Analysis of Retail Site Locations in Terre Haute, Indiana

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Abstract

The concern of this study was to test whether or not and to what degree street "connectivity" or the density of the road network within an arbitrary area around a commercial retail enterprise was related to the market population in the same area. Analysis of connectivity and population of twenty-five randomly selected retail sites in Terre Haute, Indiana, revealed that virtually no correlation existed. Further analysis based on Proudfoot's classification of locating retail sites into one of four general types within an overall city retail structure revealed that each city retail type had its own degree of connectivity. The highest degree of connectivity was found in the central business district followed by an intermediate degree of connectivity for ribbon pattern sites located along the major arterial streets of the city. Retail sites located in outlying shopping centers and neighborhood establishments ranked relatively low in connectivity. However, high connectivity does not mean that sites are more accessible because the problem of traffic congestion becomes more prevalent with an increase in the density of the road network. In short, the best location for a retail enterprise is one that offers a balance of both accessibility and connectivity between all population market areas.

Introduction and Purpose

Terre Haute, Indiana, like most standard metropolitan statistical areas, has an existing retail structure that can be subdivided into a series of types (3). One of the most marked of all the types is the central business district. It is normally located at the near focal point of the city's road transportation network and central to the entire population. Above all, however, it is marked by a distinct concentration of retail establishments (2). Second, and with the advantage of being adjacent to the primary transportation networks, are those retail establishments which have developed in a ribbon-like pattern along the major arterial roads converging on the focal point of the city and in turn depend principally on business drawn from these streets. The third type of retail structure is composed of those outlying shopping centers which resemble, except for size and number, the retail services offered by the central business district. Fourth, and last, are the small isolated clusters or individual retail establishments at the neighborhood level catering to a rather restricted population area primarily from the standpoint of convenience.

Of the many variable and interrelated cultural, environmental, and economic factors that are inherent for the success of a commercial retail enterprise in any one of the type localities mentioned above, two basic variables seem to stand out more dominantly than the others. One is a localized population market created by the population in the immediate vicinity of a retail site which would tend to purchase the commodity or service being offered by that particular enterprise. The second is the factor of accessibility of the retail site to the population market or the ease with which the population is able to move from any point within the market area to the retail site. The factor of accessibility to a business site may be aided by what can be called "connectivity"

or the density of the network of roads and intersections within the localized market area.

The primary purpose of this study and analysis is to detect whether or not and to what degree the connectivity of the transportation network around retail sites in Terre Haute is related to the population market density around these sites. Another factor to be considered while testing the relationship between connectivity and population is whether or not street connectivity varies with respect to retail site location within the overall city retail structure of Terre Haute.

Methodology

In order to determine whether or not any relationship exists between retail site connectivity and market population, a system of quantification for site connectivity was developed by first selecting twenty-five sites at random from a group of 285 retail establishments within the city limits of Terre Haute. Represented within this original group of 285 were pharmacy and drug stores, furniture stores, general merchandise and grocery stores of both independent and chain type, jewelry, appliance, hardware stores, and dry cleaning establishments (4, p. 811-812).

For each of the twenty-five randomly selected sites an arbitrary and constant market area was inscribed by a circle. A circle radius of one-quarter mile was chosen to delimit the market area. (The radius size was chosen merely for convenience.) Population density and site connectivity were then calculated for each of the twenty-five sites within the arbitrary market area.

The quantification of site connectivity was accomplished by assigning unit values to each street and intersection within the arbitrary market area. The unit value assigned to an individual street or intersection was based on its importance in an overall structure classification of highway and street standards (1, p. 289-292). Individual parts of the transportation network were assigned unit values in the following manner:

10 units—Major arterial roads, roads which traverse the city and are part of a U.S. or Interstate highway system.
8 units—Major arterial roads, roads which traverse the city and are part of the Indiana state highway system.
4 units—Minor arterial roads, streets which have a continuous length of greater than two miles.
2 units—Minor arterial roads, streets which have a continuous length of less than two miles.
2 units—4-way intersection.
1 unit —2 or 3-way intersection.

On the basis of this street network quantification method, connectivity for each of the retail sites was computed within its corresponding market area.

The arbitrary market area was also used to establish the population market to which the selected retail establishment could readily cater. Since all the arbitrary market areas were held constant, the population

density was simply expressed as the total population. Population statistics were taken from the 1960 Census Tracts of Terre Haute. Since these statistics are subject to change over short periods of time, caution was exercised in areas which had been cleared for urban renewal or where new construction was prevalent.

No quantification of the site locations within the overall city retail structure was made. As the twenty-five retail sites were selected they were coded in the following manner: (A) sites located in the central business district; (B) ribbon pattern sites; (C) outlying shopping centers; and (D) neighborhood retail establishments. The purpose of coding the individual sites was to detect if the means of retail site connectivity within each of the retail structure types of the city varied significantly from one another.

