cdot \frac{P_a}{P_b} = \frac{H_b}{d^2}$$

where $B_a = $ the proportion of the trade going to the outside town; $B_b = $ the proportion of trade retained by the home town; $H_b = $ population of the home town; $P_a = $ population of the outside town; and $4 = $ the inertia factor. According to Converse, the inertia-distance factor reflects the effort to overcome the inertia of travelling to a store close at hand. If a small town loses trade to more than one larger town, then the proportion lost to these towns is determined by using multiples of 4 to obtain a total inertia factor. Converse states that experimentation with this method has led him to conclude that it works satisfactorily.

Two more equations have been tentatively proposed by Converse to increase predictive accuracy in those cases where a

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trading centre is more than twenty times the size of the intermediate town. They are the same as the above two equations except that the distance exponential parameter is changed to 3 although Converse admits that insufficient data had been gathered in support of this modification, hence his labelling of this modification "tentative."\(^9\)

The final equation developed by Converse is a modification of equation (VI-1ll). Because of urban congestion, neighbouring small towns were found to retain a larger proportion of their fashion goods than equation (VI-1ll) predicts. After data collection, it was determined that the inertia-distance factor should be 1.5 instead of 4.

The above-mentioned equations summarize the laws of retail gravitation. They were developed, structured, and quantified on the basis of empirical observations. Reilly attempted to determine the causal factors which would explain the phenomenon of the division of retail trade between two cities, and also to determine what relationship the factors bore to each other and to the phenomenon. Reilly ascertained that the specific factors of population of the cities and distance from the cities must be the determining factors. He states:

\[ \text{It is so readily acceptable that the amount of outside trade which a city enjoys in any surrounding town is a direct function of the population of that city and an inverse function of the distance of the city from town, that the general law needs no support.} \]\(^10\)

\(^9\) Ibid., p. 383.
Reilly reasons that it is inconvenient and costly for people to travel to shop. But on the other hand, he is not nearly so certain that population is the correct variable in a direct relationship. He mentions that it is not simply a matter of a large cluster of people alone which causes other people to travel to that city to shop, but rather it is the existence of such attractions as large retail stores with a wide variety and depth of goods, social and recreational attractions, and the influence of the large city's advertising media which cause people to shop there. In fact, he mentions a long list of factors which may influence the division of trade, and distance and population are only two of the many. However, Reilly reasons that attractions offered in the city are only feasible as a result of the large population, and therefore, the degree of attraction must be correlated strongly with population, which leads Reilly to conclude that in view of this relationship, it is reasonable to use population as a "proxy" variable for these other factors.  

Reilly sums up the preceding argument as follows:

...evidence secured - shows that the population of a city and the distance from that city to another comparable city are the primary factors that condition the retail trade influence of that city; that population and distance are reliable indexes of the behaviour of other factors; that other factors are either so closely related to, or so directly dependent upon, these two primary factors that the effects of the dependent factors tend to balance out when cities are compared on the basis of population and distance.  

\[11\] Ibid., pp. 30 - 32.

\[12\] Ibid., pp. 31 - 32.
This general statement was then expressed as the "general law":

\[
\frac{Ba}{Bb} = \frac{Pa^N}{Pb^N} \times \frac{Db^n}{Da^n}
\]  

(VI - VII)

His research then attempted to evaluate empirically the exponents for population and distance.

He concluded that the value of the population exponent should be one, although no evidence is cited in support of this contention.

The distance exponent was calculated 225 times by first selecting an intermediate town which was a breaking point (determined by analyzing credit enquiries to ascertain the point where shoppers from outside the city ceased to apply for credit at stores in the larger city), and then plugging distances (highway miles) and populations into his formula and solving for the distance exponent. The values he calculated ranged from 0 to 12.5, but the greatest number of observations (87 out of 225 observations) for any single value-range occurred in the range 1.51 to 2.5. As a result, he concluded:

a clear mode occurs in the range of 1.51 - 2.50 which shows that the exponent of distance is nearer to the second power than to any other even power.\(^\text{13}\)

The fact that the exponential value chosen by Reilly was only one of a distribution of values, and that the value was a modal value, has tended to be forgotten. Practitioners who use this model often assume that it is precise and rigorous, so that when erroneous results are generated in specific situations, the exponential value

\(^{13}\) Reilly, Methods for the Study of Retail Relationships, p. 50.
is often attacked and denounced for being too precise when in fact it was never intended to be. As Reilly explains:

Since the calculation of the appropriate exponent in any particular case is a complicated problem in mathematics, and since the retailers who will use this law, as a rule, are not mathematicians, the application of the law has been simplified so that ordinary retailers can use it.  

He then tested his equation on thirty pairs of trading centres to determine if predicted breaking points matched closely with the results of field studies, and concluded that his law was reasonably accurate.

Converse later published a study in which he reported that his efforts to check Reilly's law resulted in fairly close correlation between the predictions and the empirical results.

on the whole, it works with a relatively high degree of accuracy.

However, in a later study, he cautioned:

In areas where there is less difference in size between the primary and secondary trading centres or between the trading centres and the towns from which they draw trade, the law of retail gravitation may perhaps not predict the movement of trade with the accuracy found in the territory here studied.

In a relatively recent study, Jung presented some data which he maintains refutes Reilly's law. His argument centred

14 Ibid., p. 16.
15 P. D. Converse, A Study of Retail Trade Areas in East Central Illinois, pp. 23-54.
16 P. D. Converse, Retail Trade Areas in Illinois, p. 18.
on the fact that his empirically derived breaking points did not fit the predictions produced by Reilly's law. It seems, though, that what has been disputed in this study is not the "general law," but rather the specific equation in which the value of one for the population exponent and the value of two for the distance exponent are employed. But this is not particularly surprising in view of both Reilly's and Converse's admitted recognition that the value of the distance exponent was only a modal value out of a rather broad distribution of empirically derived values.

Limitations

In Reilly's law, the attraction of population and the friction of distance both are considered. But Nelson examines Reilly's law and concludes that "all this law says is that people will normally go to the biggest place they can get to the easiest."18

There is the problem of applying Reilly's law in suburban areas where the influence of competing retail centres often overlaps. Reilly himself observed that "the influence of two nearby cities almost invariably overlap," and felt that his law was inappropriate under such circumstances.19 As a result many writers have felt that the law is inappropriate for measuring the influence of retail centres in the suburban situation where such overlapping of competitive influence is common.

Some authors, however, do not agree. For example, Baker

18 Nelson, The Selection of Retail Locations, p. 149.
and Funaro felt that when measuring the pull of a large suburban shopping centre, Reilly's law may be applied just as aptly as it has been to town shopping areas. However Nelson recognizes that the law was developed to measure the impact of rural trading centres, and even with adaptations to fit the law to urban situations, there is considerable doubt as to its applicability in such cases. The law was originally created to test the drawing power of pairs of rural trading centres between which were farm areas containing few alternative shopping facilities or none at all. Even with all the adaptations which have been made to try and force this law to fit urban situations, a law created to measure the impact of rural trading centres cannot be used indiscriminately to estimate the volume of urban shopping districts or new shopping centres. In metropolitan regions it is extremely difficult to employ this model because competition is found in so many different directions at varying levels of drawing power intensity. Furthermore, distance distinctions may be only a matter of moments. Reilly's law indicates a relatively fixed perimeter or breaking point for the trade area, whereas in the urban situation, the trade area boundaries vary and overlap considerably depending on the degree of attraction of each alternate outlet and on the relative accessibility and distance between them.

Much of the criticism of Reilly's law has focused on the exponents, particularly the exponent of distance. Huff noted that the majority of market analysts using the formula have

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apparently assumed that the distance exponent which Reilly estimated as valid for inter-urban retail movements was also valid for intra-urban areas. The intra-urban situation is just not as simple as the inter-urban situation where market centres and consumers are more widely scattered and isolated. In short, interruptive influences are far more prevalent and intense in the suburban situation.

