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**ARCHITECTURAL MORPHOLOGY AND USER BEHAVIOR
RELATIONSHIP IN SHOPPING MALLS:****A Comparative Case Study on Forum Shopping Centers in Istanbul through
Syntactic Analysis**

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ABSTRACT

In this study, the impacts of configuration and tenant types on user movement in shopping malls are examined using space syntax techniques focusing on natural movement theory. One of the main statements of space syntax methodology is the “natural movement theory” where human movement is effected by the configuration of space (Hillier et al., 1993). It is also set forth that spatial behavior is dependent upon individual evaluation and relative assessment of spaces (Downs, 1970). In this context, the study is examined as a comparative case study in two frequently visited shopping malls of Istanbul independently but with the same methodology depending on the observation of users and data collection methods. The selected malls have similar approaches in terms of user interfaces, configuration, and the brand distribution that have independent display spaces within the mall. Furthermore, they are built and managed by the same company and have similar architectural and management layouts at different locations of Istanbul. In that sense, how plan configuration and shop types affect users’ behaviors is investigated by space syntax methodology through the awareness of visual perception, shopping behavior, integration of spaces, the order in circulation areas, and the level of interaction between the spaces as well as the people that are visiting these malls. The goal is to examine whether the spatial layout or the content is affecting individuals’ decisions, and what kind of dominant effects they have on user movement at these shopping malls. According to some results in this study, spatial configuration is more dominant on users’ movements where it has a strong syntactic value such as connectivity or integration, however content is dominant where syntactic value is not very strong. The further discussion is how these findings may affect the future of shopping malls in terms of architectural design and spatial configuration in connection with the interior design decisions.

KEYWORDS

Shopping behavior, spatial configuration, integration, shopping mall, movement

1. INTRODUCTION AND THEORY

Shopping malls, in spite of their rapidly emerging existence in the recent decades, have been overspreading expeditiously and become an important part of urban life in Turkey. As well as providing one of the most basic activities like marketing, they are also new centers of social interaction and attraction, serving as public spaces of its kind. Victor Gruen (1976), the architect of the first modern shopping mall, claims that in order to provide a healthy urban social life, it is needed to create public spaces isolated from urban problems where people get in social interaction out of work or house. Likewise, today shopping malls are urban spaces where people come together, socialize and engage in socio-cultural and recreational activities besides many opportunities for shopping needs in a comfortable and safe space. In accordance with the sense of safety and comfort, many environmental factors are under control such as car traffic, security, air conditions, odor, pollution and noise. Hence, their architectural structures are vital because of being a key component of physical environment that have crucial impacts on visitors (White & Sutton, 2001; Erkip, 2003; Fong, 2003; Kurubayashi & Kishimoto, 2009; Kim et al. 2012). One of the foremost aims of shopping malls is attracting people to shops and supporting activity spaces as much as possible and it is expected that architectural design and spatial configuration should also motivate people for spending more time in these spaces, wander around and shop as much as possible. In this context, as Hillier et al. (1993) note in Diagram 1, beyond the relationship between visitor frequency and the configuration of the space in shopping settings, depending on the morphology of convex spaces as a whole, while attractors and movement may be mutually influential, the other two relationships are asymmetrical. The configuration may influence the location of attractors, but the location of attractors cannot influence configuration. Likewise, the configuration may influence movement, but movement cannot influence configuration. If strong correlations are found between movement and both configuration and attractors, the only logically possible lines of influence are from the configuration to both movement and attractors, with the latter two factors influencing each other. In this study, the relationship between visitor frequency and configuration is analyzed in detail; the attractors, namely, the shops or displays, are also considered in this relationship through certain critical semantic contributions within the overall space.

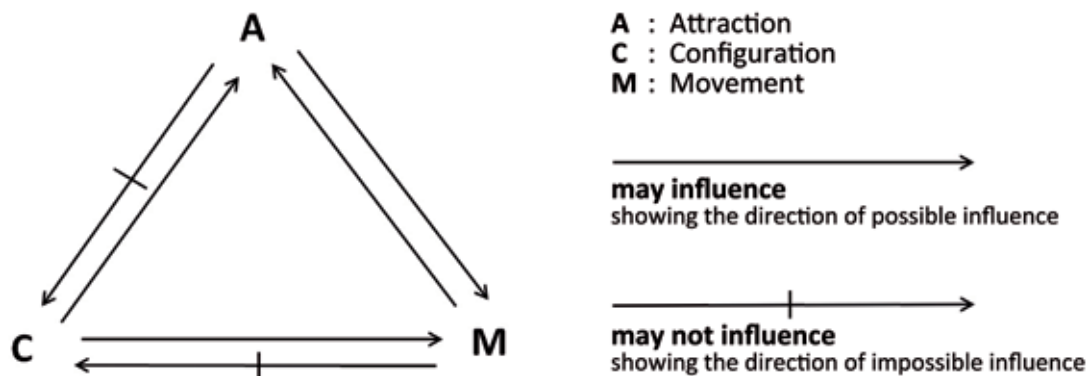


Diagram 1 - Attraction, configuration and movement (Hillier, et. al., 1993).

In regard to these circumstances, there are many researches, but we believe that there is much to do as further studies on spatial configuration and visitor behavior in shopping malls. Further studies are crucial for understanding the cultural differences of users and also differences at architectural approaches as well as management decisions in different malls. In that sense, our study intends to examine shopping behavior in shopping centers, as it is defined as shopping malls in the title of our study, of Istanbul through a comparative case study. The case study has been conducted in Istanbul by comparing two shopping centers, Marmara Forum Shopping Center (Marmara Forum SC) and Forum Istanbul Shopping Center (Forum Istanbul SC), which were built by the same business management. In this study, it is hypothesized that distribution

of shop types and the spatial configuration have significant affects on visitors' frequency and their movement at shopping malls. For this study, syntactic analyses of spatial layout and observations of the users in the selected malls were made in order to make a comparison and examination of the spatial configuration's traces. Distribution of shop types in relation with movement of visitors by using space syntax theory and methodology are also examined. Syntactic measures coming from such analysis of integration, connectivity, circularity, etc. are crucial for the comparison in this study. Through these measures "circularity" was a measure that reflects the relation with the geometry of space and has a tendency to decrease in a structure in which the interconnecting convex spaces among all spaces are tightened, narrowed and concentrated on a single field with a high mean integration. A decrease in the value is an indicator of gradual differentiation throughout the plan of the general averages of the mean 2D geometrical dimensions. Briefly, this value is accepted as an indicator of dimensional tightening of the convex spaces. Circularity value acts inversely with the compactness value. It could be inferred from the circularity value that the differences among the lengths of the plan morphologies in the second dimension (i.e., the increasing differentiation of width and length values in a convex space) begin to increase as this value increases and that the plan center began to shift towards the perimeters as this value increases. Alternatively, the convex spaces with different integration values throughout the plan begin to overlap in a single narrow field with a high integration value and visitors may be forced to use this field as a connection field due to tightening of the interconnecting areas among the convex spaces. The circularity value has the tendency to increase in these interconnecting, tightening spaces. The results coming from circularity should be interpreted and discussed particularly around the "integration" and "connectivity" values since connectivity values reflect the local shallowness or deepness within the configurational system where integration reflects a more global set of values.

