Transformation of Space Behavior Relation

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A Case Study of Shopping Centers in Istanbul

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Abstract
This study intends to analyze the structure of space and its relationship with the behaviour patterns in society. Its main focus is shopping centers where space-behaviour relation manifests itself in complex ways. Through a comparative investigation of the conceptual topology and space structure of major shopping centers in Turkey, the paper aims to observe behavioural patterns regarding space and derive insights about new conceptualizations of the relation between physical space and behaviour. It argues that spatial configuration is likely to divert user behaviour.

The criterium according to which the case studies are selected is the design type of shopping centers. Four cases are determined in that regard: Grand Bazaar, Galleria, Profilo and Cevahir shopping centers. In the fieldwork, space syntax is employed as a useful and promising methodology to analyze the physical space structure. The analysis exposes the relationship between density and people, the choice of route by shopping center visitors, their varying inclination for wayfinding. Recent data which are collected in 2007 are used to question to what extent one can evaluate the success of shopping centers with respect to their typologies.

The findings of the study does also generate important clues about the spatial configuration patterns and shopping behaviours of Turkish consumers. Its main arguments are underpinned by the general claim that there emerges a shift from traditional to global shopping typology in Turkey.

1. Introduction

This paper is an attempt to apply space-syntax to the analyze the impact of spatial designs on human behaviour. The case study of shopping centers is a very fertile ground to make such an analysis due to the fact that the design of different shopping centers is heavily influenced by the underlying anticipations of shaping, directing and if possible changing users' behaviours. In other words effecting human behaviour is very much embedded in the ideas and formulations for the architects who design shopping centers.

Different answers to the same question created different typologies of shopping centers in the last two decades in Turkey where modern shopping centers proliferated together with the urban consumers. In the literature four typologies can be classified to examine those different shopping centers: cartesian system, dumb-bell system, branch system and the hybrid system. The paper examines four shopping centers which correspond to each of those typologies and attempts at finding out how in different shopping centers the relationship between space and user behaviour is shaped. The first part of the paper makes a closer inquiry into the features of those typologies and describes briefly Grand Bazaar (Kapalı Çarsı), Galleria, Profilo and Cevahir shopping centers, all located in the city of Istanbul. The second part is an application of space syntax analysis to those centers, in order to reveal the correlations between different variables such as user density,

shopping action and real integration values. A final comparative summary reaches conclusions about the successes and failures of the design decisions which were made by the architects of those buildings in a way to derive insights about the role specific spatial configurations play to influence user behaviour.

2. Typologies of the shopping centers and methodology

Four different typologies can be identified in shopping centers: Shopping centers with a cartesian system; shopping centers with a dumb-bell system, shopping centers with a branch system, hybrid shopping centers combining the elements of the other systems.

First of all, the cartesian system has a grid network. It is constituted of one or more arteries (depending on the location of entry and exits) and the secondary streets directly or indirectly related to those arteries. The rythmic repetition of those streets has a special significance. In line with this rythm, small places are formed in certain areas of the shopping center. Secondly, the dumb-bell system is based on the creation of two or more attractive spaces. Those spaces help the shops in the circulation streets to be influenced by those attractive movements. In this system the main design concept is the choice of axis. Usually there are squares at both sides of an axis. There is also an entry and department stores which look like a square. The secondary streets exist as well but those streets are rather made for the entry and exit, loos and emergency exits. In those areas the shops provide the necessary services needed by the larger stores. Thirdly the branch system is based on the metaphor of a tree with branches. The tree refers to the main circulation axis. The circulation units are considered as the branches of this axis. At the intersection points of the main axis and the streets there are some squares. Finally, the hybrid system consists of different characteristics which belong to those previous systems with respect to the location of squares and streets. Whereas the main arteries can be parallel to each other, squares can be located at the end of the streets or at the intersection points of the streets.