For his 225 cases Reilly obtained distance exponents ranging from 0.0 to 12.5 but selected 2.0 because the modal value fell within the range 1.51 to 2.5. Yet the modal class contained only one-third of the values. Furthermore, this value was only meant to apply to shopping goods, and no evidence is cited for what the value would be for other, or more specific, categories of merchandise. Subsequently, new exponents were suggested by Converse but these too apply to broad categories of merchandise and are intended for use in the inter-urban setting. Carrothers has suggested that the distance exponent itself may be a variable, inversely related to the size of population. He also contends that populations of different sizes should be raised to variable powers greater than one, partly on account of the greater influence exerted by larger centres as a result of their collectively greater attractive power. From our discussion in Chapter IV, it would also be logical to assume that the distance exponent would vary

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22 D. L. Huff, Determination of Intra-Urban Retail Trade Areas, University of California, Graduate School of Business Administration, Los Angeles, 1962, p. 5.

with improved transportation, better accessibility, geographic influences in specific areas, and with demographic variations, all of which are subject to greater variation in the intra-urban situation.

The limitations of Reilly's law are not, however, confined to the exponential values. The main shortcoming is that it considers only two variables, population and distance, in its general formula as factors in retail drawing power whereas it is known that several other factors do exert considerable influence on consumer spatial behaviour in addition to population and distance. Reilly was not unaware of the importance of other variables that might affect the geographic distribution of consumer patronage. He did feel, however, that the other factors were of minor importance compared to the two named.

Population is a proxy variable for attraction, and distance is a proxy variable for effort. This also basically means that population is a proxy variable for benefits, and distance is a proxy variable for costs. The use of the proxy variables population and distance as sufficiently representative causal variables has been the focus of considerable criticism. Various researchers over the years have suggested replacing population in the formula with front footage of retail space, or square feet of selling area, or dollar sales volumes. Driving time has been substituted for distance in miles (realizing that time-distance is a better indicator of the costs perceived by the consumer in making the trip) although this modification still tends to ignore the possibility of significant walk-in business. However, even with these modifications, the law can be frequently inaccurate, because
still only floor space (for example) and driving time are considered as affecting consumers' shopping habits. It is true that these are two important factors and their appeal as proxy variables in the formula lies in the fact that they are easily quantifiable variables. But gross inaccuracy can result when other equally significant factors such as those outlined and presented in Chapter IV are ignored, factors which can rightly influence the extent and intensity of consumer patronage.

Such factors which warrant consideration include the following: the effects of distance vary with the type of merchandise under consideration; the impact of competition cannot be restricted to only pairs of competing outlets as in Reilly's law but also must include all other competing outlets in the vicinity of the subject centre; merchandising capabilities and parking facilities in the smaller centre might be far superior to those in the larger centre, a fact which would tend to result in a higher capture of patronage at the smaller centre than would be indicated strictly on the basis of population or square footage of selling area alone; differences in accessibility between competing centres either as a result of better transportation facilities and road networks, or different geographical or man-made barriers can produce variations in consumer patronage which would not necessarily be evident with this model which considers only distance modified by a particular exponent; the breadth of selection, the price ranges and the quality of the merchandise offered can significantly affect the drawing power of a centre and extend and intensify its attractive power, a fact which does not appear to receive adequate recognition in a formula which considers only size (in either population
or square footage) as the attractive variable; the relationships between merchandise offerings and the demographic composition of the surrounding market area are not explicitly considered - if the merchandise offered does not properly match the desires of the consumers in the area, the attractive power of that centre may be less than that indicated by the size variable alone; the influence of socio-economic factors on consumer travel and the different market areas for different types of goods is not explicitly accounted for; other attractive aspects such as the centre's reputation, the reputation of member stores, architectural features, amenities, community facilities, leisure facilities, the extent and quality and effectiveness of promotional programs, the different classes of merchandise offered (from lower to higher order), the variety of tenant-types, the image projected by the centre, and the hours of business offered for consumer convenience all may produce variations in attractive power which are not represented adequately by the single variable of size (either population or square footage). The failure of Reilly's law in particular circumstances is related to these other factors. Reilly's law measures forces that are gross in scope and ignores or inadequately accounts for other important variables. It is hard, and indeed sometimes impossible, to assign true numerical values to variables such as those mentioned above (and discussed more completely in Chapter IV), but they cannot be ignored and so must be given at least an intuitive weighting.
More fundamental is the criticism that the gravity concept is essentially an empirical notion with little theoretical content; that is, it cannot explain observed regularities. This limitation was expressed by Thompson who states that:

such laws must be regarded as little more than historical "accidents" in absence of tracing out a theoretical connection between their empirically determined weights and exponents and the corresponding behavioural variables on which they rest.24

The most that can be said in defence of Reilly's law is that all else being equal, presumably the greater the size of a centre the greater may be expected to be its retail provision and therefore its shopping attraction, and presumably the greater the distance to be travelled to reach these facilities the greater will be the expenditure of time, effort, and cost, and hence the greater the friction to travel. But as mentioned above the law as originally presented does not provide an entirely dependable tool for projection, and appears to require considerable intuitive subjective adjustment if it is to be useful at all in shopping centre patronage estimating.

Reilly's law is deterministic in nature. It merely offers a formula for calculating the breaking point between trade areas, which is defined as a particular distance between the centre in question and a competing centre at which the relative attraction of the two competing centres is approximately equal. But in densely populated urban areas, there may be many centres attracting the consumer within the distance that the consumer is

willing to travel. None of these centres have rigidly defined trade area boundaries. Rather, the trade areas overlap considerably. The breaking point concept loses its usefulness in this situation if the object of the analysis is to determine not which one of two competing centres a consumer will patronize but which ones (of the many) he will likely patronize more often than the others. In this setting the consumer does not act in a deterministic manner - he does not always visit a certain centre because he happens to reside within the breaking point perimeter (trade area). Rather, he will likely or probably act in a certain fashion, in which case his behaviour is dependent on the number of alternatives available to him and his perception as to the benefits and costs associated with each alternative. This behaviour can be described and predicted in probabilistic terms. This is the concern of probability analysis, a subject to which the remainder of this chapter is directed.

Probabilistic Models

The gravimetric models discussed in the preceding section are all macro-models. The consumer behaviour studied is treated in a highly aggregated fashion, at the regional or inter-urban level.

However, location analysis at the intra-urban level is concerned with problems in determining consumer behaviour at the micro-level, that is at the level of the individual firms and consumers where individual decisions are conditioned by local circumstances. Since Reilly's initial contribution, the notion of a single downtown shopping core has been superseded by a notion of
many alternate centres of retail activity, the most important of which are planned shopping centres. These centres do not enjoy an exclusively captive trade area but rather exert a trade influence which overlaps that of other alternate centres.

The important questions in planning the development of one of these centres would be in regard to where the centre should be located, how large it should be, and how it should be structured in terms of tenant mix to best suit the market which it will serve.

In attempting to provide answers to such questions, Reilly's law has been applied (with modifications) to estimate trade areas of proposed shopping centres within cities (intra-urban). As an example, given a proposed site for a shopping centre, competing centres are noted, their proximity to the subject site is plotted, and their size is determined. Then, using the modified gravity model, the breaking points between the existing centres and the proposed centre are calculated, and a potential trading area for the proposed centre is delineated. The population within the delimited area is determined which provides the basis for calculating the potential retail expenditure of this area, and ultimately, the proportion of this potential which is likely to accrue to the new centre in sales.

The modifications applied to Reilly's law involve changes in the factors chosen as measures of attractive and resistant forces. The square footage of retail space has been substituted for population, and driving times substituted for physical distance in miles. It can be argued that square footage of space is a good measure of attractive power since it really represents the number of items carried by the centre, and this is what mainly
attracts the consumer. That is, it is the breadth and depth of the product assortment offered at a particular centre which is the attraction of that centre - and the square footage is a representative measure of that attractive power since breadth and depth of selection are roughly correlated to the size of the centre; the larger the centre, the greater the selection. Presumably, the greater number of items carried by a particular shopping centre, the greater is the consumer's expectation that a shopping trip to that centre will be successful. It is thus assumed that the consumer's degree of expectation or relative subjective probability of achieving satisfaction is directly proportional to the number of items offered. But since it is difficult to measure the number of items, it is assumed that square footage of selling area can be substituted as an approximately representative measure of attractive power.