In this study, perception and movement related issues should also be grasped in order to understand the morphology of shopping layouts through their syntactic and semantic dimensions. Kuipers et al.'s (2003) study on the cognitive maps of movement of the people describes how visual perception and cognition plays a key role in the processes of navigation, movement, and wayfinding. In relation with the shopping settings, visual perception and accessibility of the spaces also play a significant role in movement and wayfinding. Dalton's (Zimring & Dalton, 2003) approach to decisions of people in terms of visual perception of the space that is similar to Kuipers et al.'s (2003) approach, Zimring & Dalton (2003) was interested in decisions that people head to during their navigation and in route choice decisions that are made at path junctions. "She created an environment in which participants were presented with a variety of different junction types and then noted the sequence of decisions." (Zimring & Dalton, 2003). Dalton (Zimring & Dalton, 2003) found that "Angles that deviated least from a continuous straight heading were preferable to sharp turns.". Another interesting finding was "a strong evidence that participants tended to select routes that approximated a straight line and avoided routes that were particularly convoluted or meandering." (Zimring & Dalton, 2003).

2. DATASETS AND METHODS

Shopping centers have become an important part of urban life by offering a sense of order, safety and comfort through the spaces while matching users' demands for shopping and spending leisure time. Upon these demands, researchers have focused on their spatial dynamics, spatial use and social structure that lead people and also generated by people. Likewise, there are many factors that attract people to a shopping center such as plenty of shopping opportunities, physical conditions, variety of social and entertainment activities, and need for a secure space. All these factors may also affect the use of shopping centers (Goss, 1993; Akinçi, 2013). Besides, there are many factors that affect the preference of users for a visit to a shopping center. According to some studies, preference is connected with travel time and size of the shopping center, where these important factors also increase frequencies of visitors in shopping centers (Shiffman, 1983; Bloch et al. 1994; Salcedo, 2003; Erkip, 2003). In addition to distance, factors like travel time, easy accessibility, being on the way home and so on, people also prefer the shopping mall according to their personal demands (Erkip, 2003; Akinçi, 2013). For instance,

Forum Istanbul SC is a shopping mall, which is on an easy access point with many shopping advantages; however, consumers who live close to Marmara Forum SC are inclined to prefer Marmara Forum SC as the closer shopping center according to these findings. On the other hand, in case of a target product, consumers prefer shopping centers with more distance in order to provide their need as allegedly that a human takes the action after mostly personal impulse or a specific purpose (Penn, 2003; Garip & Ünlü 2009). Preferences inside of shopping centers are as important issue as preferences of shopping centers in urban context. Intervening variables like attractors or product placement in supermarkets partially divert movement flows within buildings (Salier, 2007; Gil et al, 2009; Garip & Ünlü, 2009).

Besides all, recent studies also have focused on spatial use of shopping malls and examined spatial configuration and its impacts on use (Fong, 2003; Erkip, 2003, 2010; Kurubayashi & Kishimoto, 2009; Kim et. al. 2008). Likewise, the theory of space syntax argues that buildings act fundamentally in relation with the movement, how it is generated and controlled (Hillier, 1996; Hillier, et. al., 1993). There are many findings that spatial structure led the movement in space. For example, in terms of syntactic factors, it is found that more integrated spaces were more vivid and haunted by more visitors while more segregated spaces were less crowded (Penn & Sailor, 2010). As well, people tended to center upon the places with high connectivity while low connected places tended to be less used (Nubani & Wineman, 2005). Through this phenomenon, environmental aspects in the context of spatial hierarchy within a building complex or in an exterior environment like a public square or a park influencing the common flows of movement is defined with "Natural Movement Theory" (Hillier et al., 1993; Hillier and Lida, 2005). In this context, we may argue that people move under the effects of environmental aspects, and spatial configuration drives movement flows in building space in accordance with their configurations and spatial order within the spaces. In this context, our study compares the effects of content and physical structure in terms of natural movement theory by observing users in two shopping malls.

2.1 COMPARISON OF LOCATIONS AND ARCHITECTURE OF FORUM ISTANBUL AND MARMARA FORUM SHOPPING CENTERS

Istanbul is a crowded city with lots of outdoor and indoor public spaces such as squares, parks, cultural centers, and theaters where people find opportunities to social interaction and engage in various social, cultural, entertainment activities. Anyhow, shopping centers are still favored by citizens even though having limited indoor area, limited opportunities and limited variety of activities and shopping centers became public spaces that people with any profile come to spend their leisure time and have fun (Erkip, 2003, 2005; Akinci, 2013). The selected shopping centers, Forum Istanbul SC and Marmara Forum SC are also amongst the most visited shopping malls in Istanbul. These two shopping malls are two of 117 shopping centers in this city in different locations and also built and managed by the same company. Therefore it is thought that they are built on common expectations and architectural views basically. Thus, it is found reasonable to examine and compare these shopping malls and get further information about how spatial morphology affects users in shopping centers.

First of them, Forum Istanbul SC, with a total construction area of 495.000 square meters in Bayrampaşa, is the biggest shopping center of Istanbul and one of the biggest shopping center of Turkey, also of Europe. This center hosts nearly 300 national and international brands providing almost any kind of shopping needs; retail, technology, sport brands, jewelry brands, kid stores, food and any goods. Besides that, it also hosts entertainment areas on many different concepts as attractive factors in order to offer a public place inviting visitors without shopping motives. Moreover, it has an easy accessibility for both cars and public transportation, as it is being located at the junction of E5 and TEM highways, and directly connected with the metro lines. Easy accessibility influences the preferences about which shopping mall to go and how much time will be spent in there (Bloch et al. 1994; Saucedo 2003).