Those typologies provide a good starting point for the research to analyze the effect of the design ideas and principles on the formation of shopping centers. The analysis will investigate whether there is any relation between the time of shopping and the shopping behaviour. The density of shopping action changes according to design types and their features. The main variables important for the analysis are determined as the main artery, secondary streets and the square formation.

Four shopping centres in the city of Istanbul, which correspond to the four typologies are selected for the analysis: Grand Bazaar (the cartesian system), Galleria (dumb-bell system), Profilo (branch system), Cevahir (hybrid system). The main criteria of analysis are: design principles, spatial configurations and shopping behaviour. The value of space syntax analysis for this research resides in that circulation axes are determining the design of shopping centers with a number of different units. Since circulation has the ability to give some units a lot of depth, design geometry is also analyzed.

As part of space-syntax analysis, a number of different methodological tools have bee used during the research which constitutes the basis of this paper. The “s-partition” analysis allows to obtain analytical data about spatial structures. In order to establish the relationship between physical data and behavioural structure, one needs to examine the behavioural patterns, way finding and density. For such analysis thirty users from different age groups are selected randomly in order to observe way finding. The trajectories those consumers pursue in the shopping centers are determined. Those data are compared with space syntax data in order to find out the effect of design structure on the axes of the circulation choice. Moreover, in order to examine the relationship between plans of shopping centers with density, the planimetric schemes are divided into regions equivalent in terms of surface area. The observations of consumers in those regions during 20 minutes during the time scales selected in the morning, midday and the evening provide the necessary data regarding density. Thanks to the space syntax analysis, the extent of the integration of those regions is determined and thus the relationship between density difference and design structure is found out.

3. Case studies

Grand Bazaar was established in the form of a Big Bedesten and Sandal Bedesten in the 15th century for the first time and it was transformed into a big closed shopping center in the ninteenth century with a renovation project. It occupies a space of 310.000 square meters in the Eminonü district of Istanbul and includes the internal antique market, big commercial buildings, external antique market and a number of streets. The region is between Mahmutpasa, Beyazıt, Nuruosmaniye and Süleymaniye Mosque, in the middle of the old commercial district. The product range sold in the Bazaar is definite: jewellry, carpets, silver, leather, gifts, antique, clothing and copper products. According to the different seasons, the number of visitors is between 250.000 and 400.000. It appeals to tourists rather than the urban residents who tend to frequent mainly the shopping centers close to their residential areas, offering a wider range of products. The axes which are connected to Süleymaniye Mosque perpendicular to the axis between Nuruosmaniye and Beyazıt constitute the main circulation axes. The region between those axes has a street structure with a grid system in a way to include the antique markets. The Grand Bazaar embodies the cartesian system which does not aim at attracting the users in the main axis to come to the inner secondary axes. Since the shops in different streets are specalized in the sale of different products, they do not compete on the basis of their advantages.

The Galleria Shopping Center which is the first modern shopping center in Istanbul was built in 1988 by the famous Turkish architect Hayati Tabalýoglu. The building got the first winning prize by the International Shopping Centers Council in the same year (The Best Architectural design, The Best Shopping Complex, The Most Detailed Project, the Fastest Construction, the Most Different Center). Galleria is situated in the north west of the Istanbul Ataköy Tourism Center. It is parallel to Sirkeci-Florya sea road. It was geared to support the new residential housing built by Emlak Bankası in Ataköy district and was thought to be accessible to all urban residents. It is located on the main axis which starts from the historical peninsula of Istanbul and goes until the Atatürk Airport. It provides lots of access to many users widely from the city. Yet in most recent years, due to many new shopping centers which were set up in different places in Istanbul, one can observe a decline in the number of users. In Galleria 127 shops exist in an area of 70.000 square meters. On the first lower ground floor there are cafeteriat, buffet, ice skating area, shops; on the second lower ground floor there is a parking garage for 2000 cars. On the first floor there are shops and on the second floor there are a fair hall, a small cinema and seminar rooms. At one side of the main axis one can see the eating and drinking places as well as an ice rink. On the other side of this main axis there is a very big store. Between those two sides there are a series of different shops.