Similarly it can be argued that resistant forces are present which lessen the likelihood of a consumer visiting the shopping centre. The effort, time, distance to travel, and cost involved in making the trip are perceived by the consumer as detractive aspects of visiting the centre. The likelihood that a consumer will make the trip is negatively influenced by these resistant factors, or in other words, inversely proportional to these "costs" as perceived by the consumer.

It can be argued that as distance from the centre increases, the likelihood of the consumer visiting the centre declines even more rapidly in view of his perception of the rising "costs" of making the trip ("costs" in this context refer to any and all costs perceived by the consumer including money,
time, effort, and irritations). This facet of consumer behaviour is described in gravimetric models by an exponential function which is intended to account for the observation that the likelihood of the consumer visiting the centre declines in some inverse proportion to the costs involved in making the trip. That the exponential values chosen for use in most gravimetric models have a value higher than one is indicative of the observation that the likelihood of a shopping visit declines at a faster rate than the rate at which costs of making that trip increase. Each additional increment in cost produces a correspondingly greater negative effect on the likelihood that the consumer will make the trip. Distance has been substituted as a proxy variable for costs, but it is not really the physical distance which is relevant in the contemporary congested-traffic scene, but rather distance as measured in time units. Time-distance is thought to be a representative measure of the resistant forces (or costs) negatively influencing the consumer's decision to undertake the shopping trip.

Substituting travel time and store area into Reilly's law enables the analyst to determine breaking points between centres, and by joining these points, the trade area can then be delineated.

There are several drawbacks to this approach. The law defines the breaking point as that point at which retail trade is equally divided between the two centres. In effect this is the point where the likelihood or probability of a consumer choosing either centre is 0.5. To terminate a centre's retail trade area at the breaking point is to exclude those consumers whose probability
of visiting the subject centre is less than 0.5. It appears unreasonable to delimit the trading area at the breaking point. Furthermore the model seems to assume that shoppers only choose between the two alternative centres nearest to their place of residence. In fact, consumers normally do have a much broader latitude of choice and do not restrict themselves to only two alternative centres, but instead choose from among several alternatives according to various attractive and resistant factors.

Huff has questioned the assumption that the exponent of the distance factor which Reilly had originally estimated as 2.0 for inter-urban trade movements should also apply to intra-urban trade movements. He finds this particularly questionable in view of Reilly's empirical findings which showed a broad range of values for this parameter. Furthermore he notes that other studies (mentioned in the preceding section) have shown that the distance exponent has ranged from 1.5 to over 3 depending on the type of trip, the geographical setting, and the relative sizes of competing centres.

Huff's Model

In view of the limitations of the gravimetric models discussed above, Huff developed and tested a model which he believed overcame some of these limitations. In his words:

The model provides a tentative operational basis for understanding and determining the retail trade area of a shopping centre. The


26 Ibid., p. 65.
Retail trade area of an existing or proposed shopping centre can be ascertained by: (1) dividing the surrounding area into small statistical units; (2) calculating the probability of consumers from each of these units going to a particular shopping centre; and (3) drawing lines connecting all statistical units having like probabilities. A retail trade area is thus not a fixed line circumscribing a shopping centre, but rather a series of zonal probability contours.27

Huff's model is a probabilistic model of intra-urban retail trade transactions and is termed a "probabilistic model of consumer spatial behaviour."28 It is related to a series of models all known as gravimetric models. This particular model uses distance in time units and store area as its major variables and includes an exponential parameter, the value of which must be estimated from empirical data. The values of this parameter appear to vary significantly depending upon the type of shopping trip being considered by the consumer. The type of shopping trip is in turn determined by the particular type of merchandise sought by the consumer.

Huff's model is basically formulated as a theoretical abstraction of the factors governing consumer spatial behaviour. It is designed in such a way that the relationships between these factors produce a probability estimate of expected consumer behaviour if the factors are given certain values. The probability that a consumer will make a particular spatial choice is dependent upon his perception of the utility of making that choice, with

27 D. L. Huff, Determination of Intra-Urban Retail Trade Areas, University of California, Graduate School of Business Administration, Los Angeles, 1962, p. 5.

28 Ibid., pp. 4 - 5.
utility in this sense primarily intended as a subjective measure of the amount of satisfaction derived compared with the cost of deriving it. The greater the utility of a certain choice, the greater the probability that that particular choice will be made. All this says basically is what was said earlier in connection with Reilly's gravity model: that a particular shopping facility will attract customers according to the attractions offered by that facility weighed against the costs of visiting that facility; that is, the consumer will choose a particular alternative according to a subjective benefit-cost analysis of that alternative.

Huff believes that the primary factors which determine the probability of a decision to shop at a facility are the size of the shopping centre and the distance in time units from the consumer's travel base to that centre. The distance factor is conditional on an exponential parameter, lambda. The probability that a consumer at \( i \) will go to a particular retail facility \( j \) is defined in the model:

\[
Pr_{ij} = \frac{S_i \frac{1}{T_{ij}^\lambda}}{\sum_j S_j \frac{1}{T_{ij}^\lambda}}
\]

The parameter \( \lambda \) is to be estimated empirically to reflect the effect of travel time on various kinds of shopping trips, since as previously mentioned, Huff did not believe this value should be 2 in every case.

The number of consumers at a given place \( i \) expected to shop at a particular \( j \) is proportional to the number of consumers at \( i \) and to the probability that a consumer at \( i \) will select \( j \) for shopping.
\[ E(C_i)_j = P_{ij} \times C_i \]

where \( E(C_i)_j \) = the expected number of consumers at \( i \) choosing a shopping facility \( j \); and \( C_i \) = the number of consumers at \( i \).

Estimation of a sales volume potential for a proposed shopping centre is accomplished with the use of Huff's model by proceeding through the following sequential steps (all of which Huff has included in a computer program for ease and speed of computation):

Step 1) Determine the probability of shoppers patronizing the proposed centre by the following equation:

\[
P_{ij} = \frac{S_j}{\sum_{j=1}^{n} \frac{S_j}{T_{ij}^\lambda}}
\]

where \( P_{ij} \) = the probability \( P \) of a consumer originating at a given point \( i \) shopping at a particular retail location \( j \); \( S_j \) = the size of the retail location \( j \) (in square feet); \( T_{ij} \) = the distance \( T \) (expressed in terms of physical distance or time-distance) separating \( i \) and \( j \); \( \lambda \) = a parameter which is to be estimated empirically to reflect the sensitivity of various kinds of shopping trips to distance (the parameter is either derived through a search procedure based on data collected for the proposed location, or is simply specified based on previous findings); \( n \) = number of retail locations.

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Step 2) Estimate the number of expected consumers patronizing \( j \) from a particular \( i \):

\[
E_{ij} = P_{ij} \times C_i
\]

where \( E_{ij} \) is the expected number of consumers \( C \) at \( i \) who will shop at \( j \).

Step 3) Calculate the expected annual sales from each \( i \):

\[
A_{ij} = E_{ij} \times B_{ik}
\]

where \( A_{ij} \) is the expected annual sales \( A \) originating at \( i \) and terminating at \( j \); and \( B_{ik} \) is the average annual amount \( B \) spent by consumers at \( i \) for each class of goods \( k \).

Step 4) Calculate the total expected number of consumers from all points \( i \) patronizing \( j \):

\[
TE_j = \sum_{i=1}^{m} E_{ij}
\]

where \( TE_j \) is total expected number of consumers from all points \( i \) shopping at \( j \); \( m \) is number of statistical areas \((i_1, i_2, i_3 \ldots \ldots)\).