Forum Istanbul SC is located at Bayrampaşa neighborhood, which is a new urban area having an expeditious development in recent years. Bayrampaşa has a dynamic economy standing on trade and industry and growing with its high population density and good social, educational

and health services. Similar to atmosphere of Bayrampaşa, the main design idea of Forum Istanbul SC is creating an atmosphere of a vivid city; its interior has an architecture based on a shopping district life with squares and streets along with the general view of vernacular architecture with a combination of various identities. In other words, Forum Istanbul SC gives an outside atmosphere inside the building with secure and controlled spaces within the spatial configuration of the building.

The other shopping center of this comparative study, Marmara Forum SC comprises 135,000 square meters of rental space located in Merter with an access from any point of Istanbul, providing almost any kind of shopping needs same as Forum Istanbul SC, with nearly 300 national and international brands. Marmara Forum SC also has entertainment areas for temporary events to get attention as similar to Forum Istanbul. Besides, its location is close to E5 highways as well and close to one of the main transportation nodes of Istanbul where almost all types of public transportation come together such as metrobus, metro lines, tram, minibuses, bus, etc. Yet, the must-to-walk way after public transportation is long and unattractive and accessibility is laborious as compared with Forum Istanbul SC. In these circumstances, it can be said that Marmara Forum SC is less attractive than Forum Istanbul SC.



Figure 1 - Marmara Forum Shopping Center (below) and Forum Istanbul Shopping Center (above) in relation to their location (middle) in Istanbul.

Additionally, Merter, a district of Bakırköy, is one of the center of textile industry and trading in Istanbul, also has many transportation opportunities, thus, it has a vivid urban life. Yet, Merter has lack of cultural activities as unusual for a district in Bakırköy which, is one of the most developed regions of Istanbul and hosts many central buildings of banks and cultural activities

In comparison, Marmara Forum SC has one to third smaller site than Forum Istanbul SC, however their contents are similar to each other and both have different advantages in accordance to their various functions that are creating alternative activities. For instance; even though they host almost same brands, Forum Istanbul SC offers more options in terms of goods. On the other hand, Marmara Forum SC has a bigger food court with more options than Forum Istanbul SC and most of the others. In addition, interior design concepts of two shopping malls are similar to each other, where they offer a shopping district with squares and streets, but they do not leave the same impression because of differences at scale, colour, material, architectural structure and spatial configuration inside. On the other hand, beyond that Forum Istanbul SC is located closer to the center of the city on a more accessible point; there are other public facilities that attract people surrounding the Forum Istanbul SC and give more opportunities to people for coming and spending time here. Nevertheless, because of easy accessibility, people live near Marmara Forum SC are expected to prefer Marmara Forum SC too.

3. RESULTS OF OBSERVATIONS AND SYNTACTIC ANALYSIS OF FORUM ISTANBUL AND MARMARA FORUM SHOPPING CENTERS

Marmara Forum SC is a complex building comprised four floors and four entrances; two of the entrances are at the ground floor and the other two are at the first floor, which is selected for the study. The investigation process was operated at the selected floor as told above in three steps. The first step is collecting data by observing users' behaviors in the shopping mall, making syntactic analyses of the floor plan, and categorizing tenant types; second step is making out correlations of spatial configuration that is depending to the syntactic measures and users' movements that is depending on the frequency of visitors by using SPSS. SPSS gave us "Regression Analysis" results that are symbolized with "R" value in tables, where "p" value is also related with the degree of its significance at regression analysis. Last step is interpreting the results of these input and output data.

In Marmara Forum SC, circularity is the most effective morphological characteristic on users' behavior (Table 2): It is found that the strongest correlation is between circularity and frequency ratio at the most used time period that is weekend day 2, 14:00 hours. On the other hand, the impacts of the circularity were weaker in the weekday evenings where it was reported that people used more connected and integrated spaces at the edges rather than the centrally positioned convex spaces in this time period. As a matter of fact, it is known that people prefer well-integrated and well-connected spaces for presenting further vision in comparison with segregated ones (Kim et al., 2008; Dalton, 2012). Besides that, the spaces with high circularity have the most directed routes at this floor in this shopping center.

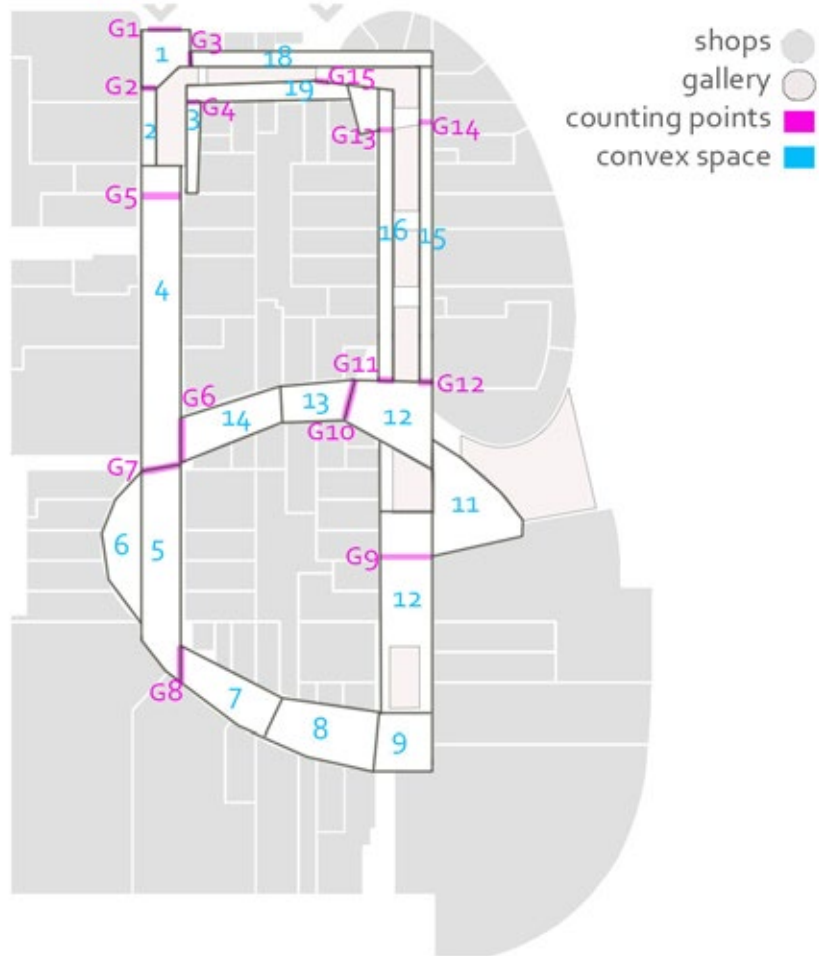


Figure 2 - Counting points/Gates and convex spaces of Marmara Forum Shopping Center.

