



Assessment of the Interaction Between Space And Visitor In the Case of the *Cité De L'architecture Et Du Patrimoine*

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(First received 28 November 2020 and in final form 17 January 2021)

(DOI: 10.31590/ejosat.832712)

ATIF/REFERENCE: Altıparmakoglu Sakarya, G., Gürani, Y. (2021). Assessment of the Interaction between Space and Visitor in the Case of the Cité de l'Architecture et du Patrimoine. *European Journal of Science and Technology*, (21), 341-357.

Abstract

This study discusses the interaction between space and humans and studies space in the case of architecture museums and humans in the case of museum visitors. Museums were determined as the topic of the study as they are one of the complex structural groups such as hospitals, shopping malls, airports and various public structures that allow many humans to interact with each other and with space. In this context, the numerous types of museums were further narrowed and the scope of the topic was reduced to the case of Architecture Museums. Compared to other types of museums, they are considered to address a wider audience and range of visitors because they are related to all types of spaces with which humans directly interact. The Cité de l'Architecture et du Patrimoine (Architecture and National Heritage Museum) museum in Paris was chosen as the field of study because of its spatial characteristics, the variety of items exhibited, visitor potential, size, spatial variety and the fact that it is one of the most recent architecture museums. The spaces identified in the field study conducted as part of this study were examined using the two main methods of onsite observation and space syntax methods. The spatial syntax analysis method was applied under two headings: permeability and visibility graph analysis. Permeability analysis were performed on permeability graphs created by Agraph software, and visibility graph analysis were performed by the connectivity, visual integration and coefficient clustering parameters on Depthmap software. Attempting to identify the effects of spatial setup on visitor behavior, the study aims to determine the features of the spatial setup that effect visitor behavior, examine the architectural and spatial characteristics of the architecture museum chosen as the field study and examine the interaction of such spatial qualifications with visitor behavior using space syntax analysis. As a conclusion of the analyses, it was observed that the permeability and visible area structures of the museum space, where fieldwork was conducted, overlapped to a great extent and it was found that spatial configuration leads to preferences in visitor behaviors.

Keywords: Museum of architecture, Cité de l'Architecture et du Patrimoine, Space syntax, Depthmap, Agraph

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Mekân ve Ziyaretçi Arasındaki Etkileşimin Fransa Mimarlık ve Milli Miras Müzesi Özelinde Değerlendirilmesi

Öz

Mekân ve insan arasındaki etkileşimi konu edinen bu çalışmada; mekân, mimarlık müzeleri özelinde ele alınırken, insan da müze mekanının kullanıcıları özelinde ele alınmaktadır. Müzeler; hastaneler, alışveriş merkezleri, havaalanları ve çeşitli kamusal yapılar gibi çok fazla insanın birbirleriyle ve mekânla ilişki kurmasına olanak tanıyan kompleks yapı gruplarından biri olması sebebiyle çalışma konusu olarak belirlenmiştir. Bu bağlamda, çok sayıda müze türü arasından bir daraltmaya daha gidilerek konu kapsamı Mimarlık Müzeleri özeline indirgenmiştir. Mimarlık Müzelerinin diğer müze türleri içinde konusu gereği doğrudan insanların etkileşimde bulunduğu her türlü mekânla ilgili olduğundan, daha geniş bir kesime ve ziyaretçi kitlesine hitap ettiği düşünülmektedir. Mekânsal özellikleri, sergilenen ürünlerin çeşitliliği, ziyaretçi potansiyeli, büyüklüğü, mekânsal çeşitliliği, açılan en yeni mimarlık müzelerinden biri olması gibi gerekçelerle Paris'te bulunan Fransa Mimarlık ve Milli Miras Müzesi (Cité de l'Architecture Patrimoine) çalışma alanı olarak belirlenmiştir. Çalışma kapsamında yapılan alan çalışmasında belirlenen mekânlar, yerinde gözlem ve mekân dizim analizi yöntemi olmak üzere iki ana yöntemle incelenmiştir. Mekan dizim analizi yöntemi, geçirgenlik ve görünür alan analizleri olmak üzere iki başlık altında uygulanmıştır. Geçirgenlik analizleri; Agraph yazılımı aracılığıyla oluşturulan erişim grafikleri üzerinden, görünür alan analizleri ise Depthmap yazılımı aracılığıyla bağlantılılık, görsel bütünleşme ve katsayı kümelenmesi parametreleri üzerinden yapılmıştır. Mekân kurgusunun ziyaretçi davranışı üzerindeki etkilerinin saptanması hedeflenen çalışmada ziyaretçilerin davranışlarını etkileyen mekânsal kurguya ait özellikleri tespit etmek, alan çalışması olarak belirlenen mimarlık müzesinin mimari ve mekânsal özelliklerini incelemek ve bu mekânsal niteliklerin ziyaretçi davranışı ile olan etkileşimini mekân dizim analizinden faydalanarak irdelemek amaçlanmıştır. Yapılan analizler sonucunda alan çalışması yapılan müze mekanının geçirgenlik ve görünür alan yapılarının büyük oranda örtüştüğü ve mekân kurgusunun ziyaretçilerin davranışlarında tercihlere sebep olduğu görülmüştür.

Anahtar Kelimeler: Mimarlık müzesi, Cité de l'Architecture et du Patrimoine, Mekan dizim analizi, Depthmap yazılımı, Agraph yazılımı.

1. Introduction

Museums are types of space with intense human-space interaction. The space establishes a very integrated relation with its users as it is given functions such as exhibition, combination and conveying information. The quality and value of the exhibited works, together with the spatial configuration and spatial organizations should have been established successfully in order for a museum space to convey information to its visitors in the most effective manner and to draw in visitors. It could be said that a space has suitable analyses if a visitor can tour it without much confusion, without concern over finding direction and without much effort to reach the desired work.