Step 5) Calculate total expected volume of sales from all \( i \) at \( j \):

\[
TA_j = \sum_{i=1}^{m} A_{ij}
\]

where \( TA_j \) is total expected volume of sales from all of the \( i \) areas terminating at \( j \).

Step 6) The first run of the above steps requires that an assumption be made as to the size of the proposed facility. This assumed size is then used in the
calculation in step (1), which of course governs the calculated results of the next four steps. The result obtained from step (5) is therefore the volume potential estimate associated with an assumed (given) size of the proposed facility. But, location analysis should provide guidelines regarding what size the proposed facility should be optimally. To accomplish this goal, the following steps are necessary: re-run the first five steps using a different, incrementally larger size assumption up to a given maximum. These re-calculation will provide sales volume estimates for each incrementally larger facility size.

**Step 7)**

The margin on sales, operating expenses and operating profit (expressed as a percentage of sales) are assumed to be a function of a retail facility's size. Generally, the larger the size of the facility, the larger will be its operating profit percentage because of economies of scale. However, a point is finally reached where diseconomies of scale come into effect that tend to reduce the operating profit percentage.

The precise relationship between the operating profit and the various sizes of a facility must be determined empirically, the result being an operating profit percentage associated with each possible size. The procedure is then to calculate the net operating profit associated with each of the assumed size levels specified in step (1) by multiplying the expected sales volume estimate for each size by the operating profit

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percentage (expressed as a percentage of sales) for each size. The result is an operating profit estimate for each assumed size. The final step is to single out the largest operating profit from the specified size levels for the proposed facility. The result is the optimum size for the facility.

Although at first glance the sequential method described above appears to have considerable appeal, it will be shown later that considerable difficulties are evident in applying this approach, difficulties which shed doubt on the ability of this method to produce a valid estimate of both the optimum size for the proposed facility, and also the corresponding potential sales volume which could be expected for that particular optimum size.

But before discussing the adequacy of this model, and before analyzing the difficulties encountered in applying probabilistic models of this type the discussion turns to a brief look at a probabilistic model similar to Huff's which was presented for the use of civic planning agencies in dealing with retail planning policy and problems.

Lakshmanan and Hansen

Lakshmanan and Hansen have produced a model which they feel provides a means of measuring retail market potential. Essentially the same as Huff's model, it is intended as an aid to planning decisions especially those of local government planning boards. As such its emphasis is not so much on delineating the trade area of a particular centre as it is on predicting the sales volume potential for proposed retail facilities, or the market potential that exists for new centres in a given area where
competitive facilities already exist. It is also used to predict future retail floor space requirements based on expected patterns of population and income growth in the future.

The model begins with the premise that the size and number of retail establishments in an area is a function of the number of consumers, or more appropriately, their purchasing power.

The present formulation asserts that the location or sales potential of a retail centre is not to be viewed as a function of the purchasing power of an arbitrary spatial slice of the region. More realistically, it describes a situation of overlapping competition between shopping centres and develops a mathematical framework for measuring it.

Essentially, the model states that the sales potential for a retail facility is directly related to its size. Further, this sales potential is directly related to its proximity to a number of consumers and their income level. Finally, the sales potential of a centre is related to how it is disposed to competing retail facilities. These relationships are expressed in the mathematical form of the familiar gravity framework:

\[
S_{ij} = C_i \frac{F_j}{d_{ij}^\lambda} \sum_{k=1}^{n} \frac{F_k}{d_{ik}^\lambda}
\]

---

where \( S_{ij} \) = consumer retail expenditures of the population in zone \( i \) spent at location \( j \); \( C_i \) = total consumer retail expenditures of the population in zone \( i \); \( F_j \) = the size of the retail activity in location \( j \); \( \lambda \) = an exponent applied to the distance variable.

The above model asserts that the retail centre at \( j \) attracts consumer dollars (\( S_{ij} \))

A) in direct proportion to the consumer expenditures, \( C_i \),
B) in direct proportion to its size \( F_j \),
C) in inverse proportion to distance to the consumers \( (d_{ij}^\lambda) \), and
D) in inverse proportion to competition

\[
\left( \sum_{k=1}^{n} \frac{F_k}{d_{ik}^\lambda} \right)
\]

The total sales in retail centre \( F_j \) is expressed:

\[
S_j = \sum_{i=1}^{n} C_i \frac{F_j}{d_{ij}^\lambda} \left( \sum_{k=1}^{n} \frac{F_k}{d_{ik}^\lambda} \right)
\]

where \( S_j \) = total retail sales in retail centre \( F_j \).

The similarity to Huff's model is evident. Without disclosing the empirical test results, Lakshmanan and Hansen stated that the model showed a good fit between model-generated annual sales and actual annual sales in the Baltimore region.
Lakshmanan and Hansen approach the question of the optimum size for the proposed centre somewhat differently from Huff. They believed that a locational decision is made by a developer when a minimum expected return is estimated at a particular location relative to returns available at known alternative locations. A certain minimum is considered necessary by developers before the decision to locate is made. Lakshmanan and Hansen define this minimum in terms of annual sales per square foot. Using figures derived from an Urban Land Institute publication,\(^{32}\) the study assumed that new shopping goods facilities were viable when the sales per square foot obtained from the model run were at least $50 - $55.\(^{33}\) When the model indicated that sales of less than $50 per square foot would be achieved at a proposed location, the size-level assumed for the centre was reduced and the model re-run until sales per square foot exceeded the acceptable defined minimum. This method is contrasted to that of Huff where optimum size was chosen by selecting the size at which the operating profit would be maximized.

As was stated previously, the model was intended primarily as a tool to aid in the development of planning objectives in an urban area - especially the retail requirements of that area. To achieve an estimate of the retail facilities required to adequately serve a particular area, the following rationale was suggested:


\[^{33}\] Lakshmanan and Hansen, op. cit., p. 139.
first the sales per square foot of shopping centres... (were estimated by the model and) were aggregated by transportation districts. The underlying assumption is that if a group of shopping centres in a transportation district achieve very high sales per square foot (say over $75), consumers in these and surrounding districts are poorly served. High sales per square foot in such areas would result either in an increase in the size of the centres, or in the development of new stores nearby to serve the consumers.

The underlying perspective stressed by the authors of this model is that it is a tool by which the total aggregated retail expenditures of a region are allocated among the set of retail facilities assumed for consideration. If a new proposed centre is to be considered, sales are re-allocated amongst the existing facilities and the proposed development under consideration, providing an estimate of its expected share of the total available expenditure. If its expected sales (under a given size-level assumption) are below the acceptable minimum, the size is altered and the programme re-run. If the size is too small, then all facilities would obtain such high sales per square foot that new competing facilities would likely be developed nearby. If the size were too large, the resulting sales per square foot would be so low as to discourage the development of such a facility. Therefore, the size of the new proposed facility is altered in successive runs of the model until the resultant sales per square foot falls within the optimum range (optimum in the sense of being high enough to permit a profitable operation, but not too high so as to indicate the threat of new competitive facilities moving in to capture a share of the excess demand).

Ibid., p. 139.
Several additional assumptions are implicit in the model described above. First, the model is run with existing centres as the only inputs. If the resulting sales per square foot estimates are much above the minimum feasible level it is assumed that consumers are under-served and the existing facilities are crowded. The excess expenditure is then determined; it is then divided by the minimum per square foot figure to provide an estimate of the number of square feet of new retail facilities which are required to serve the consumers of that region; the final step is to then allocate that required space to a new proposed location or locations, and then re-allocate the total retail expenditure amongst all centres. Because the chosen location occupies a specific geographical location, the effect of distance will modify the expectation of all excess sales accruing to that location. Therefore, successive approximations of the size of the new facility are run through the programme to arrive at the size for the centre in that location which will attract a sufficient sales volume per square foot. If the proposed location is a "poor" one (in the sense that the area is already adequately served by retail facilities), no assumed size will be sufficient to generate adequate sales to permit satisfactory sales per square foot. On the other hand, if the area is under-serviced, the model will supposedly provide (through a process of successive approximations) an estimate of the size of the proposed facility which will provide it with an adequate sales potential. In summary, the decision to build a centre on the proposed site will depend on the model's ability to determine a feasible size for the facility which will permit the model to allocate an adequate sales potential to it.
Although this model is intended for a somewhat different application than Huff's model, it employs the same mathematical formula. In this sense it suffers from the same problems and limitations as does Huff's model, namely, problems involving the variables and parameters of the probability formula. It is this subject to which the remainder of this chapter is primarily concerned.

