

THE INFLUENCE OF TRAVEL TIME AND SIZE OF SHOPPING CENTER TOWARDS THE FREQUENCIES OF VISITING CUSTOMERS IN SHOPPING CENTERS IN SURABAYA

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ABSTRACT

Visiting a modern shopping center is becoming vital in our society nowadays. The fast growth of shopping center, transportation system, and modern vehicles has given more choices for consumers in shopping. Although there are many reasons for the consumers in visiting the shopping center, the influence of travel time and size of shopping center are important things to be considered towards the frequencies of visiting customers in shopping centers.

A survey to the customers of three major shopping centers in Surabaya has been conducted to evaluate the Ellwood's model and Huff's model. A new exponent value N of 0.48 and n of 0.50 has been found from the Ellwood's model, while a coefficient of 0.267 and an add value of 0.245 have been found from the Huff's model.

Keywords: Travel time, size, shopping center, Ellwood theory, Huff theory, Surabaya

INTRODUCTION

Modern shopping center has more important role (Sugarda, 1996). Shopping center is not only place for buying goods but also a recreation place. Therefore, most shopping centers also provide amusement store, children playground, cinemas, ice skating, and other game center.

Moreover, the development of road system and transportation mode has offered more choice for customers to go to shopping center outside their neighborhood (Santoso, 1995). Furthermore, toll way has influenced customer not to consider the distance but only travel time. Tanan (1998) emphasized the importance of travel time than distance from workplace or home to shopping center. Travel time provide a comprehensive view included the access road, traffic, and available transportation mode. As a result, developer has built big shopping center not only in the city center but also in suburban area.

Shopping center manager has to realize the main factors that are considered by the customers. The major factors are travel time from home or work place to the shopping center and shopping center size. Carn (et al. 1988) mentioned that the basic assumption of shopping center size have linear relation with the variety of goods and service. Furthermore, the bigger shopping center will provide more attraction for shoppers. The balance between size and product variety in the shopping center will provide more comfortable shopping center.

Purpose of the study is to prove the influence of travel time and the size of shopping center to the frequencies of visiting customers. This study will evaluate the applicability of two equations from Ellwood and Huff theory to Surabaya's shopping center.

THEORETICAL BACKGROUND

Shopping Center in Surabaya has two types that are: plaza and mall. The difference between plaza and mall is only architectural design. Plaza emphasized in big open space in the ground floor. The open space can be used as promotion place to attract customers to come. On the other hand, mall provides a big linear circulation in between shops. The customers could have more time to check the shopping's goods from their window. Anchor tenants are located at the end of the circulation to attract shoppers to pass and visit the specialty shops.

White & Gray (1996) defined four shopping center categories, that are neighbourhood center, community center, regional center, and super regional center. The specification criteria are mentioned in Table 1. Besides the physical criteria, White and Gray (1996) also stated the catchment target.

Table 1. Shopping Center Category

Specification	Category			
	Neighbourhood Center	Community Center	Regional Center	Super Regional Center
Gross Floor Area (m ²)	3,000-10,000	10,000-30,000	30,000-80,000	80,000-150,000
Total area (hectare)	7-25	24-74	74-124	124-309
Number of shops	15-20	40	100	200-225
Population	2,500-40,000	40,000-150,000	150,000	300,000
Distance from home (km)	2.25	4.5-9	12	18
Travel time (minute)	5-10	10-15	15-20	30-45

Source: White & Gray (1996, p.55)

Tanan (1998) stated five important factors as attraction power of shopping center that is location, business concept, design, tenant mix, and management. Location have a very broad meaning includes catchment area, on the way home, accessibility, and neighbourhood development. Location has closed relationship with the accessibility of

shopping center. The key success of shopping center is location, location and location (Syahara and Ristiana, 1992). Carn et.al (1988) mentioned that in general location of shopping center is either in the city center or in suburban in housing complex. The distance or travel time will be depended on road condition and transport mode availability.

Product variety, pricing and service will attract shoppers to buy their needs in the shopping center (Carn, et al. 1988). The developers' effort to attract more customers could be done by promotion activities and provide more recreation facilities. Market segmentation and life style of the shoppers with comfortable access, air conditioning facilities and security will improve the attraction of shopping center (Carn, et al. 1988).