There are many museums with various types today. The collections of a museum are one of the main determinants in raising awareness. A museum is usually referred to with the type of works mostly contained in its space and the purpose for which it exhibits. As a type of museum, "Architecture Museums" can be considered as one of the museum architectures addressing the broadest audience. This is because everyone, regardless of age, gender, culture or profession establishes a relation with space and building. Also architecture museums can be quite attractive according to a very broad audience as they are set up to exhibit architectural works. Furthermore, a space aiming to exhibit and give information about good examples of architecture, would itself be expected to be a really well-functioning space in terms of its purpose and architectural design. The fact that it has intense human circulation due to its purpose, allows for establishing an intense relation regarding space-human interaction. Among the various architecture museums throughout the world, the Cité de l'Architecture et du Patrimoine in Paris is

a good example of this because of its location and for being the architecture museum with the highest number of visitors.

This study discusses the problem of assessing the interaction between visitor and space in the case of architecture museums and has chosen the *Cité de l'Architecture et du Patrimoine* as the space for its field study because it is the most recent architecture museum, the variety of exhibited works and the mode of exhibition and the intensity of visitors. The purpose of this study is to attempt to determine factor such as what type of social interaction is enabled by spatial configuration, design layout and inter-spatial relations in the interaction between space and visitor in the case of this museum space and to what extent does it have on visitor behaviors and their mode of experiencing the space. Additionally, attempt is made to set forth factors about this museum, which is the largest architecture museum in the world, such as its efficiency, to what extent it could be considered as a successful example and the positive/negative aspects of its impact on visitor behavior.

2. Material and Method

In the field study conducted in accordance with the specified problem, the ground floor of the *Cité de l'Architecture et du Patrimoine*, which hosts its permanent collections and the exhibition spaces on its 2nd floor were examined using the two methods of onsite observation and space syntax. First, in the onsite examination method, attempt was made to determine movement patterns by monitoring the behavioral patterns of visitors in the space, their inclinations and the relations they

established with the space using observation method by going to the museum space at specified days and times. The days for study at the museum, which is closed on Mondays and Tuesdays, were determined as Wednesday, Thursday and, as it was foreseen to be have higher visitor intensity, Saturday. As a result of observing the visitors on the specified days and times, the places of movement, visitor traces, their inclination tendencies, the total time visitors spent at spaces depending on their preferences, points of pause, the points they stopped when examining the works and the distances they travel in the space were first noted on the layout plan.

As the second method, the specified spaces were analyzed using the space syntax and visible area method, which, rather than just examining the physical properties of space, claims that a direct relation exists between space and the users of space, and is used to understand the relation between space and social life and to objectively read space with digital data. In this context, the Agraph software, which was developed based on the most basic measurements in space syntax was used to create the permeability and justified graphs and the Depthmap software was used for the other analyses due to its scope and suitability of its analysis types.

Visible area analysis is based on the visual perception of the observer moving in the space. In this context, the analyzes were evaluated on the parameters of connectivity, visual integration and clustering coefficient in order to determine the interaction between the space setup and the visitor. Because these parameters are directly related to the visual perception issues that occur in the user's mind depending on space configuration, the estimation of the movement and the rate of change in the perception of space.

2.1. The Cité de l'architecture et du Patrimoine

Known as the largest architecture museum in the world with an area of 23,000 square meter, the *Cité de l'Architecture et du Patrimoine* museum is located on one of the wings of the Chaillot Pallace in Paris (Figure 1). Built by Gabriel Davioud in 1878 as the Trocadero Palace, the structure became known as the Chaillot Palace after the renewal by Jacques Carlu in 1937. Gaining its most recent appearance with the renewal performed by Jean-François Bodin in 2007, the structure serves as a museum complex. In addition to the Architecture Museum, the structure also includes the Musée de la Marine (Maritime Museum) and the Musée de l'Homme (Human Museum).



Figure 1. *Cité de l'Architecture et du Patrimoine* (URL-1)

The museum collection is essentially based on French monuments. However, it also contains various galleries for modern and contemporary examples of architecture. With approximately 11,000 square meters allocated for exhibitions, the permanent exhibitions of the museum are as follows:

Cast gallery, Murals gallery, Stained glass gallery, Modern and contemporary architecture gallery

Consists of an identical copy of a flat from Cite Radieuse constructed by Le Corbusier in Marseilles (Figure 2). Also, exhibition areas at the basement floor hosts temporary exhibitions.




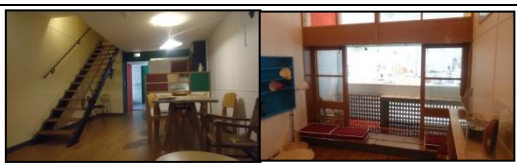
	<p>Gallery of Casts</p>
	<p>Gallery of Casts</p>
	<p>Gallery of Modern and Contemporary Architecture</p>
	<p>Le Corbusier Housing Unit</p>

Figure 2. *Cité de l'Architecture et du Patrimoine* exhibitions (Altıparmaköğlü Sakarya, G.)

Pursuant to the topic of the study, in order to be able to investigate the impact of spatial setup on visitor behavior, spaces such as administrative offices that are not open to visitor access and educational areas, the library, sales areas and the auditorium, where not much visitor circulation is observed, were excluded from the scope of the study. The study also excludes galleries allocated for temporary exhibitions, located in the basement floor and below in the museum, of which 11,000 square meters

are allocated to exhibition areas. The spatial setup of these spaces can vary as they are arranged for certain periods as specific to the current exhibition.