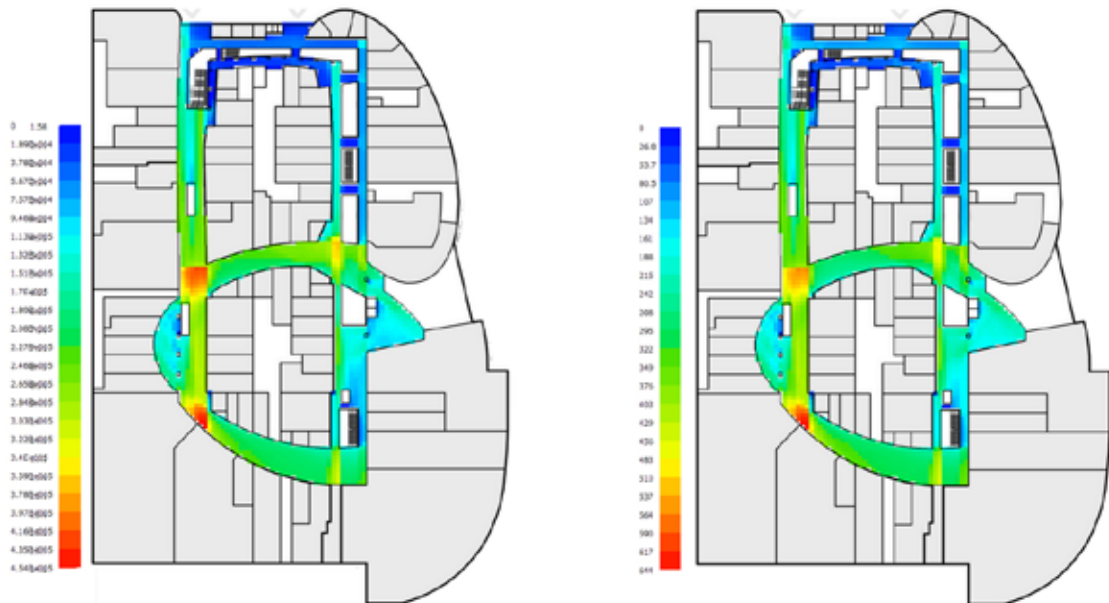


Figure 3 - Integration (left) and connectivity (right) of Marmara Forum Shopping Center.

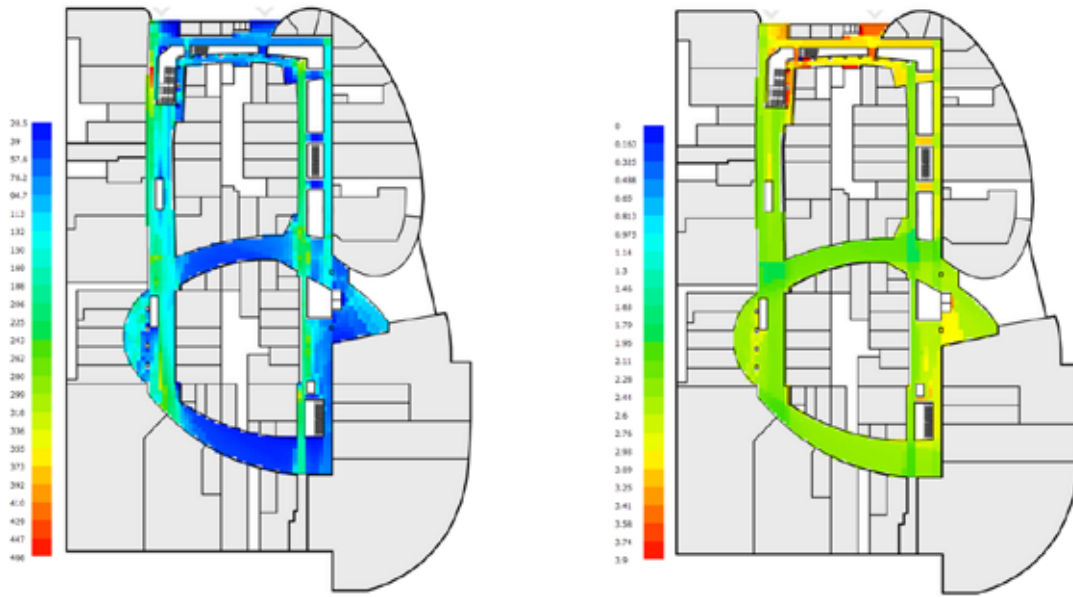


Figure 4 - Circularity (left) and mean depth (right) of Marmara Forum Shopping Center.



Figure 5 - Compactness (left) and distribution of types (right) at Marmara Forum Shopping Center.

Counting Points	FREQUENCY AVERAGE	Syntactic Values				
		COMPACTNESS	CIRCULARITY	CONNECTIVITY	MEAN DEPTH	INTEGRATION
Gate 1	123	5,67	95,45	102,000	2,913	61437
Gate 2	98	4,69	214,03	174,000	2,555	114009
Gate 3	38	6,12	82,02	116,750	3,028	55681
Gate 4	28	2,81	104,85	39,500	3,207	17706
Gate 5	109	5,41	156,78	207,111	2,585	141781
Gate 6	34	8,95	130,05	416,286	2,104	317194
Gate 7	61	8,23	141,42	378,857	2,254	282640
Gate 8	42	8,90	131,34	391,000	2,222	270461
Gate 9	60	7,44	131,67	248,500	2,528	152142
Gate 10	28	10,44	76,99	327,600	2,169	253674
Gate 11	33	5,81	189,63	236,250	2,315	176142
Gate 12	20	8,27	141,08	383,750	2,065	278137
Gate 13	29	4,90	228,84	195,750	2,296	138334
Gate 14	13	4,49	145,17	119,500	2,768	70666
Gate 15	23	4,95	39,33	41,250	3,533	16992
Convex space 1	14	5,80	107,78	121,980	2,891	69499
Convex space 2	25	5,23	200,17	201,000	2,479	137472
Convex space 3	4	3,56	86,12	47,520	3,223	27073
Convex space 4	43	7,96	159,95	402,044	2,195	300391
Convex space 5	14	7,72	170,00	395,325	2,297	285147
Convex space 6	11	5,78	136,12	173,039	2,494	119690
Convex space 7	8	11,90	63,59	323,699	2,341	223194
Convex space 8	10	13,34	45,06	295,719	2,419	203107
Convex space 9	7	10,75	86,76	318,361	2,364	215590
Convex space 10	8	5,96	133,44	153,258	2,664	100506
Convex space 11	30	7,08	122,30	214,669	2,593	132044
Convex space 12	19	8,03	85,09	201,080	2,600	124823
Convex space 13	11	7,91	134,17	302,896	2,279	221568
Convex space 14	6	11,23	61,41	316,788	2,198	239106
Convex space 15	5	10,50	66,13	274,349	2,228	220718
Convex space 16	8	4,70	145,07	131,021	2,690	77374
Convex space 17	12	4,98	223,26	200,759	2,311	147322
Convex space 18	7	5,69	92,43	109,771	3,029	51674
Convex space 19	9	3,93	93,31	55,304	2,997	26004

Table 1 - Frequency average and syntactic values of Marmara Forum SC.

