Characterizing the City Center Retail Environment of Hanoi, Vietnam Based on Consumer Shop-around Behaviors[†]

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Abstract

Hanoi is one of old big capital cities in East Asia and the largest economic and political center in Vietnam. The city center commercial district (CCCD) of Hanoi is located in its old inner quarter. The district formed long time ago is composed of many distinct shopping streets, each of which, in turn, consists of a lot of retail shops specialized as selling the same featured class of commodities. The district also contains traditional markets. While the district gradually has attracted new shop categories such as supermarkets and GMS (general merchandise stores), it still is characterized by a cluster of these distinct shopping streets and traditional markets. The motivation behind this paper is to answer the problem of why and how these characteristics of the CCCD have been developed. We try to tackle this problem from the viewpoint of consumer

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shop-around behaviors to characterize these distinct features of the CCCD. For the purpose, we conducted for the first time the consumer shop-around behavior survey at the CCCD of Hanoi in May, 2004. This paper aims to provide a fundamental analysis of consumer shop-around behaviors at the CCCD of Hanoi to clarify the location characteristics of the CCCD from the viewpoint of consumer behaviors.

Key words : City center commercial district (CCCD), City center retail environment (CCRE), Consumer, Hanoi, Shop-around behavior, Shopping street, Traditional market.

1. Introduction

Since 2000, Fukuoka University of Quantitative Behavioral Informatics for City and Space Economy (FQBIC) has carried out a series of on-site interview surveys on consumer shop-around behavior at CCCDs of mega cities in East Asia including Shanghai, Beijing, Taipei, Seoul, Ho Chi Minh and Hanoi. The purpose of these surveys is to explore and compare characteristics of City Center Retail Environments (CCREs) among those cities viewing from consumer shop-around behaviors. Based on the data of these surveys, FQBIC has published their initial researches on Shanghai, Taipei and Beijing (Cf. [6], [8], [9], [14], [15], [16]). Moreover, based on the results of surveys of consumer shop-around behavior, we have been trying to develop some framework to evaluate the strength and weakness of CCREs by providing a methodology to estimate the economic effects of urban redevelopment projects from the viewpoint of how they would change consumer shop-around behaviors, which, in turn, would cause to change turnovers of retail facilities (Cf. [1], [2], [5], [7], [11], [12]). Choosing Hanoi as one of survey fields, we conducted the survey of consumer shop-around behaviors in Hanoi, Vietnam, in 2004.

The city of Hanoi is known as one of old big capital cities in East Asia and the

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largest economic and political center in Vietnam. The CCCD of Hanoi city is located in the old inner quarter of Hoan Kiem District. The district was formed long time ago and is composed of traditional markets, old department stores and many distinct shopping streets, each of which consists of a lot of retail shops specialized as selling the same featured class of commodities. While new shop categories such as big shopping malls are emerging at the areas neighboring to the CCCD or the suburban areas in Hanoi, almost all consumers in Hanoi look at the district as the CCCD of Hanoi. In fact, the district still is the busiest place for activities of business and shopping. This may be a difference between the CCCD of Hanoi and other modern CCCDs in the world. A serious problem the CCCD of Hanoi is faced with is its poor infrastructure system. This has created much inconvenience in traveling, shopping, parking and so on. The retail system is not efficient enough to encourage consumers to make the most of their shopping activities there. It is really a difficult task for city planners to redevelop the CCCD of Hanoi to enhance the convenience for consumers' shopping needs while preserving the culture and history of the old city. Since the CCCD of Hanoi can be thought of as the outcome of long time transactions between consumers' behaviors and retail facilities, the course of redevelopment of the CCCD should be based on the actual consumer shopping behaviors.

With this in mind, we have conducted surveys of consumer shop-around behaviors. While there were few researches on shopping behaviors of Hanoi consumers (Cf. [3][4]), their concerns are limited to the frequency of shopping trips and new shop categories. Thus our survey is the first systematic survey of consumer shop-around behaviors in Hanoi.

The purpose of this paper is to make a fundamental analysis of consumer shop-around behaviors at the CCCD of Hanoi to understand the traits of shopping
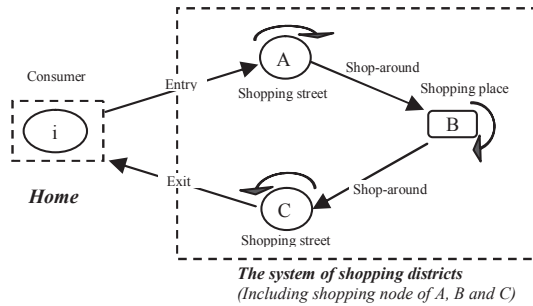
activities of Hanoi consumers as well as to clarify characteristics of the CCCD from the viewpoint of consumer shop-around behaviors, i.e., how consumers move around within the CCCD. We regard the structure of retail facilities as the relationship among the retail facilities reflected in the consumer shop-around movements. Being consistent with preferences of consumers in Hanoi, the analysis of retail structure reflected in consumer shop-around behaviors would provide useful information for planners to make a redevelopment plan for the CCCD.

2. Methodology and survey data

2.1. Methodology

In general, a CCCD of a city is composed of several shopping districts or shopping sites or shops. We consider a CCCD as a system of smaller shopping districts. In order to describe consumer's movements over these smaller shopping districts, it is assumed that each of these smaller shopping districts or shopping sites can be expressed as a point in CCCD. We will call these points as shopping nodes in CCCD. For example, Figure 2.1 represents a system of shopping districts including shopping nodes of A, B and C. For the analysis of the CCCD of Hanoi, we distinguish two kinds of shopping nodes : shopping streets and shopping places. In Figure 2.1, we see that consumer i enters a shopping district for purchasing goods, visits shopping node A, then moves to shopping node B, stops at shopping node C, and returns home. This phenomenon is called consumer shop-around behavior.