According to the observations conducted at the museum, the permanent exhibition areas (marked in blue in the Figure 3) located at the ground floor and the 2nd floor, where visitors are located most intensely, were determined as the spaces for conducting the field study.

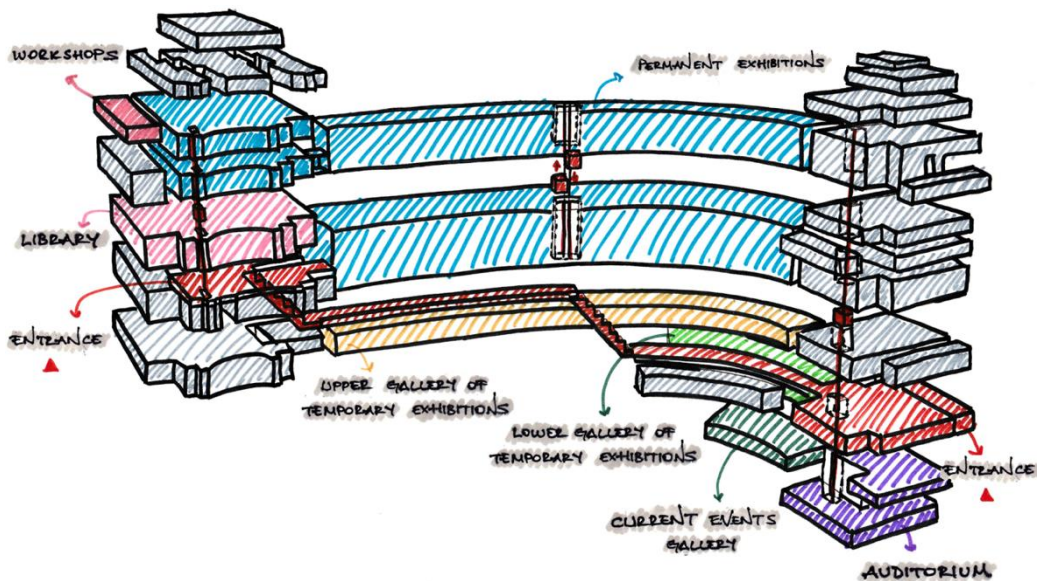


Figure 3. *Cité de l'Architecture et du Patrimoine* three-dimensional diagram (Altıparmaköğlü Sakarya, G.)

2.2. Space Syntax Theory

The first theories regarding space syntax analysis method were started being developed in the 1970s by a group led by Bill Hillier and Julianne Hanson at the Bartlett School, University College of London. The first detailed explanation of the developed theories was performed in the book entitled "The Social Logic of Space", published by Hillier and Hanson in 1984. Known as "Space Syntax" in the English literature, this method was set forth as a scientific method that examines the relations between spaces that constitute a structure, based on the word "syntax", which is a branch of linguistics that examines the relations between words that constitute a sentence.

Based on human movements, networks of social relations and the theory of space, this method generates data on buildings, cities and their spatial organization. Its starting point is that the social structure that constitutes space can be deduced from the physical setup of the space (Hillier, 1996, p.69).

As explained by Hillier and Hanson, essentially focused on the spatial experiences of people, this method is a technique that allows for concrete expression and analysis of abstract characteristics of space that plays the most significant role in creating information based on experiences as a reflection of space in the human mind (Hillier, Hanson, 1997, p.178). According to Gündoğdu, the Space Syntax Analysis Method is a term used to designate all the techniques supported by theoretical approaches and used to define the spatial models and indoor spatial organizations of regions, cities, structured environments and buildings groups at different scales and to examine their interaction with the social structure. The primary aim of such techniques is to set for the potential of "spaces" to gather and direct people, by objectively analyzing the relation between spatial organization and human movement and field of view (Gündoğdu, 2014, p.251). According to Erman, this technique analyzes the architectural space, based on the configurational features that are directly related to the social function suggested by and cultural meanings conveyed by the plan scheme. In order to understand the configuration of the space, it is necessary to examine the contiguity of spaces arising from being in relationship (Erman, 2017, p.167-168). In accordance with these explanations, it can be understood that one of the important approaches set forth by the method is that space and social structure are in direct interaction. In examining spaces, taking into account the experiences and movements of people in such spaces when considering the formal characteristics of space and its relation with other spaces as a whole, supports this approach. According to David Seamon, the most important aspect of this method that distinguishes it from other analytical approaches set forth during the same times, is that the techniques it used in describing space directly focuses on the "spatial experiences of humans" (Seamon, 2007, p.16).

According to Hillier, people exhibit a behavior basically in two ways in space: they either move or occupy. For example, when the circulation and occupation behaviors of the users in the space are observed, it is observed that the users are concentrated in the spaces that are morphologically related and connected to the whole space; it was found that pedestrian axes are particularly concentrated in these places (Hillier, 1996, p.39). In this case, it can be said that in addition to type of the space, the physical characteristics of the space are also effective in shaping the behavior. For example; In his work dated 1996 on the Tate Gallery in London, Bill Hillier tried to measure the effects of the

spatial configuration of the museum on the use of the space with the new entrance he designed for the basement. After all his works, Hillier concluded that the spatial configuration of the museum is more influential on the behavior of visitors than sign systems, guides or artifacts. In this case, in the act of behavior in the perception of the space many physical factors such as the form, borders, configuration, and volumetric relations of the space play an important role.

3. Results and Discussion

3.1. Analysis Based on Observation

The field study was conducted by observing the movement of the visitors at the Cité de l'Architecture et du Patrimoine museum on Wednesdays, Thursdays and Saturdays at 11:00 - 15:00 on the ground floor and 2nd floor, which host the museum's permanent exhibitions. In this study, which investigates the impact of spatial characteristics on visitor behavior, the observation section is based on data such as the direction preferences of visitors, the points they become undecided and pause, the points of examining the works, the spaces where they pass and the routes they use. This data was generated by marking the movement of a total of 30 visitors on the museum layout for three days, following their first entry into the exhibition space without informing them.