TIME PERIODS		COMPACTNESS		CIRCULARITY		CONNECTIVITY		MEAN DEPTH		INTEGRATION	
		R	p	R	p	R	p	R	p	R	p
WEEK DAY 1	10,30	-0,085	0,730	0,461	0,047	0,383	0,106	-0,273	0,259	0,374	0,114
	14,00	-0,198	0,417	0,553	0,014	0,256	0,291	-0,187	0,443	0,251	0,301
	17,30	-0,130	0,597	0,510	0,026	0,298	0,214	-0,211	0,386	0,289	0,230
WEEK DAY 2	10,30	-0,539	0,017	0,450	0,053	-0,264	0,275	0,235	0,332	-0,250	0,302
	14,00	-0,235	0,334	0,598	0,007	0,312	0,193	-0,214	0,378	0,301	0,210
	17,30	0,118	0,631	0,296	0,219	0,493	0,032	-0,367	0,122	0,488	0,034
WEEKEND DAY 1	10,30	-0,206	0,397	0,427	0,068	0,127	0,604	-0,084	0,731	0,119	0,626
	14,00	-0,019	0,937	0,298	0,216	0,358	0,132	-0,209	0,391	0,333	0,626
	17,30	-0,053	0,829	0,504	0,028	0,359	0,131	-0,322	0,179	0,326	0,626
WEEKEND DAY 2	10,30	-0,168	0,491	0,432	0,065	0,137	0,576	-0,119	0,627	0,119	0,626
	14,00	-0,077	0,755	0,474	0,040	0,349	0,143	-0,293	0,224	0,332	0,626
	17,30	0,044	0,858	0,155	0,526	0,201	0,410	-0,182	0,457	0,164	0,626

Table 2 - Frequency and convex space correlations Marmara Forum SC (significant findings are shaded)

TIME PERIODS		COMPACTNESS		CIRCULARITY		CONNECTIVITY		MEAN DEPTH		INTEGRATION	
		R	p	R	p	R	p	R	p	R	p
WEEK DAY 1	10,30	-0,014	0,958	0,034	0,897	-0,048	0,855	0,033	0,901	-0,068	0,796
	14,00	-0,047	0,858	0,259	0,316	-0,009	0,974	-0,067	0,799	-0,033	0,901
	17,30	-0,094	0,720	0,297	0,247	-0,003	0,991	-0,042	0,873	-0,020	0,940
WEEK DAY 2	10,30	0,012	0,965	0,291	0,257	0,082	0,754	-0,114	0,664	0,059	0,822
	14,00	-0,056	0,832	0,195	0,454	-0,050	0,848	-0,009	0,972	-0,066	0,801
	17,30	0,105	0,689	0,241	0,351	0,150	0,566	-0,180	0,490	0,127	0,628
WEEKEND DAY 1	10,30	0,074	0,779	-0,070	0,790	-0,043	0,870	0,022	0,934	-0,065	0,806
	14,00	-0,014	0,957	0,173	0,506	-0,023	0,931	-0,049	0,853	-0,048	0,855
	17,30	0,074	0,778	0,270	0,294	0,150	0,565	-0,158	0,544	0,127	0,627
WEEKEND DAY 2	10,30	0,228	0,379	0,294	0,253	0,303	0,237	-0,264	0,306	0,268	0,298
	14,00	-0,015	0,953	0,275	0,285	0,050	0,848	-0,105	0,687	0,030	0,910
	17,30	-0,022	0,933	0,211	0,416	0,030	0,909	-0,046	0,862	0,008	0,975

Table 3 - Frequency and gate counting correlations Marmara Forum SC (significant findings are shaded).

In addition to circularity, integration and connectivity were other syntactic measures that showed effects on users' movements in Marmara Forum SC such as mean depth and compactness. In such a way, the convex spaces that were crowded at most of the time, had also high compactness, integration, connectivity and integration values and low mean depth value. In contrary, the convex spaces, which were less used, also had low integration, compactness and connectivity values and high mean depth value. The observations disclosed that users mainly flow through the spaces that were at the same direction with their walking route, and they did not tend to deviate to corridors out of their directions whereas this situation was ascertained with last studies, people tend to walk straight and not to turn at the edges (Dalton, 2001). Additionally, these spaces had also higher syntactic values than the spaces at the other directions. These circumstances connote that syntactic values are determinant factors in this shopping center and have strong impacts on users' movements such as observed ones like users' flow and frequency in a space.

Lastly, there are a few types of shops and they are distributed almost a homogenous arrangement, apart from food shops which are located at disintegrated spaces on this floor of Marmara Forum SC. For the reason that there was no tenant type zoning clearly, it could not be detected that whether shop type had a determinant role or not at users' movements with only observations. However, it was also observed that when a space had an extra-ordinary activity as a short-time attractor, the space turned into the most used space at those time periods. Likewise, it is ascertained with previous studies that users' movements in shopping centers are effected by spatial attractors along with spatial configuration; and also movement is not determined by only the urban grid as Hillier said, but the specific attractors such as product, activity and so on (Hillier, 1993; Fong, 2003; Yiu et al., 2008; Garip & Ünlü, 2009). All in all, it was not appointed that how shop types affected the visitors in Marmara Forum SC overtly, but it was distinguished that there were other attractors besides spatial configuration that affected use of space.