Limitations of the Probability Models

The probabilistic method differs from the deterministic (defined trade area) method in one essential respect. The deterministic method outlines the trade area boundary and the enclosed population, and then estimates the percentage of that population which is expected to patronize the centre by applying a subjectively estimated market share percentage factor. The probabilistic approach, however, avoids physically defining the trade area and instead estimates the likely total patronage by assuming lower probabilities of patronage as distance from the centre increases.

The danger in using probability models is to assume that because the model is expressed in an apparently rigorous mathematical formula, the results will be more accurate and precise than those estimated subjectively. But if the formula embodies gross proxy variables and imprecisely defined exponents, the assumption that the model can generate reliably accurate predictions of behaviour all on its own is erroneous and somewhat naive. Yet students of location analysis, impressed by the apparent precision of mathematical formulae, often fall into the trap of placing complete confidence in their supposedly "objective" predictions. The following discussion illustrates this point.
In a study conducted in Vancouver to determine the potential sales volume for a proposed regional shopping centre in this city, various probabilities of patronage were assigned according to both distance from the centre and the type of merchandise sought. These estimates were adapted from the results of Ira Lowry's study in Pittsburgh which provided empirically derived probabilities of consumers travelling various distances to purchase various types of goods and services. It was assumed that Lowry's results could be applied to other trade areas, and any differences in the trade area conditions could be recognized by adjusting Lowry's probability estimates. Local access and competitive factors for example could be accounted for by adjusting the probabilities. Markoff's adjusted probability estimates are shown in Table I.

Later in the study, Markoff criticizes some aspects of a study conducted by a private consulting firm, especially the market share values assigned by the firm:

Thus if a figure of 15 per cent were chosen representing the drawing power for some type of good or service within the primary area of influence the inference is that this centre will draw 15 per cent equally from all sectors within the primary area, whether one block or three miles distant. Little or no justification is provided for the following values.

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37 Markoff, op. cit., p. 76.
TABLE I
Probabilities of Patronage by Distance and Type of Merchandise

<table>
<thead>
<tr>
<th>Merchandise Types</th>
<th>0-2</th>
<th>2-4</th>
<th>4-6</th>
<th>6-8</th>
<th>8-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>.50</td>
<td>.30</td>
<td>.20</td>
<td>.10</td>
<td>.02</td>
</tr>
<tr>
<td>Household Operation</td>
<td>.50</td>
<td>.30</td>
<td>.20</td>
<td>.10</td>
<td>.02</td>
</tr>
<tr>
<td>Appliances</td>
<td>.30</td>
<td>.20</td>
<td>.10</td>
<td>.05</td>
<td>.02</td>
</tr>
<tr>
<td>Other Furniture, Equipt.</td>
<td>.30</td>
<td>.20</td>
<td>.10</td>
<td>.10</td>
<td>.02</td>
</tr>
<tr>
<td>Clothing</td>
<td>.45</td>
<td>.35</td>
<td>.30</td>
<td>.10</td>
<td>.05</td>
</tr>
<tr>
<td>Transportation</td>
<td>.15</td>
<td>.10</td>
<td>.05</td>
<td>.02</td>
<td>.01</td>
</tr>
<tr>
<td>Medical Care</td>
<td>.70</td>
<td>.30</td>
<td>.20</td>
<td>.10</td>
<td>.05</td>
</tr>
<tr>
<td>Personal Care</td>
<td>.65</td>
<td>.35</td>
<td>.25</td>
<td>.15</td>
<td>.05</td>
</tr>
<tr>
<td>Recreation</td>
<td>.12</td>
<td>.08</td>
<td>.05</td>
<td>.02</td>
<td>.01</td>
</tr>
<tr>
<td>Reading</td>
<td>.20</td>
<td>.15</td>
<td>.10</td>
<td>.05</td>
<td>.02</td>
</tr>
<tr>
<td>Smoking and Alcohol</td>
<td>.40</td>
<td>.30</td>
<td>.15</td>
<td>.05</td>
<td>.02</td>
</tr>
</tbody>
</table>

Markoff apparently intends to criticize the fact that this firm was not recognizing that the percentage drawing power factor varies with distance, which on the surface appears to be a valid criticism. Yet, it is likely that the private firm did indeed recognize this fact, but merely averaged the values for different goods over different distances into an average drawing power for the whole area. What is particularly interesting to note however is that Markoff contends that "little or no justification" is provided for the choice of 15 per cent as the value of the drawing power percentage factor, which is a valid criticism since no evidence is presented which says this value could not be 20 per cent or 27 per cent or any other value. And yet, Markoff's own study provides certainly no better justification for the choice of the probability values shown in Table I except to say that they are "adjusted" (no justifying evidence cited) values based on Lowry's Pittsburgh results, which in themselves cannot with any degree of confidence be applied to any trade area other than Pittsburgh until further research determines their validity in other locations. Thus Markoff is criticizing the private research firm for exactly that which is the major limitation of his own study: that there is no real, proven justification for choosing any one particular value, or sets of particular values, as the "correct" values to use. Markoff implies that his own study is more objective than the other study because he employs probability values rather than an estimated drawing power percentage factor - but his probability values are also merely estimates. Certainly they were derived with some attempt at objectivity, but their derivation occurred in Pittsburgh based on the behaviour patterns
and influences prevalent in that location. To assume that the results derived in one empirical situation are valid in another empirical situation is somewhat presumptuous especially since the theoretical explanation for the behaviour is sketchy at best. It appears logical that the probabilities derived in a particular empirical situation are to a large extent peculiar to that situation, and still only estimates.

To apply probability values (or exponential values for that matter) to situations other than the ones from which they were derived requires that they be adjusted subjectively to account for different circumstances and influences in the new situation, which reiterates and reinforces the contention that at the present state of the art of model development, the use of subjective judgment cannot be avoided. This is not meant to imply that subjective judgment is akin to a plague which should be avoided at all costs, for in fact experienced analysts are often capable of subjectively adjusting the data with good results. What it does say is that the probabilistic models discussed in this chapter require subjective interpretation if they are to be at all useful. This does not mean that the models should be discarded for being inadequate to the task of providing consistently accurate, precise predictions all on their own. Certainly they are not perfect, but the complexities of consumer spatial behaviour are such that it may well prove to be an impossible task to build the perfect model. In the meantime, it should be recognized that the presently available probabilistic models, when applied in conjunction with subjective judgment and experience, are useful analytical tools for sales volume estimating in spite of their limitations. The task remains to further extend and
refine the models to improve their descriptive and predictive capabilities. This will require that the models more explicitly recognize the determinants of consumer spatial behaviour, either through expanding the number of variables in the formula, or through re-structuring the parameters.

To return to the subject of Huff's model, Huff empirically tested his model in a suburban Los Angeles community to determine the exponential distance parameter values for his model. The procedural steps in this empirical test are expressed by Huff:

1. Assume a particular value of $\lambda$ which is greater than unity. Correspondingly, substitute the appropriate values for each of the appropriate alphabetic characters noted in the model and calculate the expected probabilities.

2. Compare the expected probabilities with the actual relative frequencies (of patronage) obtained from the survey data and calculate a correlation coefficient.