For the purpose of analyzing consumer shop-around behaviors, first we must define shopping nodes in the CCCD of Hanoi. The CCCD of Hanoi is located

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Figure 2.1 : Consumer shop-around behavior in a system shopping district

entirely in the Hoan Kiem District (Figure 2.2). It includes the ancient quarter area and the Hoan Kiem Lake area. In the ancient quarter area, about 80,000 people inhabit in about 100 ha area. There are a lot of retail shops along the streets in the ancient quarter area. They are often called as the traditional street stores that are family owned retailers and sell a limited variety of processed foods, dry goods, drinks, household supplies, and clothes and so on. Specialized stores are located as well. Many streets often are specialized in a single category of products. There are often 200 to 300 similarly specialized stores along a few hundred meter stretch on a single street (Cf. [4]). Besides spontaneous developments of retail shops along a street line, supermarkets and shopping buildings also have emerged in Hanoi. The number of shops such as supermarkets and shopping complex buildings significantly has increased in Hanoi in 1990s (Cf. [3]). Nevertheless, most of new big shopping malls are located at the areas neighboring to the CCCD of Hanoi. As far as the CCCD of Hanoi is concerned, there are only two modern shopping buildings, Trang Tien Plaza and Ham Ca Map Building, and only two supermarkets. Most of other retail facilities in the CCCD of Hanoi are shopping streets or traditional markets.

Code	Shopping node
1	Intimex Supermarket
2	Trang Tien Plaza
3	Dong Xuan Market
4	Hang Be Market
5	Hang Dao-Ngang-Buom streets
6	Ham ca Map Building
7	Trang Tien bookshop
8	Hang Da Market
9	Hang Khoai street
10	Cau Dong Market
11	Hang Ma street
12	Lan Ong street
13	Hang Duong street
14	Hang Dieu street

Code	Shopping node
15	Hang Gai street
16	Dinh Liet street
17	Cau Go street
18	Hang Dau street
19	Hang Trong street
20	Le Thai To street
21	Hoan Kiem Lake area
22	Trang Tien Shops
23	Hang Bai street
24	Dinh Le street
25	Hang Bai Supermarket

Figure 2.2 : Location of shopping nodes of Hanoi CCCD

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As seen from the above, there are many small retail shops in a shopping street in the CCCD of Hanoi so that defining shopping nodes becomes very complicated. To simplify the problem, we define each of these shopping streets as a shopping node.   The shopping buildings or shopping places attracting many consumers also are defined as shopping nodes.   As a result, we defined 25 shopping nodes as depicted in Figure 2.2.

2.2. Survey Data

The on-site survey data was conducted at seven sampling points located in the CCCD of Hanoi in May, 2004.   The 913 samples were obtained from the survey.

The survey was conducted by about fifteen-minute interview for respondents chosen at random from those who visited sampling points in the CCCD of Hanoi at that time.   Respondents were asked to answer the history of their shop-around behaviors.   The recorded history includes places visited, purposes done there, and expenditures spent there, and shop-around routes drawn on the map of city center. Besides their shop-around history, respondents also were asked to answer other questions such as their age, gender, place of residence, occupation, modal choice to, frequency of visit to, and time distance to the CCCD of Hanoi.

In general, the survey we conducted can be said as an on-site person trip survey (Cf. [13]) because the traditional person trip survey to collect trip-chain data is usually conducted as a home-based survey.   Table 2.1 and Table 2.2 show the characteristics of respondents.   Table 2.1 presents the residential location of respondents, which shows the percentage of residents in Hoan Kiem district is about 52% and that of respondent living outside Hanoi about 2%.   Table 2.2 shows the number of samples by age.

Table 2.1 : Number of samples by residence and gender

No.	Residence	Samples	Percent
1	Hoan Kiem District	474	51.92
2	District/Precinct other than Hoan Kiem District	418	45.78
3	Other provinces	21	2.30
	Total	**913**	**100.00**

No.	Gender	Samples	Percent
1	Male	454	49.7
2	Female	459	50.3
	Total	**913**	**100.0**

Table 2.2 : Numbers of samples by age

No.	Age group	Samples	Percent
1	16~19	21	2.3
2	20~24	56	6.1
3	25~29	133	14.6
4	30~34	177	19.4
5	35~39	254	27.8
6	40's	182	19.9
7	50's	78	8.5
8	60's	12	1.3
	Total	**913**	**100.0**

3. Characteristics of consumer shop-around behaviors at the CCCD of Hanoi

3.1. Consumer's frequency of visit to the CCCD of Hanoi

In Table 3.1, Table 3.2, and Table 3.3, we show consumer's frequency of visit to the CCCD of Hanoi under the purposes of shopping, leisure, and meals respectively by age, monthly income, and gender.

From Table 3.1 we know that consumers at the age of 20 to 29 show the lowest frequency of visit to the CCCD. From Table 3.2, consumers with monthly income from 2 to 4 million Vnd[1] are known to do shopping at the CCCD with the highest frequency.