The same research process was conducted in Forum Istanbul SC. Forum Istanbul SC has four floors and four entrances whereas two of the entrances are at the ground floor and the other two are at the first floor which is selected for the study, just like Marmara Forum SC. Here, analyses and observations showed that the connectivity and integration of spaces had stronger impacts on users' frequency and circulation behaviors similar to Marmara Forum SC, although the effects of spatial structure were hardly readable most of the time only with the data that collected with observations. Findings pointed that users tended to use more connected and integrated spaces more often and move through more connected and integrated spaces from less connected and integrated spaces. It was also observed that the most integrated and connected spaces were also the most crowded spaces at most of the time because of the users' tendency to be able to gather more information about environment through the exterior or interior spaces by having wide perspective and act delicately (Dalton, 2001; 2012). Here, the most connected and integrated spaces are also the spaces, which provide vertical circulation and passage between entrances to shopping streets. Thus it can be thought that people use these areas for circulation and translocate in the floor and between floors there. On the other hand, compactness also showed effects on users in addition to connectivity and integration; users tended to use more compact spaces especially at early hours in weekdays. Whereas, the observations on weekend middays showed that compactness, connectivity and integration of spaces had impacts on users' movement. Considering the circulation behaviors, even though it was ascertained that compactness, integration and connectivity of spaces affected users' movements, it is thought that other factors such as types and numerosness of shops had more dominant effects on users than the spatial structure. It was also observed that people tended to move from the entrances to direct orientations at the junctions through the spaces containing retail as a tenant type, otherwise, they changed their direction in order to reach retail tenants. Local attractors have impacts on users' movements flow in shopping centers and provoke unexpected space use (Fong, 2003; Garip & Ünlü, 2009).

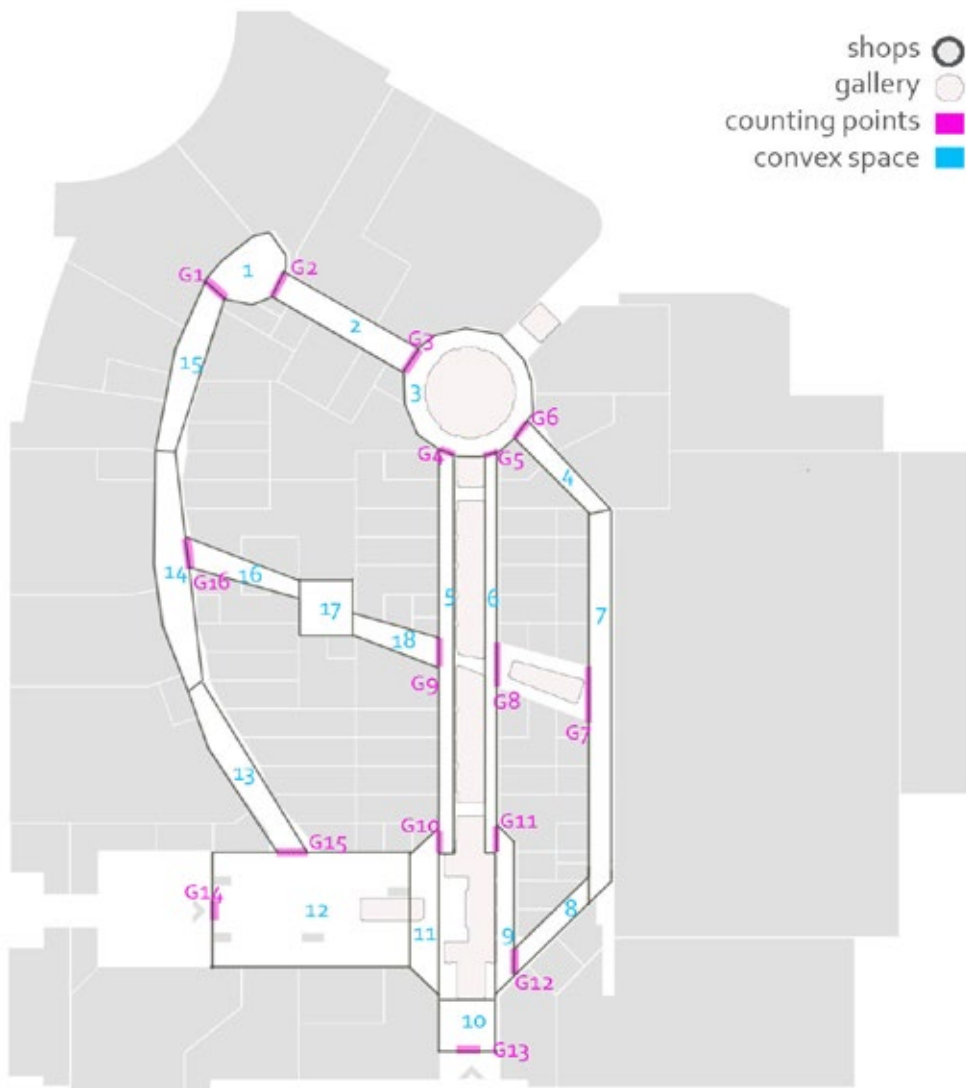


Figure 6 - Counting points/Gates and convex spaces of Forum Istanbul Shopping Center.

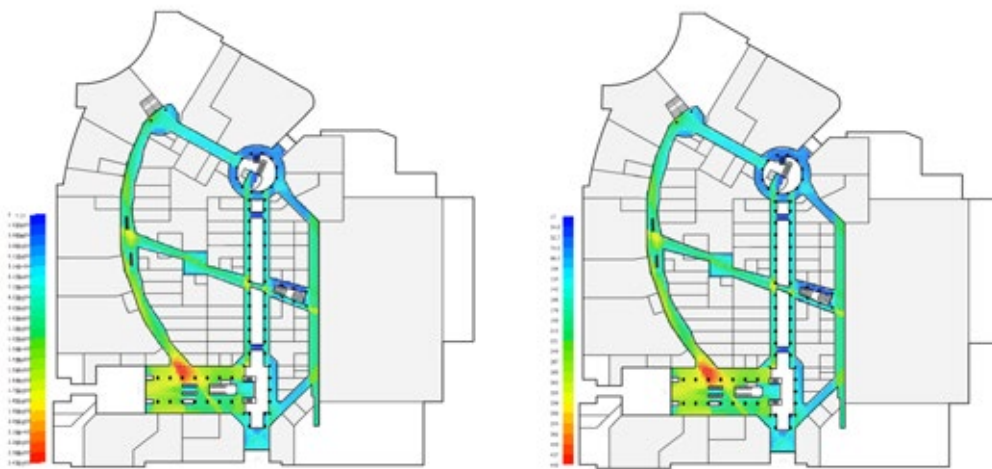


Figure 7 - Integration (left) and connectivity (right) of Forum Istanbul Shopping Center