3. Continue to substitute incremental values for $\lambda$ until the highest correlation coefficient is obtained which will represent the optimum value of the parameter.38

Huff's empirical study obtained data samples from three neighbourhoods and fourteen planned shopping centres, with the following results:

1. For the commodity "clothing," the three neighbourhoods produced lambda values of 2.655, 2.889 and 3.690.

2. For "furniture," the three neighbourhoods produced lambda values of 2.115, 2.542, and 3.247.39

38 Huff, Determination of Intra-Urban Retail Trade Areas, p. 23.
39 Ibid., p. 27.
Huff commented on the results of his test:

the expected behaviour derived from the model corresponds quite closely to the actual behaviour observed from the survey findings. However, contrary to what was expected, the estimates of lambda varied from neighbourhood to neighbourhood - the investigation was designed in such a manner as to test the hypothesis that lambda was primarily a function of the type of shopping trip. Each of the three sample neighbourhoods were selected on the basis of their homogeneity, and it was therefore expected that lambda would be approximately the same for each neighbourhood with respect to a given type of shopping trip, i.e., clothing and furniture.

Huff employed a statistical technique to determine whether or not variations in the exponential values obtained from the model were due to sample variation, and having satisfied himself that such variations were indeed a result of sample variation, he calculated a mean value of lambda for each of clothing and furniture, 3.191 and 2.723 respectively. Huff concluded:

Despite the lack of conclusive statistical evidence that the mean lambda estimates are valid representations of the clothing and furniture parameters, they do indicate that a consumer's spatial behaviour is a function of the type of shopping trip. For example, the mean estimates for shopping trips involving clothing purchases is higher than the mean value estimated for furniture purchases, which confirms the observation that consumers are not willing to travel as far for clothing as they are for furniture purchases.

41 Ibid., p. 29.
42 Ibid., p. 31.
In one study which tested Huff’s model, negative coefficients of determination were reported in some cases. Those who are accustomed to dealing with coefficients of determination as used in regression analysis know that $R^2$ is never negative. But if the sum of squared deviations of estimated behaviour from actual behaviour is greater than the sum of squared deviations of random behaviour from actual behaviour, $R^2$ will be negative. In some cases, negative values of $R^2$ occurred over the whole range of lambda values. In other words, the correlation between model predictions and actual behaviour was found to be negative in some cases. Wiginton concluded that in some cases the model did not fit the data as well as purely random behaviour. That is, predicted behaviour deviated from actual behaviour more than random behaviour would have deviated from the actual. The model predicted behaviour whose relationship to actual behaviour was worse than a purely random pattern. Wiginton believed that this could only be the case when the model misrepresented the factors which actually determine behaviour, which led him to believe that the model must be incorrect in some very fundamental way, and possibly should be rejected in its present form.

Wiginton also re-ran Huff’s data on a computer programme selected to test Huff’s model in Vancouver. A sub-routine of this programme produced graphs showing the behaviour of the correlation coefficient ($R$) with incremental changes in the value of lambda

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44 Ibid., p. 109.
over the range for lambda of 0.5 to 4.5. While Huff presented the optimum value of lambda for which the correlation coefficient was maximized, he did not stress whether or not there was a range of lambda values all exhibiting high coefficients of correlation; rather, he merely chose the particular lambda value which exhibited the highest corresponding R. However, Wiginton found that when he reproduced Huff's results, "the model produced consistently high values of R over a very wide range of values for lambda." He concluded that not only did Huff's tests for significance of particular lambda values seem questionable, but also the model was relatively insensitive to values of lambda over a very wide range since the coefficients of correlation in many cases remained above 0.9 while lambda ranged between 2.0 and 4.0. Wiginton felt that this result meant that in the model almost any value of lambda over a wide range would predict about as well as any other value, a conclusion which he believed raised serious questions about the value of the model.

Wiginton was unable to detect any discernable trends in the clusters of maximum lambda and R pairs generated from his data and observed that although maximum R values tended to increase with increasing lambda values, the scattering of generated values was so broad that fitting a curve or straight line to the results, or even detecting a central tendency, was virtually impossible. He concluded that the results of his test were:

46 Ibid., p. 115.
47 Ibid., p. 115.
48 Ibid., p. 130.
so diffuse as to not lend any support to the hypothesis (that the value of the parameter is a function of the type of shopping trip).\textsuperscript{49}

Perhaps more important, he could not find sufficient evidence to support the choice of any one absolute value of lambda for a particular type of shopping trip. The lambda values were too diffuse (at high levels of $R$) to permit choosing any particular value with confidence.

It would appear that the attempt to abstract the primary determinants of consumer behaviour into a formula has resulted in a choice of variables and parameters which are too gross in scope. The factors and parameters and their structured relationship in the formula are too simplified and too broadly defined to adequately represent the complex influences on consumer spatial behaviour. Calibration of the model in different areas, under different circumstances, and with different inputs produces more often than not different exponential parameter values which the model does not explain: that is, the exponential distance parameter is a "catch-all" parameter designed to give recognition to the multitude of factors and influences not otherwise contained in the model. Essentially the exponential value can be altered to produce vastly different results with the formula, even though the size and distance factors may remain constant. The exponent is basically a conditional or contingency parameter through which all the consumer patronage variables not included in the formula can alter the results produced by those variables which are in the formula. Therefore, all the significant unrecognized, ignored,

\textsuperscript{49} Ibid., p. 133.
and "left-over" location variables can supposedly be given recognition through this parameter. But the exponential values are empirically derived, and theory has not developed to the point where it can predict what the correct numerical value for this exponent will be in a specific situation, in a particular geographical location, with the specific circumstances prevalent in that location.

It appears that to improve the precision and predictive ability of the model, the unrecognized and ignored variables which might influence consumer spatial behaviour must be given greater recognition in the model. Two avenues appear to offer the best possibilities. The first involves their explicit recognition through the vehicle of the exponents; that is, they would be specifically included in the mathematical construction of the exponential parameters. The second avenue would involve their inclusion in the formula as variables along with the variables of time-distance and store area to create some sort of weighted function which could predict the probability of shopping.

Since the concern of this section of the thesis is not to examine methods of model construction but rather to examine the factors and interrelationships in such models, no attempt will be made to specify which of the two avenues mentioned above offers the best approach. Rather, the intention is to illustrate how the many factors and relationships enumerated in Chapter IV as the primary determinants influencing consumer spatial behaviour are not explicitly and adequately accounted for, or recognized, in the mathematical formulation of the model. The contention here is that if they were, the model might be more capable of producing more accurate predictions.
The model does not seem to be able to account for changes in consumer behaviour resulting from changes in the level of uncertainty faced by the consumer when evaluating alternatives and making decisions. It may be recalled that the model developed from the reasoning that consumers form a subjective probability estimate of success regarding a particular store for particular items, and that the attracting power of that store could be represented by the proxy variable store area. However, this would be modified by resistant factors, represented by the proxy variable distance, to produce a likelihood of shopping. But, if the subjective probability estimates were based on better knowledge, and were thus more certain, the distance factor would have a relatively lesser influence on the consumer's likelihood of shopping, since the consumer's greater expectation of achieving success at a particular store would render the distance factor relatively less important; the consumer would travel further if his perceived likelihood of achieving success was higher. Consumers who are more knowledgeable regarding the available product mix offered at a store will not be as affected by the nuisance factor distance as would those who were less knowledgeable.

The centre's advertising program can be instrumental in lessening the uncertainty facing the consumer. A well-executed advertising programme could significantly alter the relationship between attraction and resistance factors to the point where Huff's model (which does not explicitly consider the degree of uncertainty or lack of it facing the consumer) would have to recognize various exponential parameter values for each level of uncertainty. Difficult as it is to estimate rough parameter values anyway, it would appear to be a rather monumental task to ascertain variations
in these values according to variations in uncertainty.

The distance exponent is further modified by the following considerations, all of which tend to lessen the certainty with which any one particular absolute value for the exponential parameter can be chosen:

1) Product substitutability - if the particular shopping good sought by the consumer is one for which the consumer is unwilling to substitute other, similar goods (in other words, this good has a certain uniqueness); and if the consumer is uncertain as to his likely success in finding that specific good at a particular retail facility, then he will desire a broader selection of goods of this general type, and will show a corresponding willingness to travel farther to obtain such goods. The exponential parameter in this case would be altered by such a consideration. Furthermore, the degree of substitutability depends on a multitude of factors including established brand preferences; advertising and promotion affecting the consumer; income and social class of the consumer, etc. That these variables differ from area to area for the same general type of good renders the problem of defining absolute exponential values for the distance parameter difficult at least.