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**Table 3.1 : The frequency of visit to Hanoi CCCD
by Age (times/month)**

No.	Age	N	Freq. of visit	Std. Dev.	Min	Max
1	16~19	21	5.7700	7.13680	0.17	30.00
2	20~24	56	3.2202	5.32544	0.08	30.00
3	25~29	133	2.8008	4.15564	0.17	20.00
4	30~34	177	4.7298	5.49659	0.17	30.00
5	35~39	254	3.9904	5.73217	0.08	30.00
6	40's	182	6.0001	6.77963	0.08	30.00
7	50's	78	7.1190	6.15752	0.08	30.00
8	60's	12	7.1167	4.30007	0.40	15.00

**Table 3.2 : The frequency of visit to Hanoi CCCD
by monthly income (times/month)**

No.	Monthly income (Million Vnd)	N	Freq. of visit	Std. Dev.	Min.	Max.
1	< 1	128	2.5542	4.0875	0.08	15.00
2	1 ~ 2	323	3.4139	4.8956	0.08	30.00
3	2 ~ 3	190	7.0688	6.9003	0.08	30.00
4	3 ~ 4	130	6.0688	5.9581	0.17	30.00
5	4 ~ 5	62	5.1710	6.3134	0.40	30.00
6	> 5	35	2.6743	5.1425	0.40	30.00

**Table 3.3 : The frequency of visit to Hanoi CCCD by gender
(times/month)**

No.	Gender	N	Freq. of visit	Std. Dev.	Min	Max
1	Male	454	4.4640	5.3308	0.08	30.00
2	Female	459	4.8601	6.3742	0.08	30.00
Average			**4.6631**	**5.8787**	**0.08**	**30.00**

[1] Exchange Rate : 1USD＝15,700 VND (as of May, 2004)

Table 3.4 : Transport means from home

No.	Vehicle	Frequency	Percent
1	Bus	46	5.0
2	Motorcycle	426	46.7
3	Bicycle	87	9.5
4	On foot	251	27.5
5	Car	56	6.1
6	Taxi	47	5.1
	Total	**913**	**100.0**

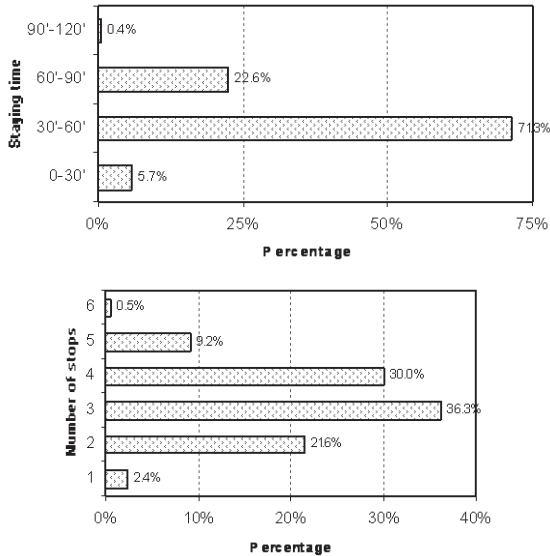### 3.2. Means of transportation

As shown in Table 3.4, the transportation means consumers choose most is motorcycle.   In 2004 and still at present, motorcycle is main means for consumers to travel to the CCCD from their home.

3.3. The length of staying time at the CCCD of Hanoi

We calculated the average length of consumer's staying time and the average number of stops at the CCCD of Hanoi based on data about consumer shop-around behaviors obtained from our survey.   They are shown in the following Figure 3.1, Table 3.5 and 3.6.

3.4. Expenditure

Since the records of histories of consumer shop-around behaviors include the information about how much they spend at what shopping node, we can define two kinds of indices about how much consumers spend on the way of their shop-around : The first is the average of their whole expenditure at all shopping nodes they stopped.   That is to say, this average measures the expenditure per capita or per person.   This average can be defined either as including consumers who spent nothing or as including only consumers who spent some.   The other is the

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Figure 3.1 : Length of staying time and number of stops

Table 3.5 : Average length of staying time

Average length (minutes)	Number of sample	Std. Deviation	Min.	Max.
49.52	913	14.92	20	120

Table 3.6 : Average length of stop number

Average length (stops)	Number of sample	Std. Deviation	Min.	Max
3.27	913	0.987	1.00	6.00

average expenditure per visit including all shopping nodes they visited.   In other words, to calculate the average expenditure per visit we include the shopping nodes where they spent nothing.   As our record of consumer shop-around behaviors includes the purpose of visit at each shopping node, we can analyze how much consumers spend for what kinds of categories of products.   These results are shown in Table 3.7 and Table 3.8.

Table 3.7 : Average expenditures per person and per visit (Vnd)

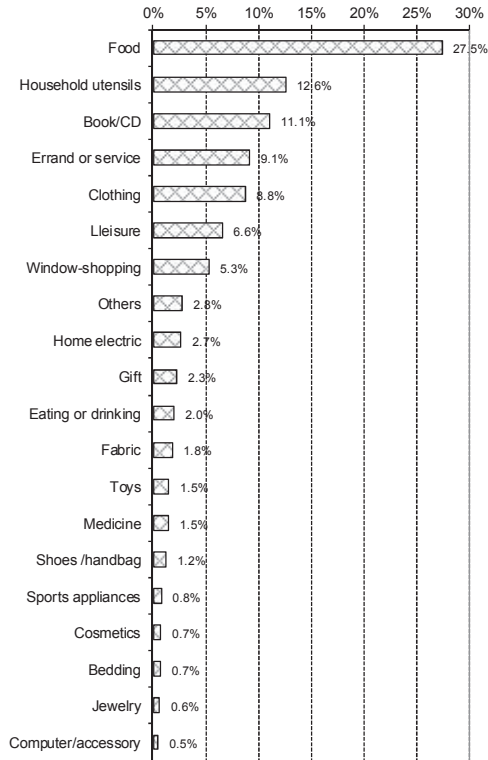| Item	N	Mean of expense	Std. Deviation	Min.	Max.
Average expenditure per a person for his whole shopping trip	913	190,137	371,522	0	6,562,000
Average expenditure per visit	2439	71,175	218,070	0	6,506,000