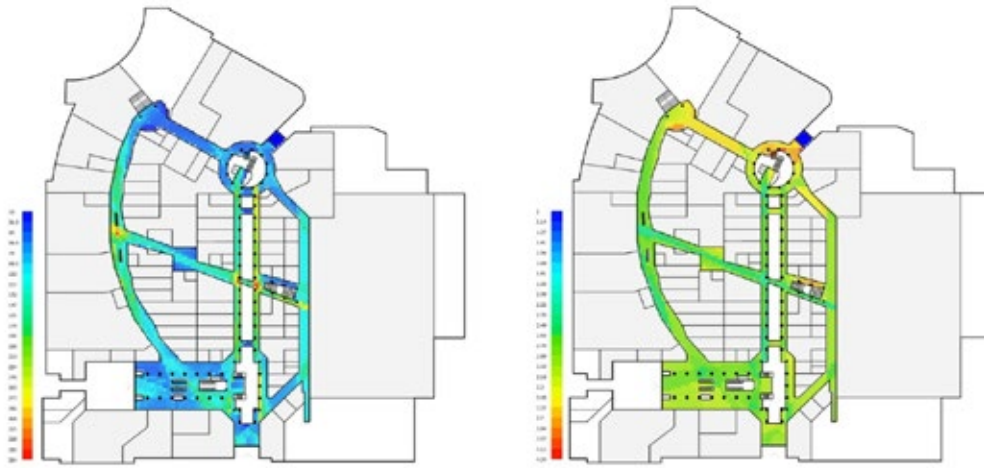


Figure 8 - Circularity (left) and mean depth (right) of Forum Istanbul Shopping Center

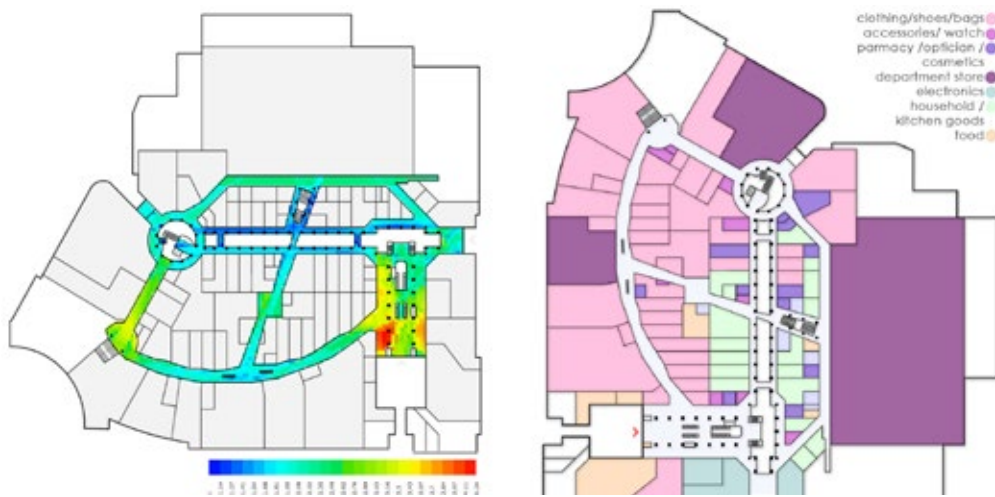


Figure 9 - Compactness (left) and distributions of shop types (right) at Forum Istanbul Shopping Center.

Counting Points	FREQUENCY AVERAGE	Syntactic Values				
		COMPACTNESS	CIRCULARITY	CONNECTIVITY	MEAN DEPTH	INTEGRATION
Gate 1	50	31,00	54,57	227,75	3,05	125076,40
Gate 2	69	30,71	42,70	176,50	3,49	75175,16
Gate 3	64	22,53	84,17	186,67	3,14	79906,01
Gate 4	51	15,11	197,51	196,00	2,45	115807,80
Gate 5	37	12,88	244,83	184,00	2,72	97004,96
Gate 6	24	19,09	77,25	125,50	2,95	58034,85
Gate 7	70	15,33	149,62	138,50	2,95	74855,88
Gate 8	56	11,00	197,06	119,83	2,88	66723,63
Gate 9	39	14,16	218,80	196,25	2,51	123000,20
Gate 10	52	17,46	139,02	182,67	2,62	111120,40
Gate 11	35	13,66	135,69	118,33	3,13	61002,67
Gate 12	49	16,71	102,25	126,80	3,04	65379,69
Gate 13	75	17,11	100,93	121,25	2,94	63432,98
Gate 14	100	26,12	102,91	299,83	2,83	161426,00
Gate 15	70	29,85	93,75	351,75	2,84	193765,60
Convex space 1	10	27,72	51,77	169,00	3,39	75777,50
Convex space 2	14	25,85	53,51	150,48	3,46	64118,70
Convex space 3	21	16,77	80,97	94,93	3,26	45481,70
Convex space 4	5	17,04	69,04	86,57	3,40	39425,30
Convex space 5	17	14,41	171,07	150,88	2,59	95578,60
Convex space 6	15	11,97	221,10	146,55	2,91	78322,80
Convex space 7	28	20,60	122,82	206,57	2,94	108096,50
Convex space 8	10	17,19	76,72	97,51	3,08	51376,30
Convex space 9	11	14,11	145,35	125,43	3,04	64154,70
Convex space 10	12	22,19	51,73	97,88	3,23	50919,80
Convex space 11	14	20,46	121,45	213,56	2,72	117874,60
Convex space 12	60	28,89	82,38	278,42	2,95	150059,60
Convex space 13	25	22,26	117,48	240,85	2,80	138205,70
Convex space 14	26	16,25	168,88	196,85	2,68	117776,80
Convex space 15	20	20,22	110,64	169,58	2,89	93204,20
Convex space 16	8	17,59	114,99	151,83	2,69	93528,50
Convex space 17	18	20,73	76,45	142,73	2,94	83561,30
Convex space 18	6	15,64	138,60	150,16	2,67	92468,20
Convex space 19	19	12,61	130,77	85,43	3,06	48646,90

Table 4 - Frequency and gate counting correlations Forum İstanbul SC (significant findings are shaded).