The observational analyses conducted at the spaces where the field study was performed, were assessed as part of physical factors that impact visitor behavior. As mentioned in the study, these factors consist three components: plan configuration and spatial organizations, architecture program and sign and graphics system. Assessing the findings as a result of observation accordingly;

The following assessments were made about the plan configuration and spatial organization:

As a result of three days of observation, recording the visitor circulation traces, it was observed that 11 different routes were formed on the ground floor. It could be stated that the fact that the spaces in the gallery have multiple relations of passage to each other caused the formation of different routes. On the 2nd floor, certain routes were not formed as in the ground floor because visitors toured in a certain order. The reason for this could be the layout of the works in the entrance main exhibition hall.

The exhibition spaces on the ground floor have a linear relation with each other. As a result of observation, it was determined that the visitors toured all the exhibition spaces on this floor. This is considered to be caused by a linear spatial organization.

The points where the visitors halted most were also the locations where they were most undecided in their direction preferences. It was determined that these locations were also the connection points with the widest gap in the passages between spaces. Visitors who paused in these areas were observed to have difficulty in direction preference. Therefore, the deduction can be made that the layout and organization are not sufficient at these points on their own and sign systems or certain environmental items that interact with the perceptive and cognitive processes of visitors are needed.

Observing the points at which visitors examined works, it was noticed that the scale of the exhibited works affected the distance between the work and the viewpoint. Most of the works exhibited on the ground floor of the museum have 1:1 scale. These impacts the number of works placed in the gallery and is also decisive in the perspectives and therefore the visual perceptions of visitors (Figure 4).

Visitors preferred points from which they can see the whole work from a wide angle. Accordingly, less number of viewpoints was recorded in the main gallery with respect to the other spaces.

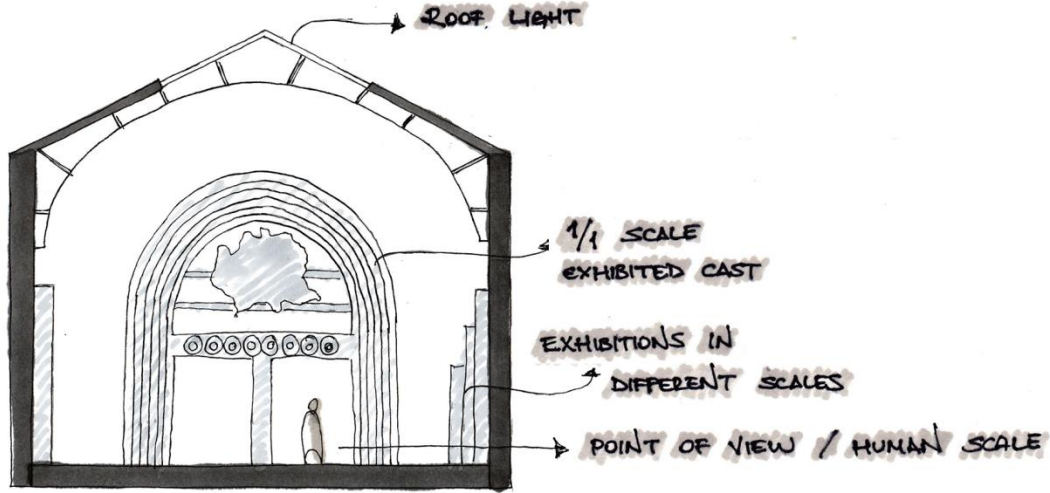


Figure 4. Section diagram expressing the scale of the work and visitor on the ground floor (Altıparmakolu Sakarya, G.)

Examining the points from which visitors examined the works at the 2nd floor, as in the ground floor, the scale and exhibition modes of the works were effective on the distance between the work and the viewpoint. Unlike the ground floor, the fact that the main gallery on the 2nd floor has a small-scale model and drawings, has caused visitors to stand at the closest

point. Accordingly, less number of viewpoints were recorded in the main gallery with respect to the all exhibition spaces. However, it is possible to state that the fact that all the works exhibited in this gallery is below the eye level, affects visual perception. As expressed in the section diagram provided in Figure 5, the main gallery space and Le Corbusier's flat can be perceived from various viewpoints.

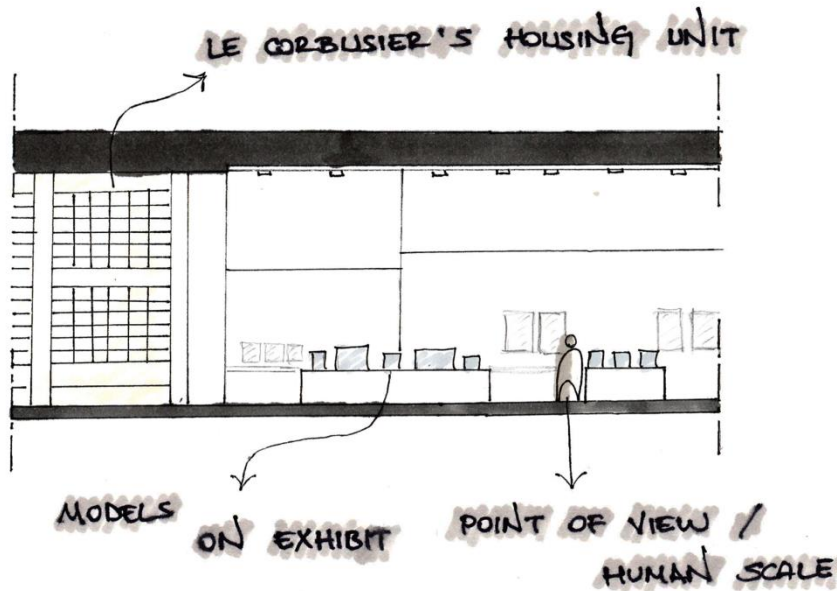


Figure 5. Section diagram expressing the work, visitor scale and space perception on the 2nd floor (Altıparmakolu Sakarya, G.)