Profilo Shopping Center was 75.000 square meters the first time it was built; today it occupies an area of 110.000 square meters. The architect of the center is Utarit Ýzgi. It was built on the area where old Profilo warehouses existed. Inside the center there are 250 shops, 7 cinema halls, 3 theatre halls, a bowling hall, a large sport center, a parking garage for 1500 cars. The shopping center is located in the Sisli Maslak region in the hinterland of the Büyükdere Avenue. It appeals to the residents in the area and office workers of the big office buildings. The center is open to access from Levent-Sisli axis and from the highway via Bosphorous Bridge. The building was built in two stages: The first one was made up of five floors, the second one four floors and a mezzanine. On the lower ground floor there are a theatre hall, sport center, entertainment center; on the upper flor, eating and drinking areas and cinema halls. Shops and cafes occupy the remaining places. The location of shops with respect to the product range is random. The main entrance is designed in the general circulation area and formulated as an atrium which evolves into the shopping center. The secondary entries are car parking entry and two side entries. The most distinctive feature of Profilo, which makes it different from the other shopping centers is the location of the escalators in the empty space of atrium. The branch system used in the shopping center has an organic structure. The reason for this is the land on which it is built and the adjacent structures used in the environment. The lack of a proper geometrical structure and the lack of complex subsidiary arteries which are distributed from a main artery remind the arcades' structure. However, the users, as contrary to the design idea, tend to use the main axis and vertical circulation rather than the secondary arteries.

Cevahir Shopping Center is the applied part of a project designed by Minoru Yamasaki as a result of an architectural competition. Originally it was designed as a triple skyscraper block. Today it is only used as a shopping center. The center is located in the axis of Sisli-Maslak where most of the office buildings in Istanbul are located and the commercial and service sector is emerging. The accessiblity of the center to the Anatolian side of the city is made via one single axis. There is direct access to the center via Levent-Taksim underground. It is possible to see diverse shoppers from different parts of the city. The main area of the shopping centers is 358.000 square meters and there exist 320 shops in total. The area covered by those shops is 107.000 square meters. The main entrance door which looks over the main street is located within the main center of the building. The big shops which are on both sides of the door constitute the starting point of the main axis at the end of which there is a cinema made up of two floors and an entertainment area. The secondary axes which are parallel to the main axis are connected to the main circulation area via streets which intersect in perpendicular and there are two small squares on those axes. On secondary axes it is possible to observe a number of shops from a given range of products. The idea behind it is to preserve the product-based shopping action in the traditional Turkish shopping behaviour. On the lower ground floor there are supermarkets and big retail shops, whereas on the two upper floors there are eating and drinking areas. The large corridors, the deep atrium and the floor height of 7 meters show how much the dimensions used in the center are much larger than other centers. Those vey large measures have a direct effect on the traditional shopping behaviours.

4. The findings of space syntax analysis

The programme Spatialist designed by the Georgia Technical University helps to obtain graphical and mathematical data which give the real integration value (RI). The integration values are obtained thanks to the arithmetical average of the selected points in those four shopping centers and the surface partition made by space syntax. The graphical visions belonging to the shopping centers typologies represent the changes of the real integration values according to the partition of surfaces. The surface parts which are represented as red in the plans are examined. The blue ones are the regions where the integration value is the lowest. The whole analysis is ranged following the color scale changes from blue to red.

In the Grand Bazaar (Figure 1), red space is the center whereas the blue color belongs to the sides of the area. The red part which spreads from the main center to the surroundings is the place where real integration is the highest. The surroundings of the main center are made up of, by order, red, pink, light blue and blue colored regions. The symmetrical Grand Bazaar exhibits a pattern of balanced density. The distribution from the center to the sides is of equal proportion.