Some theories have been developed to measure the attraction potential of shopping center. William J. Reilly introduced his Law of Retail Gravitation (Carn, et al. 1988, p. 187), which conclude that attraction of shopping center between two cities has direct proportion to the population of both cities and has inverse proportion to the square of the distance from each consumer's house in both cities.

Ellwood has modified the Law of Retail Gravitation by using different variables. "The principal retail districts within a metropolitan trading area attract trade from the residential sections of the area approximately in direct proportion to the size of the retail districts and in inverse proportion to the square of the driving time distance from each residential section to the retail districts" (Ellwood, 1954 in Carn, et al. 1988, p.190). In mathematical form, Ellwood's theory is stated in equation 1.

$$\frac{B_a}{B_b} = \left(\frac{S_a}{S_b} \right)^N \left(\frac{T_b}{T_a} \right)^n \quad (\text{equation 1})$$

Where: N = 1
 n = 2
 B = percentage of consumer want to visit shopping center
 S = retail area (NLA)
 T = travel time
 a, b = two shopping centers (a and b)

Although Ellwood has modified the Reilly's law, the equation can analyze only two shopping centers. Huff has developed formulae that could evaluate problems for more than two shopping centers (Carn et al., 1988). Huff has used the same variable as Ellwood's equation, that is: size of shopping center and travel time (see equation 2).

$$P(C_{ij}) = \frac{\frac{S_j}{T_{ij}^1}}{\sum_{j=1}^n \left(\frac{S_j}{T_{ij}^1} \right)} \quad (\text{equation 2})$$

where: P (C_{ij}) = the probability that a consumer living at site *i* will shop at retail center *j*
 S_{*j*} = the size of the retail center *j* (NLA)

- T_{ij} = the travel time from site i to retail center j
 n = the number of retail center in the immediate area
 λ = a parameter that reflects the effect of travel time on different kinds of shopping trips (Huff discovered values of 3.19 for furniture and 2.72 for clothing)

Huff model have advantage, which could measure the shoppers' image to competitiveness among shopping center and their response. However, the weakness of this model is assumed that demography characteristic of shoppers are equal and they have similar shopping behavior. Mason, Mayer and Wilkinson (1994) suggested that the selection of specific shopping center could improve the performance of Huff model.

RESEARCH METHODOLOGY

This study is based on a survey to three main shopping centers in Surabaya. Short description of those shopping center are listed in Table 2. The Tunjungan Plaza and Surabaya Plaza are located in Central Business District. Although Galaxy mall is a new shopping center, it has attracted many shoppers. It locates in the luxury residential complex in East of Surabaya.

Table 2. Size and Characteristics of main shopping centers in Surabaya.

	Shopping Center		
	Galaxy Mall	Tunjungan Plaza (I – III)	Surabaya Plaza
Category	Regional Center	Super Regional Center	Regional Center
Land area (m ²)	27,095	65,000	75,270
Building area (m ²)	53,979	117,000	66,685
Net Leaseable area (m ²)	25,000	90,000	49,397

Source: Sutjianingsih (1998) and Sulistyawati (2000)

In this survey, the population is the consumers in three shopping centers. The questionnaires have been distributed proportionally with the estimation number of shoppers in one year of each shopping center. For example, Tunjungan Plaza as the biggest shopping center has higher proportion. Total respondent in Tunjungan Plaza, Plaza Surabaya and Galaxy Mall are 450 people, 400 people, and 350 people, respectively. However, some questionnaires are incomplete and only 757 set could be used for the study. Total valid questionnaire in Tunjungan Plaza, Plaza Surabaya and Galaxy Mall are 299 people, 256 people, and 202 people, respectively.

Questionnaires were distributed in some spots by systematic sampling. The distribution time was chosen by random sampling. A short questionnaire consists of three main variables, that is: travel time, size and frequencies of visiting customers.

Regression analysis is used to evaluate the application Ellwood and Huff theories. It requires differing between independent and dependent variables. In this case, the independent variables are travel time and size, meanwhile, the dependent variable is frequencies of visiting customers. However, modification of data gathered to fit with linear regression assumption is necessary.