Examining the organization of the exhibition spaces located on the second floor, it can be stated that they have a more complex layout. As a result of the observation, it was recorded that only 4 out of the 30 visitors toured the exhibition space at the very end. Together with spatial organization, it can be stated that this is caused by the sign and graphic systems used on this floor for direction.

It is known that sections designated as linear paths and nodes/connection points in the layout setup have an important place in directing visitor behaviors. As a result of observation, it was noted that on both floors, any passage space such as corridor intersections, doorsills, entry spaces, horizontal and vertical circulation areas are the locations where the visitors had the highest indecision.

It was determined that all visitors who toured the ground floor went up to the 2nd floor. The fact that the elevators providing access to the 2nd floor are located at a central location in the main exhibition hall and are transparent, were effective in this regard.

The following assessments were made regarding the architectural program:

Various studies have asserted that architectural program also has decisive effects on behavior, independent of layout setup and organization. Spaces can be characterized as strong or weak programmed depending on their features.

Evaluating the spaces of the museum in this respect, it can be said that a strong program exists here in general, as not many unplanned and unexpected uses occur in the spaces. However, it can be stated that the actions, circulation and functional relations expected in the ground floor are more systemic with respect to the second floor. This was effective in the observed visitors touring on the ground floor by following certain routes and touring more irregularly on the second floor.

Most of the visitors on the ground floor were observed to first go to the main exhibition hall located at the entrance front side. This may be explained with the level of lighting in the space being more inviting due to the wide window openings on the front.

The following assessment were made regarding the sign systems and graphical information:

In complex structures such as museums, a well-resolved spatial organization and architectural program along with a well-resolved sign system are always needed due to reasons such as raising the experience quality of visitors, preventing the feeling of insecurity and getting lost, helping them decide on their behaviors and taking actions. It is considered that sign systems are even more important due to the limitations of spatial organization particularly in the museum set up by refunctioning an existing structure, where the field study was performed.

As a result of observation and personal experience in the museum, it can be stated that the greatest deficiency was the lack of sign systems and graphical expressions. Insufficient information is obtained about exhibitions and some exhibition spaces can be missed due to lack of sign systems and signboards providing information about the spaces, other than the leaflets available at the museum entrance.

However, it was found that the observed visitors paused most at positions with wide openings at the passages between the spaces. The lack of sign systems in these areas in particular cause visitors to experience indecision by making it more difficult for them to find direction.

Considering the times spent by visitors in the spaces, it was observed that visitors spent more time in spaces containing certain educational items and interactive items that visitors can experience in person. This shows that such graphical and interactive items placed for purposes other than directing, are influential on the visiting experience of the visitors.

3.2. Space Syntax Analysis

The following findings were achieved as a result of the space syntax analyses performed in the study as part of permeability and visible area analyses:

3.2.1. Permeability Analyses for the Ground Floor

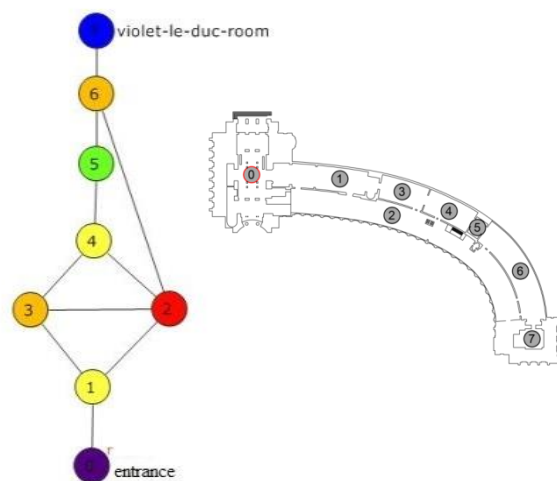
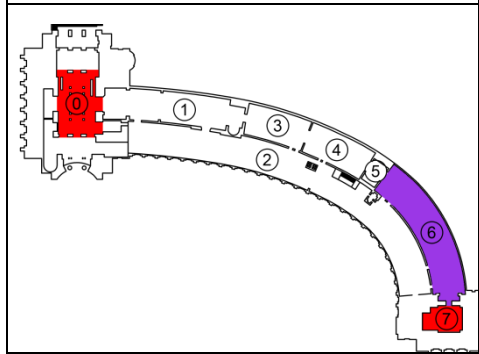
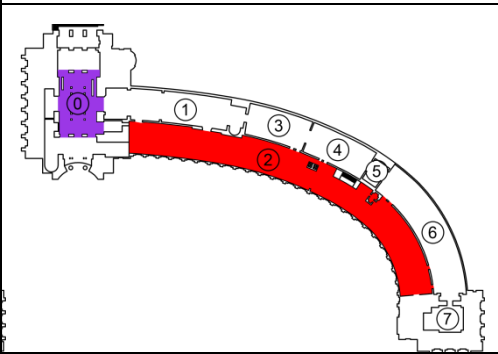
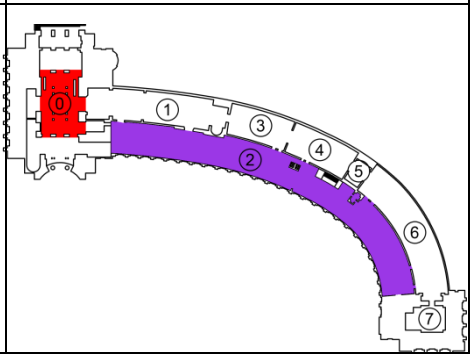



Figure 6. Justified permeability graph of ground floor (Altıparmakoğlu Sakarya, G.)