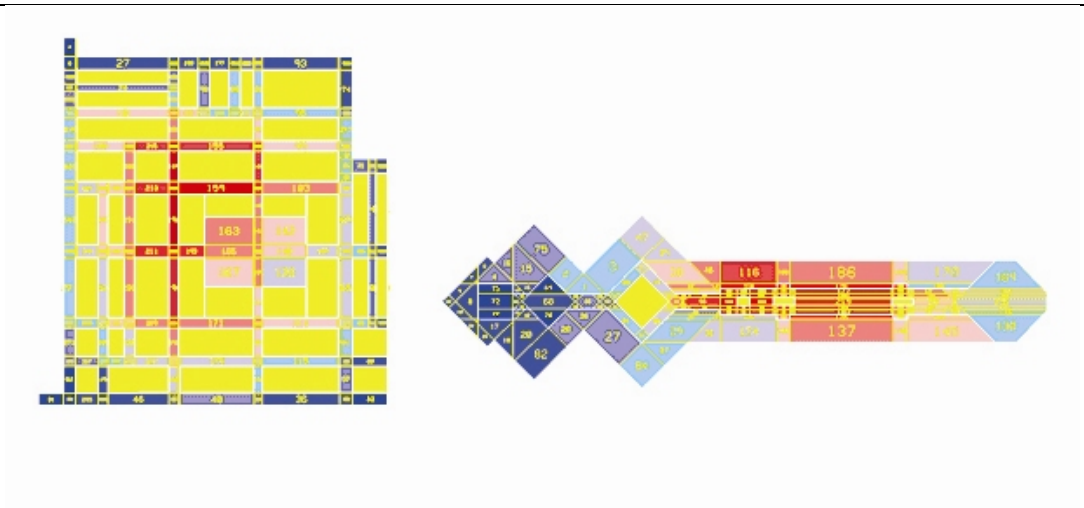

Figure 1
S-partition graphic in grand bazaar and galleria

In Galleria where there are attraction centers on both sides, the real integration is the lowest on those two sides. The highest integration value can be observed in the main circulation axis. This situation suggests that the area between the attraction points provide the necessary density. The high integration value in the main axis and the shopping areas point out to a well working design strategy.

In Profilo (Figure 2) the real integration is low in the entry, high in the first atrium area, similar to other examples. However as opposed to other models, there are more volumes whose integration value is low and the areas with intermediary values do not exist. The system of the shoppng center is not in equilibrium. Most of the shops, when considered from the relationship between space and shopping center relation, are not in an advantageous position.

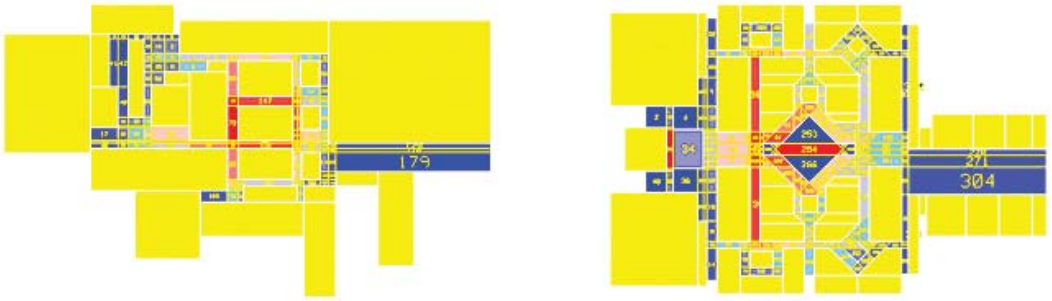

Figure 2
S-partition graphic in profilo and cevahir

Finally in Cevahir, the real integration of the circulation area is the highest. The integration value of the main center units is similar to the main artery. Secondary streets and squares far from the center have low integration values. Therefore there are advantageous positions for some shops.
User and shopping action density in the shopping centers

The density analysis emerges from the observations made during 11-12 am (d1), 3-4 pm (d2) and 8-9 pm (d3). For 20 minutes in each time period in limited spaces with four other people, users who entered the shops and left it with shopping bags were counted. The aim of those observations was, first of all, to find out the correlation between the physical space in the measured unit and the density of the users in that unit. Secondly, the target was to obain the density of shopping in the units analyzed in a way to compare that data with the s-partition (surface partition value). The data obtained were transferred into a table. In that table the real integration value, the average of this value for each unit analyzed, user density value and shopping action density value appear as variables.