2) Price comparison - if the opportunity exists for better price comparison at a facility which offers a broader selection of the general type of good sought after, the consumer will likely be willing to travel further to achieve price savings. The effect is modified by the socio-economic class of the consumer, the number of locations offering price-comparison shopping in close proximity to the place of residence, etc., all of which
tend to modify the distance exponent for the particular shopping item. The degree of modification in the parameter depends on the relative strength of such modifying influences in the geographical area under study.

3) Absolute price - products which have a relatively high price in relation to the consumer's income are usually more carefully selected by the consumer. He finds it worthwhile (since the expenditure is relatively high) to shop around for broader selection both in styles and qualities as well as price. The consumers will be willing to travel farther in pursuit of such items in order to assure themselves that they have purchased wisely and have received the most suitable item (in terms of personal tastes and preferences) for the relatively large monetary outlay. Any facility which offers a wider selection will be more likely to satisfy the consumer who expects that the wider selection will provide him with a better choice for this relatively important (to him) purchase.

4) Socially significant purchases - certain goods provide a degree of satisfaction to the consumer related to the social status associated with such items. Clothing, for example, is socially important to most consumers to the extent that they are willing to travel farther to find broader selection in style, quality, price, and prestige value. The greater the social significance of such items to the consumer, the more important they will be to him, and the more willing he will be to go more out of his way to achieve a satisfactory purchase. Again, social status, income status, age level, store image, alternative facilities available, and advertising can all affect the likelihood of a particular consumer in a particular geographical area shopping
at a particular retail outlet. The distance exponent would have to be modified to account for these variations in consumer motivation and behaviour, and the modifications would have to be different according to the weight that each influencing factor carries in each area for each class of consumer.

In summary, the distance exponent varies according to:
- the type of merchandise sought;
- the degree to which certain goods are important to the consumer;
- the importance to the consumer of selection, quality, pricing, and depth of merchandise offered;
- the degree of selectivity in the purchase decision;
- the social significance attached to certain types of merchandise;
- consumer willingness to accept substitute merchandise;
- psychological blocks caused by various geographical considerations;
- road capacities, traffic congestion, and conditions of accessibility;
- the availability, proximity, quality and effectiveness of competing retail establishments;
- and all other attractive aspects of the subject location.

The extent to which the above factors modify the effect of distance (distance exponent) differs according to family sizes, age groupings, income status, and social status of the consumers in the area.

Furthermore, as cited previously, it appears that the two variables in Huff's model (store area and distance) may be insufficient in themselves as proxy variables to permit the model to accurately predict consumer behaviour. We have mentioned the factors which modify the effect of distance, and it is academic whether these factors should be recognized in the form of variables or through the expansion of the exponential parameter.

But store size as a proxy variable (with no modifying exponent)
may not be adequate to represent other aspects of attraction such as: sizes of the individual stores in the centre; attractive design and layout; variety in tenant-types; merchandise mix, breadth of selection, range of colours, qualities, styles, and sizes; competitive or market-oriented or unique pricing policies; the image projected by the centre; its reputation; the availability or lack of free parking; amenities and community facilities; appropriateness of the hours of business; and the effectiveness of the promotional programme. Furthermore, the importance and effect of each of these factors differs according to the size of family, age group, income status, and social status of the consumers in the area.

This suggests that either other factors of attraction could be included, or an exponent modifying the store area proxy variable could be included.

The major problem with gravimetric models is that they attempt to predict average behaviour, and in doing so, they tend to de-emphasize those influences which can affect individual decision making. As a general premise it may be quite true that store area and distance would produce an accurate prediction of consumer behaviour if all other things were equal, which of course they never are. Different interfering influences exert themselves in varying degrees on individual consumers, affecting their decisions, and distorting the simple store size - distance relationship. These other factors are basically additional factors of attraction and resistance as perceived by the consumer which modify the relative importance and basic relationship of the proxy variables in Huff's model.
The various factors which influence a consumer's choice for shopping must be combined into some sort of weighted function which can recognize their relative importance in the consumer decision-making process, and which can therefore better predict the probability of consumer choice.

Huff himself recognized that his model was not infallible. He concluded that:

mathematical models are not infallible. They are, by necessity, simplified constructs of some aspect of reality. It is impossible for such constructs to include all the possible factors that may have a bearing on a particular problem. Therefore decision makers should be aware that there are variables other than those specified in the model that affect the sales of a retail firm. The reputation of a firm, the newness of the store, the merchandise that it carries, the services it offers, etc., are but a few examples of additional variables - human judgment plays an important role in arriving at an adjusted sales estimate.50

In fact at the present level of knowledge in model developments of this type, it appears that human judgment is not only important, it is essential. This in itself is not necessarily a bad thing, but the goal of research should be to develop tools of sufficient precision such that the necessity for subjective judgment will be minimized. When evaluating the models discussed above, it seems important to keep in mind that although the use of analogy (to Newton's original formula) in developing a model may be attractive, flexibility must be maintained or the approach becomes dogmatic. Quite possibly there may be a point at which referring back to the

50 Huff, A Programmed Solution for Estimating Retail Sales Potentials, p. 3.
original analogy can retard progress. At this point, serious con-
sideration should be given to the question of whether the original
analogy should be de-emphasized in favour of other, more fruitful
approaches.

In the case of gravity models of human interaction which
are based on laws in physical science, a fundamental difficulty
arises from the analogy between molecules and people: the human
being as an individual can make decisions with respect to his
behaviour whereas the molecule cannot. This does not necessarily
imply that the behaviour of large numbers of individuals cannot
be aggregately described with some mathematical uniformity, but
if that mathematical description of aggregated behaviour cannot
tolerate the myriad influences producing variations in individual
decisions, then the validity of such mathematical descriptions as
predictive tools is in doubt. It appears that at some point
aggregative averages cannot adequately describe behaviour. This
is the point where the power of individual decision-making with
all the complexities affecting that decision can critically
affect what the formulas are trying to measure. In effect this
casts doubt on whether basic and simplified mathematical opera-
tions are legitimate procedures in models of human behaviour. A
particular formula may in general represent the basic perspective
about which general classes of causal factors are important (for
example attraction and resistance) but too-simplified a formula
which substitutes simply proxy variables to represent the general
class (for example distance for resistance) is in all likelihood
too simple to adequately represent the necessary complexities
governing a behaviour. It will not adequately cope with the
complexities of reality. In this case, the predictive value of such a formula must be questioned.

Summary

Many assumptions are made in marketing about the factors which influence consumer spatial behaviour. Models are intended to explicitly clarify some of these factors and their inter-relationships in order that behaviour can be better understood and the number of assumptions and general statements reduced. Many such models follow the idea that the probability of consumer action is a direct function of the attractive factors of a location, and an inverse function of the resistance or cost factors involved in responding to that attraction. The models discussed above attempted to include from among those factors mentioned in Chapter IV only those which were considered necessary to build a model of sufficient predictive ability.