Table 2. Highest and Lowest Values in Permeability Analysis of Ground Floor

<p>Control Value The space with the lowest value: 6 The space with the highest value: 0 and 7</p>	<p>Total Depth & Mean Depth & Relative Asymmetry The space with the lowest value: 0 The space with the highest value: 2</p>	<p>Integration Value The space with the lowest value: 2 The space with the highest value: 0</p>
		
<p>Value Grade: high  low</p>		

According to the table, the entrance space and the exhibition hall number 2 were the spaces with the minimum and maximum values other than the control parameter. The fact that the exhibition hall number 2 is the most integrated and correspondingly the shallowest space, gives an idea about it being the space with the highest visitor traffic. Furthermore, the fact that it has direct passing relation with all the spaces except for the spaces number 5 and 7, suggests that it will increase the visit potential of this space. The fact that the exhibition hall number 2 was found to be the space with the highest movement as a result of observation, verifies the permeability analyses for this floor. In this context, it can be stated that the analysis conclusion will contribute to the decision-making process regarding the layout of the works to be exhibited in the museum.

3.2.2. Permeability Analyses for the Second Floor

According to the passage graph of the second floor, the passage relations between spaces are also assessed relative to the main exhibition hall, which is also the entrance space. The spaces here have non-distributed property due to the fact that there are no alternative paths from the other spaces on this floor to access this starting space, which is expressed with the number 0. However, the spaces number 1 and 3 have symmetrical property because they have the same passage relation with respect to the starting space number 0 and the spaces number 2, 4, 5 and 6 have asymmetrical property due to being interconnected with respect to passage relations.

According to the colors assigned to the passage graph, the space number 3, expressed in red, is the most integrated space. The spaces number 2 and 6, expressed in purple, are observed to be the most dissociated spaces.

Table 3 shows the total depth, mean depth, relative asymmetry, integration and control values of the exhibition spaces on the second floor, calculated with the program. Table 3 also shows the basic difference factor values calculated with this data.

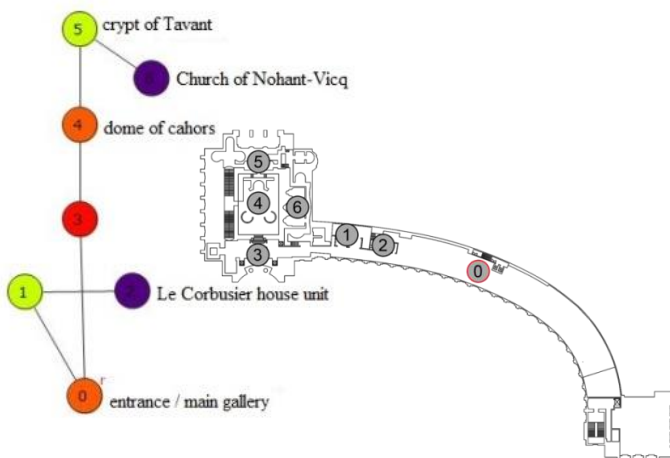
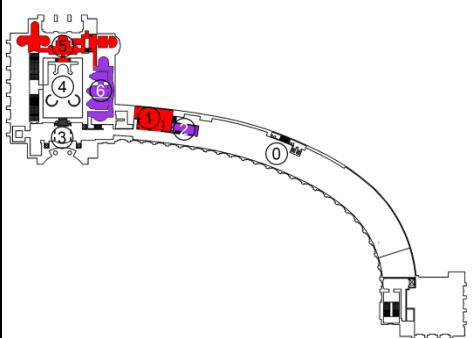
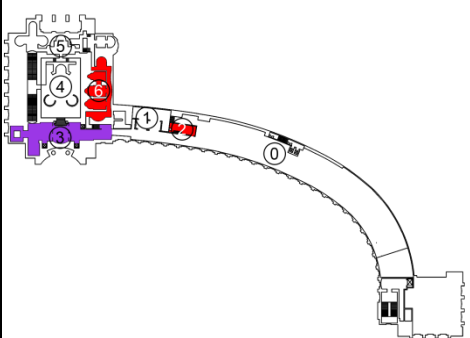
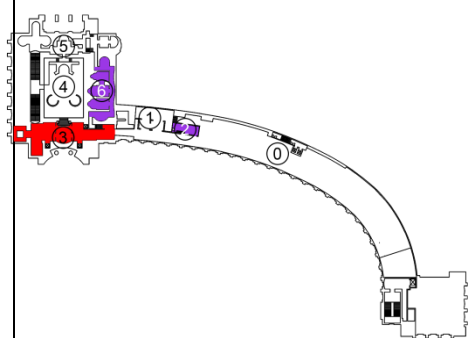



Figure 7. Justified permeability graph of second floor (Altıparmakoglu Sakarya, G.)