TIME PERIODS		COMPACTNESS		CIRCULARITY		CONNECTIVITY		MEAN DEPTH		INTEGRATION	
		R	p	R	p	R	p	R	p	R	p
WEEK DAY 1	10,30	0,160	0,513	0,159	0,516	0,504	0,028	-0,257	0,288	0,517	0,023
	14,00	0,150	0,540	0,262	0,279	0,615	0,005	-0,367	0,123	0,634	0,004
	17,30	0,239	0,325	0,315	0,189	0,741	0,000	-0,367	0,122	0,734	0,000
WEEK DAY 2	10,30	0,329	0,168	0,092	0,708	0,603	0,006	-0,046	0,851	0,522	0,022
	14,00	0,405	0,085	-0,184	0,451	0,476	0,040	-0,070	0,776	0,455	0,050
	17,30	0,411	0,080	0,058	0,814	0,675	0,002	-0,153	0,533	0,622	0,004
WEEKEND DAY 1	10,30	0,024	0,921	0,393	0,096	0,557	0,013	-0,346	0,146	0,583	0,009
	14,00	0,538	0,018	-0,097	0,694	0,719	0,001	-0,114	0,643	0,651	0,003
	17,30	0,337	0,158	-0,168	0,491	0,392	0,097	0,008	0,975	0,345	0,149
WEEKEND DAY 2	10,30	0,457	0,049	-0,079	0,748	0,567	0,011	-0,001	0,997	0,473	0,041
	14,00	0,379	0,109	0,120	0,626	0,748	0,000	-0,244	0,314	0,709	0,001
	17,30	0,417	0,075	-0,089	0,718	0,504	0,028	-0,041	0,868	0,466	0,044

Table 5 - Frequency and convex space correlations Forum Istanbul SC (significant findings are shaded)

TIME PERIODS		COMPACTNESS		CIRCULARITY		CONNECTIVITY		MEAN DEPTH		INTEGRATION	
		R	p	R	p	R	p	R	p	R	p
WEEK DAY 1	10,30	-0,021	0,939	0,009	0,973	0,105	0,698	-0,024	0,930	0,126	0,642
	14,00	0,258	0,334	-0,235	0,381	0,246	0,359	0,236	0,378	0,184	0,495
	17,30	0,370	0,159	-0,331	0,211	0,258	0,335	0,225	0,402	0,198	0,461
WEEK DAY 2	10,30	0,191	0,478	-0,166	0,539	0,147	0,588	0,163	0,547	0,102	0,708
	14,00	0,127	0,639	-0,175	0,517	0,047	0,863	0,335	0,205	-0,012	0,966
	17,30	0,216	0,422	-0,086	0,750	0,231	0,389	0,200	0,458	0,189	0,483
WEEKEND DAY 1	10,30	0,138	0,609	0,034	0,901	0,387	0,139	-0,079	0,771	0,355	0,178
	14,00	0,543	0,030	-0,406	0,119	0,614	0,011	0,141	0,602	0,511	0,043
	17,30	0,477	0,062	-0,275	0,303	0,530	0,035	0,085	0,753	0,457	0,075
WEEKEND DAY 2	10,30	0,052	0,849	-0,040	0,882	0,124	0,647	-0,026	0,923	0,088	0,747
	14,00	0,750	0,001	-0,534	0,033	0,672	0,004	0,275	0,303	0,547	0,028
	17,30	0,332	0,208	-0,346	0,190	0,159	0,558	0,307	0,247	0,049	0,856

Table 6 - Frequency and gate counting correlations Forum Istanbul SC (significant findings are shaded)

In sum, the spatial use in Forum Istanbul SC in relation with the users are mainly affected by spatial morphology as it is especially seen with the values of integration, connectivity, compactness and mean depth. These values showed distinguishable effects in some spaces, however it is still undeniable that there are other factors that may be influential more than spatial configuration. Considering the correlations depending on observations and syntactic analyses, it was obvious that syntactic values of space do not show strong effects on users' flow and movement. In these circumstances, we may argue that tenant types and other attractors were more effective on users' flow than spatial configuration in relation with the morphology of space.

4. CONCLUSION

In conclusion, this study compares the impacts of building morphology and content by examining their impacts on users' circulations and spontaneous gatherings in two shopping malls of Istanbul. Systematic observations of users were made in both shopping centers at definite time periods in weekdays and weekends in order to detect the impacts accurately. Correlations between syntactic analyses and users' gate counts and convex space frequencies show that there are certain impacts of each factor. It is attested that building morphology clearly affects observed user behavior in these shopping centers. The users' behavior may definitely be affected by the configuration, but this is not always in accordance with the syntactic values. Other factors like types and quantity of stores, a temporary activity, having a target product that is making an attraction etc. could sometimes be more effective than spatial configuration. At one of the shopping centers, Marmara Forum SC, shops types are distributed almost homogeneously while at the other one, Forum Istanbul SC shop types are zoned partially on the selected floor. In these circumstances, it is ascertained that long axial paths (we may also call these paths as main orientation path or main movement path) of this character has distinguishable effects on users' movements besides other syntactic values at both of the shopping centers. Natural Movement Theory suggests that people incline to well-integrated and well-connected spaces because they collect information about space better for further movements in these kind of spaces (Hillier et al. 1993; Hillier & Iida, 2005; Sailer & Penn, 2010). In addition, it is also reported that visitors tend to the spaces with long lines as having high connectivity in both shopping centers. Likewise, it was alleged that direct links in shopping arcade have positive effects for the reason that continuing the shopping activity without interruption inclining with Natural Movement Theory (Teklenburg et al. 1994; Fong, 2003). On the other hand, there were observed certain effects of spatial attractors and shop types in spite of morphological structure. Even though general physical configuration was supportive on natural movement of users in shopping malls, content was more dominant on users' decisions of spatial use as we have seen in this comparison. In other words, "the product is the key" (Yiu et al., 2008; Garip & Ünlü 2009). People move in the space not only according to spatial structure but also their personal assessments of space (Downs, 1970).

Although syntactic measures such as circularity, connectivity, integration all have some significant correlations with frequency of people depending on the time periods that they are counted and analyzed, the attraction factor of displays, shops, various activities such as entertainment areas and food courts usually influence the correlations. In this context as we seen from the table 6, there may be no correlations between the movement and frequency in gate counts in relation to syntactic values.

It is also significantly seen that in comparison of the two shopping malls, the comparatively small one (Marmara Forum SC) is giving very significant and strong correlations between the integration and gate counts as well as connectivity measures and gate counts. The reason for such as a result is the more compact and visually increased orientation of the mall with the functions. The bigger mall (Istanbul Forum SC) is creating no correlation in that sense, which has the similar setting and the functions as well as the brands within the mall. As Dalton (Zimring & Dalton, 2003) found that "Angles that deviated least from a continuous straight heading were preferable to sharp turns" and also found that "a strong evidence that participants tended to select routes that approximated a straight line and avoided routes that were particularly convoluted or meandering" (Zimring & Dalton, 2003). In that sense, the difference in the morphology of main orientation path or main movement path between the two compared shopping malls created these significant results about the gate counts-frequency correlation. Marmara Forum SC that is serving with two main paths in comparison to a more complex axial or path system in Istanbul Forum SC due to its increasing total area has become a disadvantage in terms of visitor-user experience of the mall.

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