Table 3.8 : Average expenditure per visit by purposes (Vnd)

No.	Purpose		N	Mean of expenditure	Std. Deviation	Min.	Max.
1		Clothing	260	86,842	119,005	0	1,215,000
2		Shoes /handbag	37	131,162	70,649	26,000	312,000
3		Jewelry	19	390,421	421,159	21,000	1,208,000
4		Food	815	52,485	53,101	0	556,000
5		Bedding	21	119,619	79,497	37,000	326,000
6		Home electric appliances	76	218,211	750,210	19,000	6,506,000
7		Computer/accessories	12	1,602,667	1,554,102	75,000	4,251,000
8	Shopping	Household utensils	373	58,767	74,617	0	652,000
9		Cosmetics	22	57,818	22,855	15,000	103,000
10		Book/CD	229	43,729	41,474	5,000	320,000
11		Toys	45	41,000	36,195	5,000	206,000
12		Medicine	32	36,938	26,711	7,000	126,000
13		Sports appliances	23	170,348	186,086	34,000	885,000
14		Gift	67	56,433	40,052	11,000	255,000
15		Fabric	54	87,907	69,308	21,000	445,000
17		Others	80	53,313	56,024	7,000	277,000
19	Eating and Drinking		59	19,661	14,036	5,000	77,000
20	Errand or service		229	17,983	23,041	2,000	204,000

4. Characterizing shopping nodes by variety of purposes consumers perform there and by expenditure consumers spend there

4.1. By variety of purposes

We can decompose our record of consumer shop-around behavior, i.e., trip chain data into unlinked visits at shopping nodes.   For instance, if we decompose the record of H → A → B → C → H into three visits, A, B, and C, we can calculate how many visits each shopping node attract for what purpose.   Using this method we wish to characterize shopping nodes in the CCCD of Hanoi by calculating

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	0%	5%	10%	15%	20%	25%	30%

- Food 27.5%
- Household utensils 12.6%
- Book/CD 11.1%
- Errand or service 9.1%
- Clothing 8.8%
- Lleisure 6.6%
- Window-shopping 5.3%
- Others 2.8%
- Home electric 2.7%
- Gift 2.3%
- Eating or drinking 2.0%
- Fabric 1.8%
- Toys 1.5%
- Medicine 1.5%
- Shoes /handbag 1.2%
- Sports appliances 0.8%
- Cosmetics 0.7%
- Bedding 0.7%
- Jewelry 0.6%
- Computer/accessory 0.5%

**Figure 4.1 : Percentage of number of visits to the CCCD
by purposes (N＝2969)**

what amount of variety of purposes they accommodate at their shopping places.

To do this, first we calculated the distribution of purposes over all the visits. The result is shown in Figure 4.1. We see from the figure that the purpose to buy food receives the highest percentage, the next is the household utensils, and books/CD and clothing follow. There are 815 visits (27.5%) for the purpose of buying food, 375 visits (12.6%) for buying household utensils and 330 visits (11.1%), 260 visits (8.8%) for buying Book-CDs and clothing.

Now in Figure 4.2, we show the result of which shopping node consumers choose as a destination for each purpose. For instance, as to the purpose to buy food, Hang Be Market is most likely to be chosen as a destination by consumers as it is attracting 257 visits (31.6%) from all of 814 visits for the purpose of buying food. From the figure we see that the competitive destinations for buying food at the CCCD of Hanoi are Hang Dao-Ngang-Buom Street (22.3%), Dong Xuan Market (17.0%), and Supermarket Intimex (16.2%). Also known is that the dominant destination for buying books or CDs is Trang Tien bookshop as it is attracting 72.4% from all the visits for the purpose of buying books or CDs.

Now we turn our attention to shopping nodes. For a given shopping node, we wish to characterize the trait of each shopping node by investigating what kinds of purposes each shopping node accommodates. To do this, we calculated the distribution of purposes for each shopping node. To elucidate the results of our analysis, we classify these shopping nodes into three classes : shopping street, traditional market, and modern format (department store & supermarket). The result is shown in Figure 4.3.

As apparent from Figure 4.3, almost all of shopping streets are specialized into one or few purposes. To take up Hang Khoai Street as an example, all the visits to the street are for the purpose of buying household utensils. Likewise, Hang Dieu Street, Hang Ma Street, Lan Ong Street, and Hang Dau Street clearly are specialized into a single purpose of bedding, toys, traditional medicine, and shoes/ bags respectively. As for traditional markets, purposes of visits become a little bit diversified than shopping streets. Meanwhile, purposes of visits to new formats such as supermarkets and department stores are most diversified among three classes of shopping nodes.