In the cartesian system, it is worth noting that, even though antique markets are conceived as squares on the plan, this characteristic disappeared as a result of the partition which was made much later. Moerover the user and shopping action density analysis were not made not between 8 and 9 pm since the Grand Bazaar closed at 7 pm. In this cartesian system, the user density (formed of the users who do shopping and the ones who use the circulation axis) is the highest on the circulation axis which is connected to one of the main entrances. The density of the secondary streets which are connected to the main entrance is found to be high (Table 1). This can be ascribed do to the location of the shopping center and the expected density of the regions with entry and exit. However the density of the other seconadry streets which are close to the external membrane and of the intermediary axes is lowest. The intensity ratios are higher in narrow streets than medium size streets.

GRAND BAZAAR					
Unit	Integration value	User density			Shopping action density
	RI	d1	d2	d3	n
1	9,757	889	1755	-	20
2	13,045	102	524	-	40
3	13,184	243	639	-	50
4	13,393	176	512	-	40
5	12,951	302	699	-	30
6	9,178	124	442	-	10
7	9,530	726	1533	-	0
8	12,982	542	737	-	10
9	12,643	576	892	-	10
10	14,055	413	578	-	20
11	11,555	212	422	-	20
12	9,490	108	313	-	30
13	10,859	802	1216	-	10
14	13,706	412	608	-	30
15	13,861	338	712	-	20
16	10,062	401	412	-	0
17	10,974	756	1035	-	10
18	15,806	112	632	-	20
19	14,761	325	471	-	30
20	9,915	214	152	-	20
total	241,707	7773	14284		420

Table 1
Grand bazaar user and shopping action density analysis

GALLERİA					
Unit	Integration Value	User Density			Shopping Action Density
	Ri	d1	d2	d3	n
1	9,687	72	243	312	40
2	11,240	154	554	623	30
3	11,677	162	308	417	30
4	12,037	201	332	526	40
5	9,911	204	425	438	20
6	7,131	192	452	441	10
7	5,662	82	260	322	0
8	5,378	34	211	299	0
total	72,723	1101	2785	3378	170

Table 2
Galleria user and shopping action density analysis

In Galleria, the main artery is divided into two equal parts. The regions which constitute the dumb bell system are divided into two. The ice rink and eating and drinking areas which exhibit the features of a square and the big stores are the main elements of this region. Four units whose visibility distance close to each other are obtained from this exercise. Those units are divided into eight parts according to the results of the space syntax analysis. In the midday and the afternoon, the intensity is high in those areas where people are busy with shopping. During the evening hours, the density increases in the eating and drinking areas. From a general point of view, the density ratio is high along the main circulation axis in all time periods, but much higher in the main artery's center. In other areas, density values are close to each other. When one looks at the density percentages, the most user density can be observed in the main square (Table 2). The density of those areas which is even higher than the attraction centers is high in all time slices, due to the concentration of units such as ice rink and eating, drinking and shopping areas in this region.