Table 3. Permeability Analysis Values of Second Floor

	TDn	MDn	RA	i	CV		0	1	2	3	4	5	6	TDn	MDn	RA	i
0	0	13	2,16	0,46	2,14	1,00	0	1	2	1	2	3	4	13	2,16	0,46	2,14
1	1	16	2,66	0,66	1,50	1,50	1	0	1	2	3	4	5	16	2,66	0,66	1,50
2	2	21	3,50	1,00	1,00	0,50	2	1	0	3	4	5	6	21	3,50	1,00	1,00
3	3	12	2,00	0,40	2,50	1,00	3	2	3	0	1	2	3	12	2,00	0,40	2,50
4	4	13	2,16	0,46	2,14	1,00	4	3	4	1	0	1	2	13	2,16	0,46	2,14
5	5	16	2,66	0,66	1,50	1,50	5	4	5	2	1	0	1	16	2,66	0,66	1,50
6	6	21	3,50	1,00	1,00	0,50	6	5	6	3	2	1	0	21	3,50	1,00	1,00
Min		12,00	2,00	0,40	1,00	0,50	Mean							16,00	2,66	0,66	1,68
Mean		16,00	2,66	0,66	1,68	1,00											
Max		21,00	3,50	1,00	2,50	1,50											
							H (Difference factor)							= 0,71			
							H* (Relative difference factor)							= 0,06			

Table 4. Highest and Lowest Values in Permeability Analysis of Second Floor

<u>Control Value</u>	<u>Total Depth & Mean Depth & Relative Asymmetry</u>	<u>Integration Value</u>
The space with the lowest value: 2 and 6 The space with the highest value: 1 and 5	The space with the lowest value: 3 The space with the highest value: 2 and 6	The space with the lowest value: 2 and 6 The space with the highest value: 3
		
Value Grade: high  low		

3.2.3. Visibility Graph Analysis (VGA)

Visible area analyses, which are based on the visual perception of the observer moving in the space, were assessed based on *connectivity*, *visual integration* and *clustering coefficient* parameters acquired through the Depthmap software. Also,

The visible area analyses in the ground floor were conducted based on three different layout plans containing;

- only structure buildings (without furnishing),
- items that impact circulation,
- items that impact circulation and visibility.

On the other hand, the visible area analyses in the second floor were conducted based on two layout plans containing;

- only structure buildings (without furnishing),
- items that impact circulation.

The heights of the exhibitions on this floor are also at levels that only impact circulation. As there are no exhibition elements with height that blocks visibility, a third layout plan was not taken into consideration as in the ground floor.

Connectivity value is a measure of the number of adjacent spaces directly connected to the space. This local measure is the most basic information about understanding a space. The legibility and connectivity of space is not only related to the nodes and side points that constitute a functional structure. The nature of the space constituting the node is related to its location and use. The most important aspect of the concept of connectivity is the reflection of the space's form based the visual perception it creates in the mind of the person using the space (Köken, 2018, p.33; Ünlü and Edgü, 2007).

Table 5 shows the connectivity maps drawn based on the visible area graphs of the ground floor. (The decreasing order of the colors in the visible area graph is as red > orange > yellow > green > blue > dark blue/purple). As a result of the analysis of the layout plan without furnishing, it is observed that the place

with the highest connectivity value is the area covering the region containing the elevator and stairs positioned for going up to the gallery on the upper floor in the exhibition space number 2 and the place with the lowest value is the exhibition hall number 7 which is the deepest space. In this case, the conclusion can be reached that the vertical circulation elements were placed at the most suitable locations. The passage points from the space number 1 to the spaces number 2 and 3, and the space number 5 have high connectivity values.

As a result of the analysis of the layout plan containing the elements that impact circulation, it is observed that the highest connectivity value is again at the exhibition hall number 2, however, it shifts from the area containing the vertical circulation elements to the exhibition areas. However, other locations that had the highest values in the previous graph, have a lower connectivity value with respect to that graph.

On the analysis map of the layout plan containing all the elements that impact both circulation and visibility, while the highest connectivity value is again at the exhibition space number 2, positional differences are striking. In this case, the location with the highest connectivity was the area containing the second entry point from the exhibition space number 1 to the exhibition space number 2. It was also observed that the other locations in the system also have lower values with respect to the previous graphs.