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Figure 4.2：Percentage of number of visits to shopping nodes by purposes
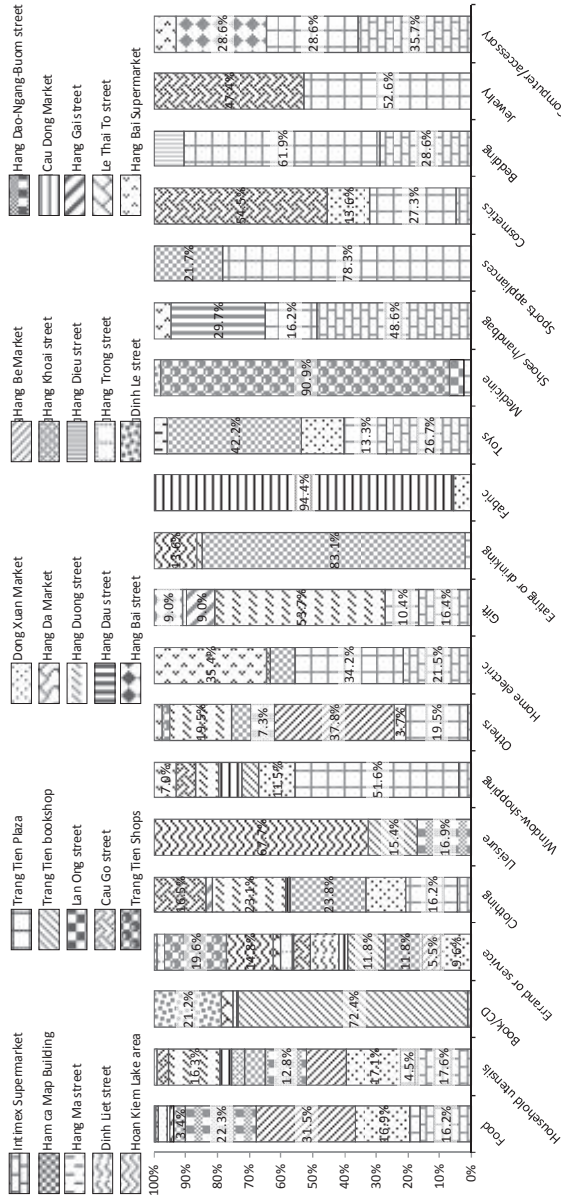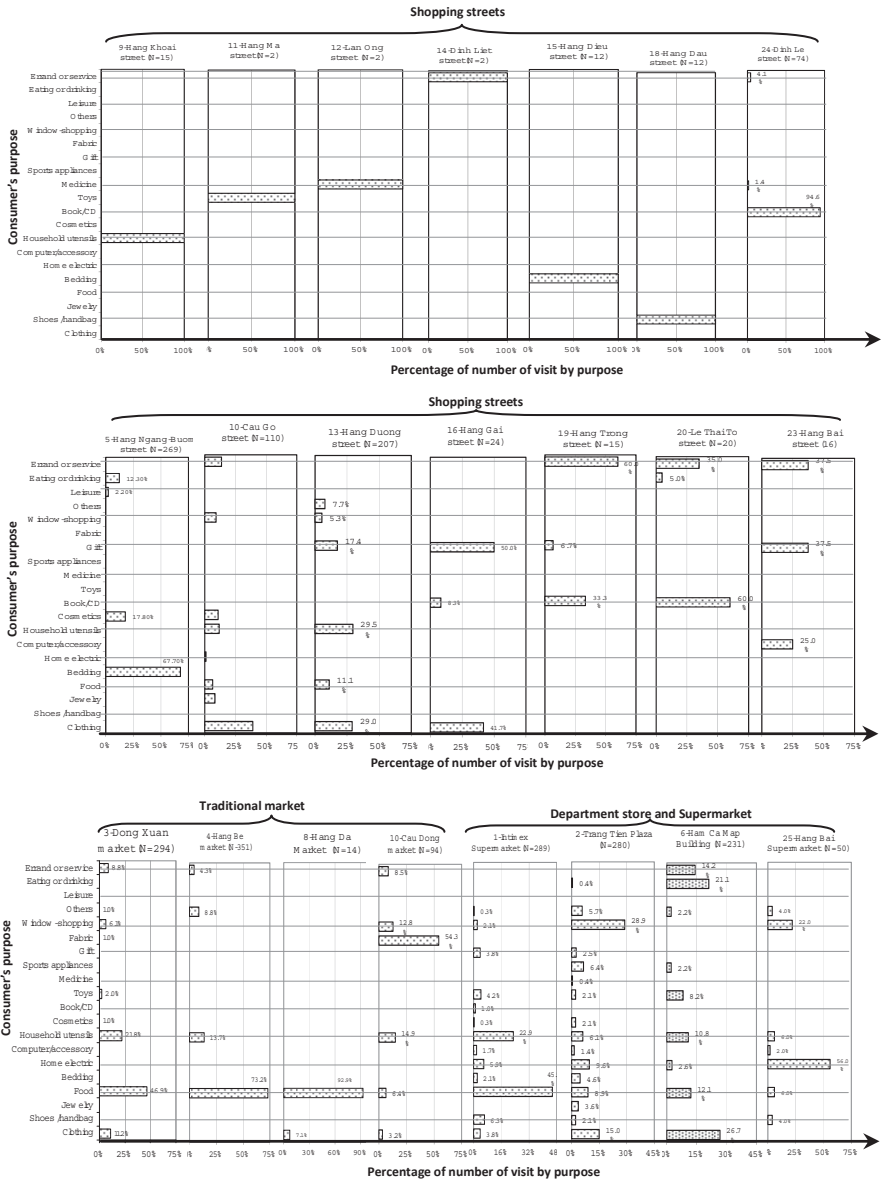
Figure 4.3 : Characterizing shopping nodes by variety of consumer's purposes