PROFİLO AVM					
Unit	Integration Value	User Density			Shopping Action Density
	Ri	d1	d2	d3	n
1	6,124	23	102	160	0
2	7,672	27	89	155	0
3	10,851	31	132	120	30
4	9,608	57	194	227	20
5	7,497	21	82	120	20
6	6,791	20	83	188	10
7	7,821	37	165	211	10
8	11,838	52	172	248	30
9	11,023	123	212	360	40
10	8,299	115	111	128	10
11	10,851	12	36	24	0
12	9,536	89	201	302	20
13	7,038	274	545	407	60
14	7,262	102	323	121	0
15	9,372	78	292	184	20
16	8,564	32	44	62	10
17	7,115	12	24	58	0
18	7,140	3	10	7	20
19	10,747	112	186	184	40
20	9,457	23	28	27	20
21	9,354	112	143	164	20
22	11,812	134	232	288	50
23	11,593	31	48	92	40
24	9,728	12	26	32	10
25	7,281	356	902	844	70
26	9,405	656	1024	983	20
27	9,005	102	134	120	20
28	8,513	17	82	56	70
29	6,853	898	1563	1328	80
total	258,150	3561	7185	7200	740

Table 3

Profilo user and shopping action density analysis

Profilo's branch system is divided into a main circulation axis and secondary streets. The entrance part and the main circulation units are the areas with higher intensity values. The other streets which are connected to those units are the areas with secondary intensity. The regions with less intensity are the ones which are the farthest to the main entrance. In a sense the main entrance determines density (Table 3). The shops in that area are the most advantageous ones, given that the farther one is from the entrance, the fewer users are observed and there does not exist a balanced distribution of density in the region. The most intense times are midday and afternoon, whereas in the evening, the eating and drinking areas exhibit more density, showing that office workers in the neighbourhood frequent the shopping center after work.

CEVAHİR					
Unit	Integration Value	User Density			Shopping Action Density
	Ri	d1	d2	d3	N
1	9,681	63	143	217	20
2	9,484	432	632	845	10
3	9,467	543	840	976	10
4	9,636	72	132	234	20
5	11,067	119	212	342	40
6	13,971	56	172	321	30
7	14,344	341	461	543	10
8	14,28	564	865	1010	20
9	14,174	32	80	162	10
10	11,071	11	28	56	20
11	11,072	56	104	202	40
12	10,95	17	40	75	50
13	10,599	31	68	101	30
14	11,644	52	52	104	20
15	11,525	243	341	546	10
16	11,483	447	620	887	20
17	11,549	56	80	203	30
18	10,728	62	103	194	30
19	9,85	31	44	62	20
20	9,797	67	96	102	30
total	226,372	3295	5113	7182	470

Table 4
Cevahir user and shopping action density analysis

The partition shows a different characteristic in the hybrid design system of Cevahir shopping center, because the scale is really big and the circulation axes very large. Moreover, the structure is quite complex, since it exhibits some of the features of the other systems and the division is not made simply on the basis of the plan. Between the main entrance and the final destination point, the main artery which is the main circulation of the shopping center is divided into three units whose visibility distance is equal. Those regions are concomitantly divided into two parts. Five secondary streets which are connected to the main artery perpendicularly and secondary streets which are parallel to the main artery constitute other regions. On the secondary streets which are parallel to the main artery, there are four small square formations. In the main entrance area and the main atrium area, the density reaches its highest level. There is no balanced distribution of density and some other parts have quite a low density value, which is not a desirable situation for a shopping center. This indicates an inefficient use of space and a failure of the initial design principle (Table 4).

The real integration values obtained as a result of the analysis depicted above can be seen in Table 5. According to this table, Galleria Shopping Center is a successful case as compared to others, in terms of the design ideas and structure and user density/shopping action correlation. (r=0,601 – average user density (d-av) and real integration (RI) relationship; r=0,456 – shopping action and RI relationship). In commercial terms there exists a strong correlation between user density and shopping action density. In Cevahir Shopping Center there is a positive (but not strong) correlation between design structure and user density (r=0,149 – average user density (d-av) and real integration (RI) relationship; r=-0,157 – shopping action and RI relationship). In that sense the contribution of user density to shopping action is negative. In the Grand Bazaar the design had no effect on user density or shopping action density (r= 0,046 – average user density (d-av) and real integration (RI) relationship; r=0,061- shopping action and RI relationship). In Profilo Shopping Center, design and user intenstiy are negatively correlated. However the initial design has a positive effect on the user in terms of increasing shopping action (r=-0,200 – average user density (d-av) and real integration (RI) relationship; r=0,108 shopping action and RI relationship). Despite the negative correlation, user intensity/shopping action density correlation is quite strong (r=0,578 – average user density (d-av) and shopping action relationship).