Analysis of Site Location Quantification

The bivariate data (see Table 1) consisting of market area connectivity and population density for each of the twenty-five randomly

TABLE 1. *Quantified market area population, retail site connectivity and city retail structure type*

Site Number	Structure Type	Connectivity Site	Area Market Population
1	B	75	2160
2	B	68	1580
3	B	89	1520
4	A	73	1400
5	B	68	1720
6	B	53	700
7	B	42	1290
8	A	109	1070
9	B	86	1540
10	D	53	1460
11	D	50	1050
12	D	59	1070
13	B	86	2640
14	A	112	1450
15	C	42	480
16	D	46	1030
17	C	56	490
18	C	57	470
19	C	61	1110
20	B	64	1210
21	C	56	1760
22	A	108	1050
23	D	64	1650
24	C	52	660
25	D	58	1390

selected sites was tested by the Pearson product-moment correlation method. The product-moment correlation coefficient obtained for the above data was a —.357. This indicates that there was virtually no relationship between street connectivity in an area around retail site locations and the population within this same area. A variance interpretation of the correlation coefficient —.357 revealed that only 12 per cent of the variance of one variable (connectivity) was predictable from the variance of the other variable (population). In short, this meant that 84 per cent of the factors necessary to make predictitons about site location connectivity with respect to the population in the market area were unaccounted for in this correlation.

Although the above correlation was poor, the plotting of site data by city retail structure type on a scatter diagram (see Figure 1) yielded one interesting factor: namely, a grouping of retail site types within certain limits of site connectivity. Therefore, the means of site connectivity were computed within each of the retail structure types and the results revealed each mean was different.

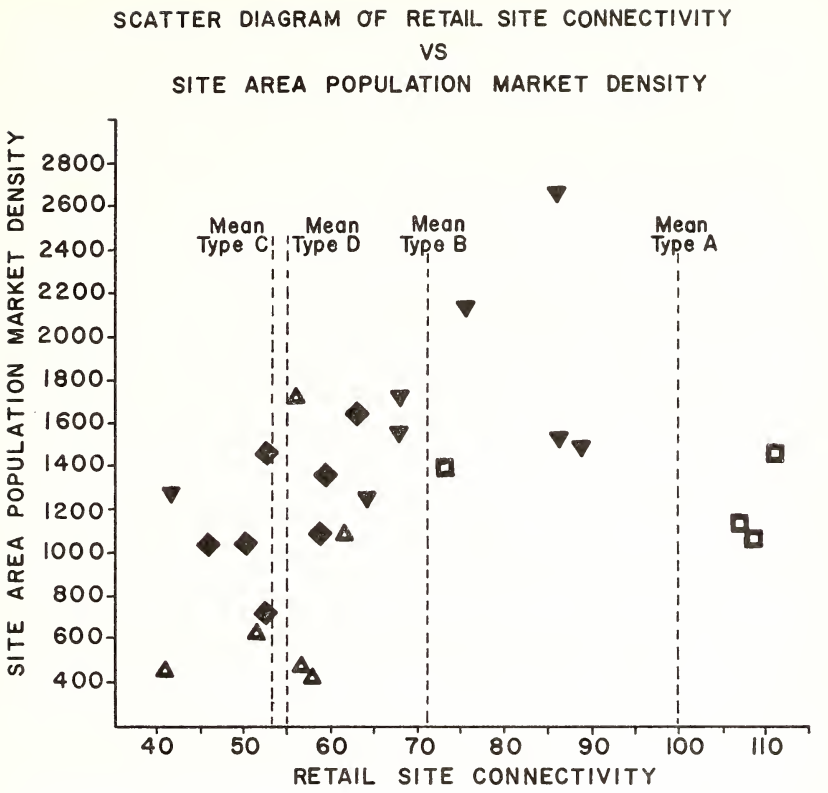
Connectivity Means	*Retail Structure Type*
100	Central Business District
71	Ribbon Pattern Service Site
54	Outlying Shopping Centers
55	Neighborhood Retail Site

To test whether or not the differences between the above means were significant or simply due to sampling error, an analysis of variance was made. Analysis of variance showed that the differences between the means were not attributed to sampling error; consequently, each retail structure type has its own degree of connectivity.

Conclusion

This study revealed that a considerable emphasis is placed on streets which traverse not only the market area but the entire city as well, and that a great degree of interconnectivity exists between population market area of all city retail structure types. The main factor that accounts for the poor correlation within a controlled area may be the degree of interconnectivity between controlled market areas. A high interconnectivity would provide easy access for the movement of population from one market area to another. The central business district and the ribbon-pattern establishments in Terre Haute are prime examples of this interconnectivity. While they have high connectivity within an immediate area, their existence is not dependent upon an immediate or local population market area.

Another variable is that a high density transportation network leads to the problem of traffic congestion especially where the area is dominated by retail establishments. With increased congestion, a site becomes less accessible even though connectivity remains relatively high. Outlying shopping centers and neighborhood retail stores, while having a low connectivity, are on the whole more accessible than the central business district. In short, the best location for a retail enterprise is one that offers a balance between connectivity and accessibility.



Symbol Legend

Retail Structure Type	Symbol	Location Description
A	◻	Central Business District
B	▼	Ribbon Pattern Site
C	△	Outlying Shopping Centers
D	◆	Neighborhood Retail Site

Figure 1.

Literature Cited

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