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Table 4.1 : Expenditure at each shopping node per visit (Vnd)

No.	Shopping node	N	Mean of expense	Std. Deviation	Min.	Max.
1	Intimex Supermarket	283	136,728	527,773	3,000	6,506,000
2	Trang Tien Plaza	196	190,959	365,465	5,000	4,105,000
3	Dong Xuan Market	276	55,254	53,635	5,000	402,000
4	Hang Be Market	351	37,162	29,846	2,000	204,000
5	Hang Dao-Ngang-Buom streets	238	64,063	70,160	0	506,000
6	Ham ca map Buiding	231	50,212	62,218	0	581,000
7	Trang tien book shop	175	39,320	34,170	2,000	209,000
8	Hang Da Market	14	41,429	9,693	25,000	50,000
9	Hang Khoai street	15	58,733	22,212	21,000	95,000
10	Cau Dong Market	82	77,939	82,343	2,000	542,000
11	Hang Ma street	2	15,000	5,657	11,000	19,000
12	Lan Ong Street	2	123,500	3,536	121,000	126,000
13	Hang Duong street	196	51,811	45,389	0	326,000
14	Dinh Liet street	2	82,000	32,527	59,000	105,000
15	Hang Dieu street	12	123,833	151,458	11,000	516,000
16	Hang Gai street	24	18,375	15,316	5,000	85,000
17	CauGo Street	100	43,060	64,308	4,000	625,000
18	Hang Dau Street	12	90,083	36,183	26,000	145,000
19	Hang Trong street	15	29,933	25,955	8,000	116,000
20	Le Thai To street	20	26,000	25,171	5,000	109,000
21	Hoan Kiem Lake area	43	13,977	15,626	5,000	69,000
22	Trang Tien are	62	19,081	16,607	2,000	59,000
23	Hang Bai street	16	109,750	146,165	15,000	562,000
24	Dinh Le street	53	43,698	34,245	5,000	159,000
25	Hang Bai Supermarket	35	101,286	104,293	19,000	526,000

4.2. By expenditure of consumers

In this section, we look at shopping nodes from the aspect of how much consumers spend at each shopping node. The result is shown in Table 4.1. As expected, consumers spend the largest average expenditure per visit, 190,959 (Vnd) at Trang Tien Plaza, the sole department store at the CCCD of Hanoi. The largest average expenditure per visit is at Intimex Supermarket, which amounts to 136,728 (Vnd). These two shopping nodes belong to the modern format of shop categories. The other supermarket, Hang Bai Supermarket, also shows the higher average expenditure per visit, 101,286 (Vnd). From these we know that the modern shop categories such as supermarket and department store have larger

average expenses per visit than other shop categories. It should be noted that there are some shopping streets that show their average expenditures more than 100,000 (Vnd).   They are Lan Ong Street, Hang Gai Street, and Hang Bai Street. They are specialized in Medicine, Gift, and Computer, respectively.   While there are few shopping streets with higher average expenditures per visit, shopping nodes can be characterized by the amount of large average expenditures to be classified into two classes, modern format and traditional shopping streets/markets, which show large and low average expenditures per visit respectively.

5. Characterizing shopping nodes from consumer shop-around behaviors

5.1. How many visits each shopping node attracts?

In this section, we analyze consumer shop-around behaviors. For the purpose, we decompose our record of shop-around behavior, i.e., trip chain data into unlinked OD (Origin-Destination) pairs. For instance, if we decompose the record of H → A → B → C → H into four OD pairs, i.e., (H, A), (A, B), (B, C), and (C, H), we can classify these four pairs or four visits into three groups, that is, an entry visit of (H, A), two shop-around visits of (A, B) and (B, C), and a return-home visit of (C, H).   If we ignore return-home visits, the number of OD pairs equals the number of visits to shopping nodes. Therefore we can decompose total visits to each shopping node into two kinds of visits : The first one is "entry visits" to each shopping node. In other words, they are the visits that consumers give to the shopping node when they come to the shopping node directly from their home. On the other hand, the second one is "shop-around visits" to each shopping node that consumers give to the shopping node when they come to the shopping node either from other shopping nodes or from the same shopping node.

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Table 5.1 : The number of visits to shopping nodes