As a result of all the analyses made for each shopping center the average integration value was found. In Table 5 for the Grand Bazaar and Cevahir shopping center, the integration values are much higher, which shows that design structure was much stronger. Yet, due to other factors the shopping action is not equally strong.

GRAND BAZAAR		
Ri	r=0,009	d1
	r=0,063	d2
	-	d3
	r=0,046	d av
	r=0,061	Shopping action
d av	r=-0,565	Shopping action

GALERİA		
Ri	r=0,686	d1
	r=0,379	d2
	r=0,207	d3
	r=0,601	d av
	r=0,456	Shopping Action
d av	r=0,374	Shopping Action

PROFİLO		
Ri	r=-0,180	d1
	r=-0,231	d2
	r=-0,172	d3
	r=-0,200	d av
	r=0,108	Shopping Action
d av	0,578	Shopping Action

CEVAHİR		
Ri	r=0,138	d1
	r=0,147	d2
	r=0,155	d3
	r=0,149	d av
	r=-0,507	Shopping Action
d av	r=-0,490	Shopping Action

Table 5
Integration value, shopping density and shopping action relation analysis

5. Way finding and shopping action intensity in the shopping centers

Another important component of the analysis was way finding. During 20 minutes the ways pursued by users from the entrance into the shopping centers were followed. The step numbers of users between different units were also observed. In order to measure a general tendency, user selection was random and the time frame was the same as in the previous section. A comparative analysis of time, steps and the number of units was made at the end.

According to Table 6, in the case of Grand Bazaar, according to the large size of the space, the distance per unit and the nuber of units is higher. In the same way, in Cevahir Shopping Center, the number of steps per person is much higher. However the number of units visited is much lower. That can be ascribed to the fact that the space and plan regulations do not work in harmony. Galleria Shopping center, on the other hand, has the lowest total number of steps, but in terms of units visited it has the second highest value. In Profilo Shopping Center, despite the complex plan, the distance made is low and the number of units visited is high.

GRAND BAZAAR			
Person	Time (mn)	Step	Number of shops
	t	a	k
1	20	112	4
2	20	201	0
3	20	232	0
4	20	342	6
5	20	161	1
6	20	221	4
total	120	1269	15
Av.	20	211,5	2,5

GALLERİA			
Person	Time (mn)	Step	Number of shops
	t	A	K
1	20	38	3
2	20	100	3
3	20	46	2
4	20	250	1
5	20	50	1
6	20	142	3
Total	120	626	13
Av.	20	104,33	2,16

PROFİLO			
Person	Time (mn)	Step	Number of shops
	t	a	k
1	20	304	3
2	20	88	1
3	20	98	1
4	20	98	2
5	20	72	1
6	20	52	2
Total	120	712	10
Av.	20	118,67	1,67

CEVAHİR			
Person	Time (mn)	Step	Number of stops
	t	A	K
1	20	164	2
2	20	26	1
3	20	260	1
4	20	327	1
5	20	312	1
6	20	171	2
total	120	1260	8
Av.	20	210	1,33

Table 6
Time/Distance/Unit relation

6. Comparative analysis of the case studies

The relationship between real integration values, user density, the shopping action density and the use of time by users is analyzed by simple regression (R) analysis. The main objective is to find out the relationship between space design and shopping action. The values found out as a result of correlations are within the scale of -1 and +1. -1 is the highest negative relation; +1 is the highest positive relation. 0 value is the neutral relation between the two.