In a general sense, models are meant to be representations of observed reality. They attempt to abstract certain properties of a relationship and then structure them to represent that relationship. However, the data inputs which are abstracted in the model are rarely as exactly related as the model must assume. To this degree, model results must often be regarded as approximations of reality insofar as they often are expressed in clearly defined abstractions of not so clearly defined reality in order that some workable formula can be achieved. As a result, models are often oversimplifications of reality, a condition which is often necessary if any abstraction is to be attempted at all. In this sense, the abstraction process of necessity
ignores or neglects some of the conditional aspects of reality in order that some relationships may be clarified in their simplest form. If such a "pure" relationship does not exist in reality due to conditional influences, and if such conditional influences normally affect these relationships in a manner far different than implied in the model, then the model must be altered to account for these conditional factors, otherwise it is not representative of the determining factors. If, however, the model description of a relationship "fits" well with reality by isolating key variables and parameters which function as described in the model except for minor conditional influences, then these conditional influences can be recognized but left out, only to the extent that in doing so, the resultant abstraction of reality still bears close resemblance to the primary factors in reality and does not suffer a loss of credibility as a result of neglected contingencies. But from the preceding discussion, it would appear that further research is required to extend and refine the models, either through expanding the number of variables in the formulae or through restructuring the parameters, in order to improve the predictive capabilities of such models.
CHAPTER VII
CONCLUSIONS

Restatement of the Problem

As stated in Chapter I, the problem to which this thesis was addressed involved that part of retail location analysis which is concerned with estimating the sales volume potential for a proposed shopping centre.* The available literature on the subject focuses on different aspects of the problem, sometimes describing techniques for sales volume estimating, sometimes describing specific research efforts designed to define more accurately the critical variables and relationships governing consumer patronage behaviour, and sometimes describing theoretical models of those factors and relationships which are considered adequate to accurately predict both consumer patronage behaviour and the corresponding sales volume potential for a new retail outlet. But the theory behind sales volume estimating appeared somewhat disjointed, since the methods and models emphasized different approaches and factors, and ignored or inadequately accounted for others. Furthermore, it was apparent that predictive accuracy was far from satisfactory with the presently available tools of analysis, since sales volume estimates appeared to be prone to wide errors, or at least wide variations depending on the methods of analysis employed. It was felt that the problem revolved around the various arguments, assumptions, concepts, factors, and relationships inherent or missing in each model or method.

* Many other factors (including return on investment criteria and local political constraints) which will have a bearing on the choice of a site and the ultimate development decision were not considered in this thesis.
Hopefully, by examining the determinants of consumer patronage behaviour in the context of the practised methods and theoretical models, the thesis could: highlight the complexities and problems involved in sales volume estimating; illustrate the complex inter-dependencies of the many variables and present a more complete picture of all the factors involved; and focus on the reasons behind the apparent inadequacies or limitations of the practised methods and theoretical models for sales volume estimating.

More specifically, the purpose of the thesis was to:

1) discuss the validity and limitations of the many arguments, assumptions, concepts, factors, and relationships deemed to be important for locational sales volume analysis, and in so doing, suggest the "building blocks" or "raw materials" which should be considered and included in the development of procedures and models to aid in sales volume estimating.

2) discuss and analyze the various techniques and models employed in shopping centre volume estimating in order to a) determine how adequately and to what extent they recognize and incorporate the above factors and relationships, and b) evaluate their ability to produce theoretically sound, reliable, accurate predictions.

3) attempt to tie these various concepts, factors, techniques and models into a more comprehensive overview of the problems faced in estimating potential sales volumes, thereby highlighting areas where further research is required to refine and improve the techniques of prediction.
Summary and Conclusions

To predict the expected sales volume which a new centre will likely achieve requires ascertaining how many consumers will spend a specified portion of their income at that centre. It is therefore necessary to understand the determinants of consumer patronage behaviour, or how consumers react to the various factors affecting consumer motivation in the selection of a retail facility in which to purchase the various goods they require. It is also necessary to be able to specify, quantitatively, how such behaviour will be manifested in a certain area in regard to a particular retail facility.

Shopping behaviour is governed by the consumer's perspective towards certain benefit and cost factors: what satisfaction can be achieved at what cost in money, time and effort. A retail facility exerts an attractive influence which diminishes as distance from the centre increases, a result of the fact that travel costs (money, time, effort, and inconvenience) increase with distance. The problem of ascertaining expected consumer patronage then boils down to assessing the costs that consumers will sustain to respond to certain attractions.

For the sake of analysis, these costs are normally represented by distance in physical or time-units. But as contended in Chapter IV, the effect of distance on shopping behaviour varies according to: the type of merchandise sought; the degree to which certain goods are important to the consumer; the importance to the consumer of selection, quality, pricing, and depth of merchandise offered; the degree of selectivity in the purchase decision; the social significance attached to certain kinds of
merchandise; consumer willingness to accept substitute merchandise; psychological and geographical barriers; road capacities, traffic congestion and conditions of accessibility; and the availability, proximity, quality and effectiveness of competing retail establishments. The extent to which the above factors modify the effect of distance differs according to family size, age groupings, income status and social status of the consumers in any particular area.

Again as suggested in Chapter IV, the attractive influence of a retail facility varies according to: the size of the centre and the sizes of various stores in the centre; attractive design and layout; variety in tenant-types; merchandise mix, breadth of selection, range of colours, sizes, qualities, and styles; competitive or market-oriented or unique pricing policies; the image and reputation of the centre; the availability or lack of free parking; amenities and community facilities; hours of business; and the effectiveness of the promotional programme. The importance and effect of these factors varies in turn according to the size of family, age group, income status, and social status of the consumers in the area.

The practised methods and theoretical models were then examined to determine how adequately the preceding factors and interrelationships were recognized or quantified in them, and to what extent these methods and models were capable of generating reliable, accurate predictions.

The Market Share, Vacuum Calculation, and Analog techniques were examined and it was observed that while the methods attempted to recognize the determinants of consumer behaviour suggested above and sought to account for them in the
analytical techniques of estimating the drawing power of a proposed centre, the determinants and their interrelationships were imprecisely, subjectively, and inadequately quantified. Problems and limitations were evident in several areas: in the considerable reliance on subjective judgment; in estimating the sales volume captured by competing retail outlets; in estimating the trade area boundary or the limit of effective attraction exerted by a particular facility; and in guessing the market share which that centre would likely achieve in a given area. In view of the excessive reliance on subjective assumptions and judgments, and since the determinants of behaviour are arbitrarily and inadequately quantified, it was concluded that there was considerable doubt as to the ability of these methods to generate reliable, accurate, and consistent predictions based on theoretically sound measurements.

The examination of Reilly's law concluded with the observations that: the law was not appropriate to intra-urban settings where competitive influences are numerous and overlapping; there is little justification for his choice of 2 as the value of the distance exponent; the proxy variables population and distance may not be sufficiently representative as causal variables to describe and predict consumer patronage behaviour consistently. It appeared that other factors which affect consumer patronage behaviour were not given adequate recognition in a formula which considered only the proxy variables size and distance; and the model contains little theoretical content and cannot explain observed regularities.

The distinct contribution of the probability models is their probabilistic notion whereby the idea of a fixed line
circumscribing a centre (trade area boundary) is replaced by a series of probability contours. But after examining the probability models, it appeared that the attempt to abstract the primary determinants of consumer behaviour into a formula had resulted in a choice of variables and parameters which were too gross in scope to permit accurate predictions. The exponential distance parameter performed the function of a "catch-all" parameter through which the multitude of influences and factors not otherwise contained in the model could exert their influence. Determining a satisfactory value or values for this parameter was a complex problem because the theoretical explanation of its construction was restricted to the effect that the type of merchandise sought had on the distance variable. Other factors and influences which caused the exponent to vary were suggested (these factors are listed earlier in this concluding section). The proxy variable for attraction was also criticized and other factors which vary the weighting of this variable were suggested (again, these are listed earlier in this concluding section).

The discussion concluded with the observation that the presently available probabilistic models require subjective interpretation if they are to be at all useful. But the models, when applied in conjunction with subjective judgment and experience, can be useful analytical tools in spite of their limitations.

The task remains to further refine and extend the models to improve their descriptive and predictive capabilities. This will require that the models more explicitly recognize the determinants of consumer spatial behaviour. It is suggested here that if the factors mentioned above were more explicitly recognized in the
formulae, either through expanding the number of variables in the formulae, or through re-structuring the parameters, the descriptive and predictive capabilities of these models might be improved.

In summary, there remains a great need for more basic research and a greater coherence of theory to specify the "building blocks" for a more comprehensive model of consumer spatial behaviour which would be capable of description and prediction at a less aggregative, more microscopic level.
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