No.	Code	Shopping Nodes	Entry visit (A)		Shop-around visit (B= b1+b2)				Total (C+A)		Dependent rate of shop-around effect (RE)%	
					Shop-around (b1)	Sojourn (b2)	B=b1+b2					
			Freq.	Percent	Freq.	Freq.	Freq.	Percent	Freq.	Percent	B/A	B/C
Shopping streets												
1	5	Hang Dao-Ngang-Buom streets	91	9.97	57	121	178	8.66	269	9.06	195.60	66.17
2	9	Hang Khoai street	7	0.77	8	0	8	0.39	15	0.51	114.29	53.33
3	11	Hang Ma street	2	0.22	0	0	0	0.00	2	0.07	0.00	0.00
4	12	Lan Ong Street	1	0.11	1	0	1	0.05	2	0.07	100.00	50.00
5	13	Hang Duong street	76	8.32	66	65	131	6.37	207	6.97	172.37	63.29
6	14	Dinh Liet street	2	0.22	0	0	0	0.00	2	0.07	0.00	0.00
7	15	Hang Dieu street	0	0.00	12	0	12	0.58	12	0.40	-	100.00
8	16	Hang Gai street	9	0.99	15	0	15	0.73	24	0.81	166.67	62.50
9	17	CauGo Street	45	4.93	51	14	65	3.16	110	3.70	144.44	59.09
10	18	Hang Dau Street	5	0.55	7	0	7	0.34	12	0.40	140.00	58.33
11	19	Hang Trong street	6	0.66	9	0	9	0.44	15	0.51	150.00	60.00
12	20	Le Thai To street	14	1.53	3	3	6	0.29	20	0.67	42.86	30.00
13	23	Hang Bai street	8	0.88	8	0	8	0.39	16	0.54	100.00	50.00
14	24	Dinh Le street	26	2.85	42	6	48	2.33	74	2.49	184.62	64.86
Shopping places												
15	1	Intimex Supermarket	69	7.56	62	158	220	10.70	289	9.73	318.84	76.12
16	2	Trang Tien Plaza	96	10.51	48	136	184	8.95	280	9.43	191.67	65.71
17	3	Dong Xuan Market	60	6.57	73	161	234	11.38	294	9.90	390.00	79.59
18	4	Hang Be Market	91	9.97	68	192	260	12.65	351	11.82	285.71	74.07
19	6	Ham ca map Buiding	81	8.87	54	96	150	7.30	231	7.78	185.19	64.94
20	7	Trang tien book shop	96	10.51	103	110	213	10.36	309	10.41	221.88	68.93
21	10	Cau Dong Market	24	2.63	50	20	70	3.40	94	3.17	291.67	74.47
22	21	Hoan Kiem Lake area	56	6.13	113	13	126	6.13	182	6.13	225.00	69.23
23	22	Trang Tien are	15	1.64	74	6	80	3.89	95	3.20	533.33	84.21
24	25	Hang Bai Supermarket	23	2.52	4	23	27	1.31	50	1.68	117.39	54.00
25	8	Hang Da Market	10	1.10	4	0	4	0.19	14	0.47	40.00	28.57
		Total	913	100.00	932	1,124	2,056	100.00	2,969	100.00	225.19	69.25

The total arrivals of customers to each shopping node are by definition the sum of entry and shop-around visits to the shopping node. The result is shown in Table 5.1. The table indicates that Hang Be Market, Trang Tien bookshop, Dong Xuan Market and Trang Tien Plaza are attracting more total visits than any other shopping nodes. Here, we found that shopping places where a variety of merchandises is sold are attracting more consumers. Moreover, as seen from Hang Duong, Hang Dao-Ngang-Buom, and Cau Go Streets, even among the

shopping streets, those shopping streets where multiple items are sold also are likely to attract more consumers than other shopping streets.

5.2. Clustering shopping nodes by consumer shop-around movements in the CCCD of Hanoi

Following the standard method, we can decompose shop-around routes or trip chains into unlinked OD pairs and calculate the table of OD flows from data obtained from the survey conducted. We call this table of OD flows as the frequency table of shop-around movements among shopping nodes. The obtained frequency table of shop-around movements is shown as Table 5.2.

We consider that every shopping node is related to other shopping nodes through consumer shop-around behaviors. We regard the relationships among shopping nodes reflected through consumer shop-around behaviors as the retail structure of CCCD studied. Thus Table 5.2 is thought of as representing the particular retail structure of the CCCD of Hanoi.

From Table 5.2 and Figure 2.2 that shows the locations of shopping nodes, we know that consumers in Hanoi are moving in the narrow range in a way that when they stop at one shopping node, they move mostly to other near shopping nodes. Dong Xuan Market area, Hang Be Market area, Intimex Supermarket area and Trang Tien area can be seen as such ones where consumers move around closely among each shopping node within the area.

To clarify the matter observed above, we apply the cluster analysis to classify shopping nodes into similar groups strongly connected by consumer shop-around movements. To do this, first we must define the distance matrix (denoted by D) for the frequency table of shop-around movements (denoted by F). We define the distance matrix for Table 5.2 as follows :

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Table 5.2 : Shop-around movements of consumers in the CCCD of Hanoi

| To → / From ↓	Zone	Code	13	9	3	10	5	14	11	12	18	16	17	6	4	15	19	20	1	21	24	22	7	23	2	25	8	H	Sum
Hang Duong street	Zone (1)	13	65	8	16	2	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	60	207
Hang Khoai street		9	0	0	8	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
Dong Xuan Market		3	4	0	161	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88	294
Cau Dong Market		10	0	0	33	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	94
Hang Dao-Ngang-Buom streets		5	53	0	14	0	121	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	75	269
Hang Dieu street		14	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Hang Ma street		11	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Lan Ong street		12	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Hang Dau street		18	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	12
Dinh Liet street	Zone (2)	16	0	0	0	0	0	0	0	0	0	0	7	2	1	0	0	0	0	0	0	0	0	0	0	0	0	14	24
Cau Go street		17	0	0	0	0	0	0	0	0	0	3	14	31	16	0	0	0	0	16	0	0	0	0	0	0	0	30	110
Ham ca Map Building		6	0	0	0	0	0	0	0	0	0	12	9	96	29	0	0	0	0	16	0	0	0	0	0	0	0	69	231
Hang Be Market		4	0	0	0	0	0	0	0	0	0	0	31	17	192	12	0	0	0	2	0	0	0	0	0	0	0	97	351
Hang Gai street		15	5	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Hang Trong street	Zone (3)	19	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	3	0	0	0	0	0	0	0	0	15
Le Thai To street		20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	13	1	0	0	0	0	0	0	0	3	20
Intimex Supermarket		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	158	39	1	1	0	0	0	0	0	84	289
Hoan Kiem Lake area		21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	13	9	2	12	0	8	0	0	105	182
Dinh Le street	Zone (4)	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	9	6	1	32	0	1	0	0	19	74
Trang Tien Shops		22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54	0	0	0	0	41	95
Trang Tien bookshop		7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	27	13	9	110	7	20	27	0	78	309
Hang Bai street		23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	9	0	0	6	16
Trang Tien Plaza		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	20	14	9	136	0	0	81	280
Hang Bai Supermarket		25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	14	12	0	0	13	50
Hang Da Market		8	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	2	14
Entry visits	H	26	76	7	60	24	91	2	2	2	5	9	45	81	91	0	6	14	69	56	26	74	96	16	96	23	10	26	913
Total			207	15	294	94	269	2	2	2	12	24	110	231	351	12	15	20	289	182	74	95	309	16	280	50	14		913