The size of shopping centers has been explained in Table 2. Table 3 shows the range and average travel time of shoppers to each shopping center. The distributions of shoppers' travel time to the shopping centers based on their residential area are listed in Table 4.

Table 3. Shoppers' travel time

Shooping Center	Travel time (minutes)		
	Minimum	Maximum	Average
Galaxy Mall	3	120	26.04
Tunjungan Plaza	3	120	24.56
Surabaya Plaza	5	120	23.64

Source: Sulistyawati (2000, p.55)

Table 4. Average Travel Time of Each Residential Location (minutes)

Residential Location	Shopping Center		
	Galaxy Mall	Tunjungan Plaza	Surabaya Plaza
West of Surabaya	36.11	27.17	31.18
North of Surabaya	21.64	22.60	23.57
Center of Surabaya	24.62	16.66	16.98
South of Surabaya	30.00	26.28	25.60
East of Surabaya	14.79	27.71	17.73
Sidoarjo	33.85	42.25	46.00
Gresik	60.00	25.00	52.50

Source: Sulistyawati (2000, p.56)

ANALYSIS OF ELLWOOD THEORY

Some modifications are required to simplify and to fit with linear regression requirements. Firstly, each proportion of three variables will be represented by three new variables (see equation 3). Secondly, by using logarithmic methods, the new equation is utilized directly in multi linear regression analysis.

$$Y = (X_1)^N * (X_2)^n \quad (\text{equation 3})$$

$$\log Y = N * \log X_1 + n * \log X_2 \quad (\text{equation 4})$$

$$\text{where: } Y = \frac{B_a}{B_b}$$

$$X_1 = \frac{S_a}{S_b}$$

$$X_2 = \frac{T_b}{T_a}$$

By using software SPSS for windows, the regression analysis has discovered the value of both coefficient N and n (see equation 5). The new exponent value N is 0.48 and n is 0.50. The intercept of linear regression function is 0.129 in equation 5 represents other attraction factors that influence shoppers to visit shopping centers.

$$\text{Log } Y = 0,475656 \log X_1 + 0,501317 \log X_2 + 0.129 + e \quad (\text{equation 5})$$

Thus, the percentage of consumer want to visit shopping center is approximately in direct proportion to root square of the size of the retail and the travel time of the shoppers to the retail.

ANALYSIS OF HUFF THEORY

Unlike in the Ellwood theory, the transformation process is very difficult to determine the coefficient λ . Therefore, this study will find the new equation with the determinant λ (equal to 3, for shopping center) by using simple regression in equation 6. By using software SPSS for windows, the regression analysis has discovered the value of coefficient B is 0.267 and intercept A is 0.245.

$$Y = A + B \cdot X \quad (\text{equation 6})$$

Where: $Y = P(C_{ij})$

$$X = \frac{\frac{S_j}{T_{ij}^1}}{\sum_{j=1}^n \left(\frac{S_{ij}}{T_{ij}^1} \right)}$$

$\lambda = 3$ (for shopping center)

This study has found five major factors which have attracted shoppers to visit shopping centers. Variation of supporting facilities and goods are very important factors. An easy access to the shopping center and strategic location are also important. A shopping center could be a comfortable place for sitting and relaxing. It is also a represent place which is safe, comfortable and clean. Moreover, very limited shopping facilities in the suburban have interested people to visit the major shopping center. In other words, distance and travel time could not bind their eager to come.

CONCLUSION

In conclusion, the Ellwood and Huff theories could be applied in Surabaya with some modification. A new exponent value N of 0.48 and n of 0.50 has been found from the Ellwood's model. The percentage of consumer want to visit shopping center is approximately in direct proportion to root square of the size of the retail and the travel time of the shoppers to the retail. Meanwhile, a coefficient of 0.267 and an add value of 0.245 have been found from the Huff's model. The coefficient λ is equal to 3 for Huff's model.

Besides travel time and size of shopping center, there are some other factors which are influenced the frequencies of visiting customers to the shopping center, such as variation of supporting facilities, variation of goods, strategic location and comfortable place. Moreover, distance and travel time could not bind the costumers from suburban to visit the major shopping center, because shopping facilities is very limited in the suburban.

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