The Grand Bazaar regression analysis suggests that there is a neutral relationship between design and user density, design and shopping action. (r=0,061 - shopping action and real integration (RI) relationship). User density and shopping action relationship reveals a negative correlation (r=-0,289 – average user density (d-av) and RI relationship). The cartesian system shopping center is a system based on goods so there is no real relationship between design and shopping action. Moreover the high number of users does not effect shopping action, because some users use the space as a transit. In terms of design structure, the system has a homogenous structure. The product range shapes the shopping center in line with the logic of traditional shopping centers. This example is based on less the attractions provided by the shops then the shopping based on the need for certain products. So, users do not show any shopping behaviour as a direct response to design. Some use it for shopping, some for transit purposes.

In Galleria Shopping Center there is a very high and positive correlation between the distribution of users in the shopping center and design structure and between shopping action and design structure (r=0,601 – average user density (d-av) and real integration (RI) relationship; r=0,456 - shopping action and RI relationship). As a result of those findings, the effect of the design on leading people to shop more works well. In order to support this argument, the relationship between average user density and shopping action is found to be high (r=0,374). Due to its typology, Galleria Shopping Center was designed with the idea of attracting consumers on the main axis between two attraction centers. The main axis of the dumb bell, which is the core of the system is the most intensively used area according to the space syntax analysis. In this region where shops are concentrated, the users are also concentrated and thus shopping more intensively made. The high positive correlation between the real integration and user density and shopping action demonstrates this point. The big store which constitutes the dumb bell system is designed as a region with high levels of attraction. However, the user density is really low in this area. In that sense, two attraction areas do not have a balanced user density and the functionality targeted in the initial design structure was not fully achieved.

In Profilo Shopping Center, there is a negative correlation between the design structure and user density. This correlation is not that high. But the design structure has an inverse effect on the distribution of density. There is a positive correlation between the design structure and shopping action (r=-0,200 – average user density (d-av) and RI relationship; r=0,108 – shopping action and RI relationship). As a result of those two relations, the productivity of the design seems to work well. This is supported by the positive relationship between user density and shopping action (r=0,578). The inverse relationship between the RI and user density in the branch systems shows that the distribution of user density is not distributed in a balanced way. However in Profilo, on the axis where user density is high, the ratio of shopping action is higher than in other shopping centers. Despite this different and complex structure, the success of design in shaping shopping action is unusual.

The youngest shopping center among the four, Cevahir Shopping Center exhibits a high level of user density (not as high as in Galleria). The level of this relationship is changing according to the different hours in the day. Th correlation between design structure and shopping action is also high (=0,149 – average user density (d-av) and real integration (RI) relationship; r=0,125 – shopping action and RI relationship). The relationship between user density and shopping action is negative and strong (r=-0,490). The relationship here is inverse as compared to other shopping centers. So user denstiy is very high, but the actual shopping is more limited. The design is unable to transform the user intensity into actual action. Therefore it is a failure of the design to lead the users to do more shopping. However, Cevahir shopping center has still certain design advantages as compared to other shopping centers. In the circulation areas, the units of shopping and real integration levels are high. However, the very largeness of the physical space, the high number of external inputs and the fact that distances are long make it dififcult to transform user density into shopping action. Morever the uneven location of shops shows that the center is not effectively used in terms of space and good design ideas were not fully actualized.

7. Concluding remarks

The space syntax analysis allows to make a judgement about which typpology of shopping center is the most successful one in terms of the relationship between design structure and shopping behaviour. A detailed evaluation of four shopping centers suggests that the dumb-bell system is the most successful and efficient one in terms of shaping consumer behaviour. Between attraction points, there is one main artery and the scale is not very large. That is why there is no risk of getting lost. The system is both simple and working well. The translation of user density into shopping action is one of the important features of this typology. Such analysis demonstrates that space syntax methods are useful in factually determining which spatial configurations generate better outcomes.

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