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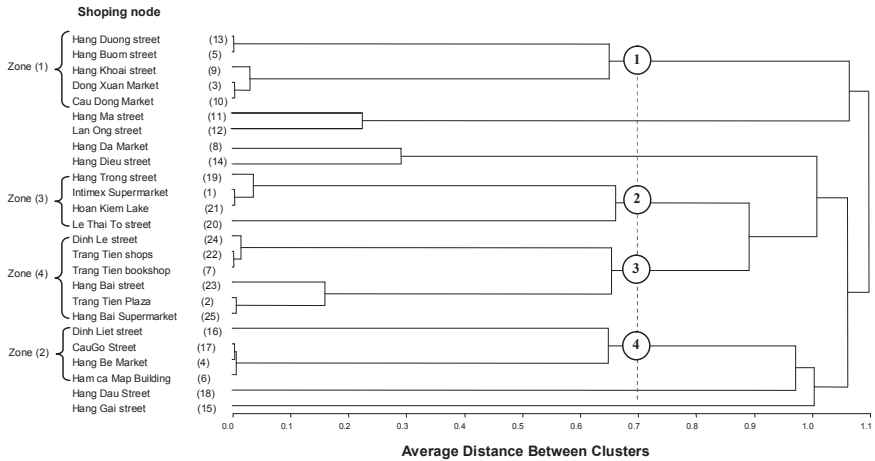
Figure 5.1 : Tree diagram of cluster versus average distance

$$D = \begin{cases} d_{ij} = \dfrac{1}{f_{ij}+f_{ji}} & \text{if } (f_{ij}+f_{ji}) \neq 0 \text{ and } i \neq j\,; \\ d_{ij} = \alpha & \text{if } (f_{ij}+f_{ji}) = 0 \text{ and } i \neq j\,; \\ d_{ij} = 0 & \text{if } i = j. \end{cases} \qquad (5.1)$$

The matrix F is an n by n matrix of Table 5.2 where f_{ij} represents the frequency of shop-around movements from shopping node i to shopping node j. The matrix D is an n by n matrix whose (i, j) element d_{ij} represents a distance between shopping node i and shopping node j. By definition, α becomes infinity but here we set α equal to 5.

With these, we applied the cluster analysis employing the average linkage method. From the analysis, we extracted four groups of Zone (1) to Zone (4) by average distance of 0.7 as shown in Figure 5.1. From the result, some interesting features of extracted groups are known.

Take a look at Zone (1) for example. While shopping nodes of Hang Duong Street, Hang Dao-Ngang-Buom Street, Hang Khoai Street, Dong Xuan Market and

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Cau Dong Market contained in Zone (1) are closely linked together by consumer's shop-around movements, we see that Dong Xuan Market and Cau Dong Market have a particular strong relationship with each other since their average distance is around 0.03. Now take a look at Figure 2.2. From the figure, we know that these five shopping nodes are located very close with each other. In particular, two markets of Dong Xuan Market and Cau Dong Market are adjoining. Thus we might interpret the functional development of Zone (1) as follows. First, there has been formed a core attracting shopping node, Dong Xuan Market, which plays a key role to attract many customers as seen from Table 5.1. Then the market has induced the formation of derivative shopping streets near there. In a similar way, we can analyze the other zones of Zone (2), Zone (3), and Zone (4). To sum up, the following becomes apparent. First, the frequency of consumer shop-around movements among shopping nodes in a short distance is much higher than that within a far distance. Second, in each extracted zone there is at least one core shopping node that plays a key role to pull in many visitors and belongs to the category of traditional market or modern format. In Zone (1), this node is Dong Xuan Market, and those in Zone (2), Zone (3) and Zone (4) are Hang Be Market, Intimex Supermarket, and Trang Tien Plaza respectively.

6. Conclusion

In this study, we have carried out a fundamental analysis of consumer shop-around behaviors at CCCD of Hanoi, Vietnam and explored the retail structure of the CCCD viewing from its reflection on consumer shop-around behaviors. We clarified that the CCCD of Hanoi is composed of many specialized shopping streets selling one or two items and shopping facilities that accommodate a wide

variety of purposes or commodities. The latter usually takes a retail format of traditional markets or a modern format of supermarket and department store. The amount of expenditure is larger in a modern format of supermarket and department store. The number of visitors is large in the shopping nodes accommodating a wide variety of purposes and commodities.

While this research is confined to describe and characterize the current state of retail structure of the CCCD of Hanoi, it would become more interesting if we would conduct comparative studies with other Asian mega cities and if we would carry out some policy oriented research topics such as shopping behaviors and modal choices. These issues should be explored further.

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