Table 5. Connectivity Maps of Ground Floor

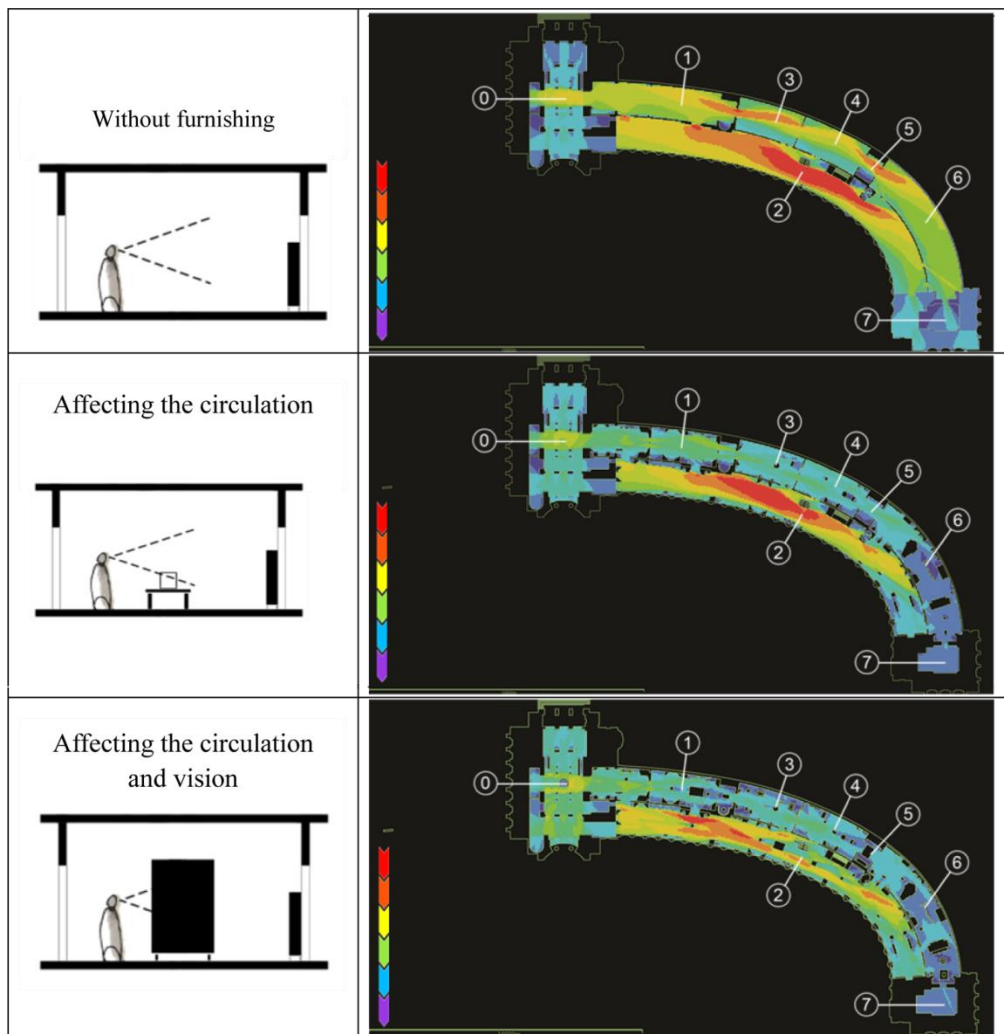


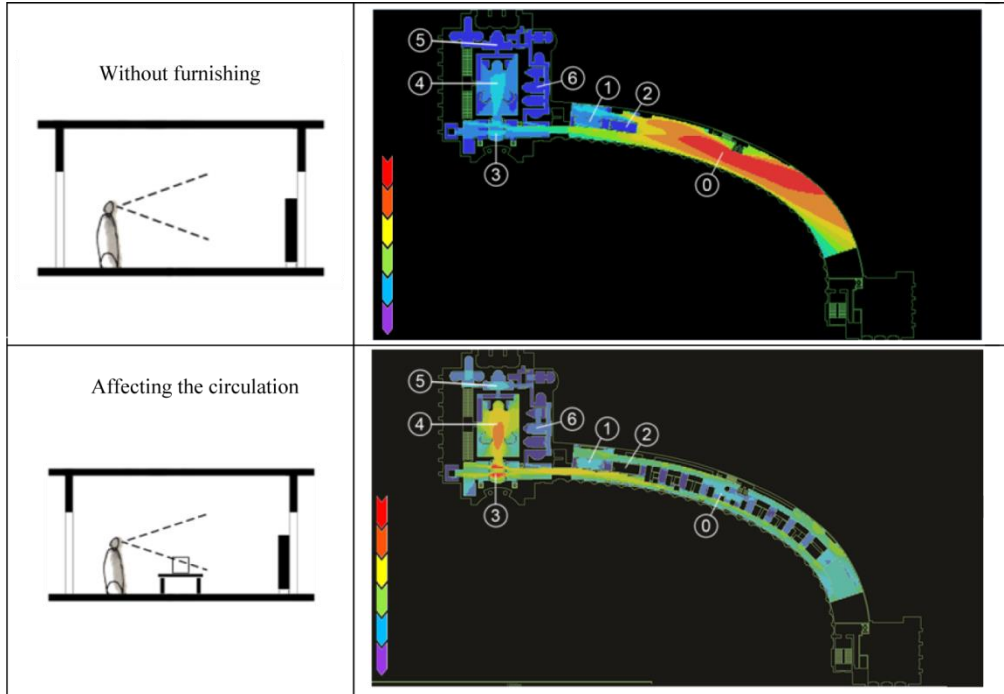
Table 6 shows the connectivity maps on the visible area graphs of the second floor. As a result of analyzing the layout plan without furnishing, the contemporary and modern architecture gallery, which is the main exhibition hall of the second floor and also referred to as the entrance space, was the

area with the highest connectivity value. The fact that the vertical circulation elements used for the entrance/exit of the space are located in this location can be interpreted as that a suitable layout was made in the spatial organization as in the ground floor. In parallel with the permeability analyses, the areas with the lowest connectivity values were the spaces number 2, 4, 5 and 6, which are the most dissociated areas that can be entered by accessing from another space.

According to the result of analyzing the layout plan containing all the elements, it was observed that the areas with the highest connectivity value are located in the passage space number 3. And the lowest values were observed in certain areas

in the spaces numbered 5 and 6 and in the main exhibition hall number 0. Two separate conclusions were reached due to the intensity of the exhibition elements and therefore, the fact that they significantly restrict circulation.

Table 6. Connectivity Maps of Second Floor



Visual integration value is a global measure that refers to the mean depth of a space with all the other spaces. Spatial integration value is the most important measure in predicting motion along a circulation line (Köken, 2018, p.34; Çakmak, 2011). Space syntax theory defines shallow spaces with high integration value as evacuation points with high visibility and permeability. These are integrated areas with high social interaction. However, spaces with less social interaction are spaces that are deep and have low interaction (Ünlü et al., 2001).

Table 7 shows the visible integration maps drawn based on the visible area graphs of the ground floor. According to the layout plan without furnishings, it is observed that the exhibition hall number 3 is the space with the highest integration value and thus, the most integrated space. This space can also be characterized as a passage space and is expected to have higher social interaction. According to the map containing the layout with the elements that block circulation, the exhibition hall number 1 is the most integrated space. In the analysis with the most realistic approach due to the inclusion of all the elements, the conclusion was reached that, similar to connectivity value, the most integrated space is the location of the second passage point from the exhibition hall number 1 to the exhibition hall number 2. The fact that different results are obtained depending on the exhibited products and other furnishment elements, indicates that the social interaction in the space is also different. This can be interpreted as that the region marked in red is the location with the highest movement and interaction.

Table 7. Visual Integration Maps of Ground Floor

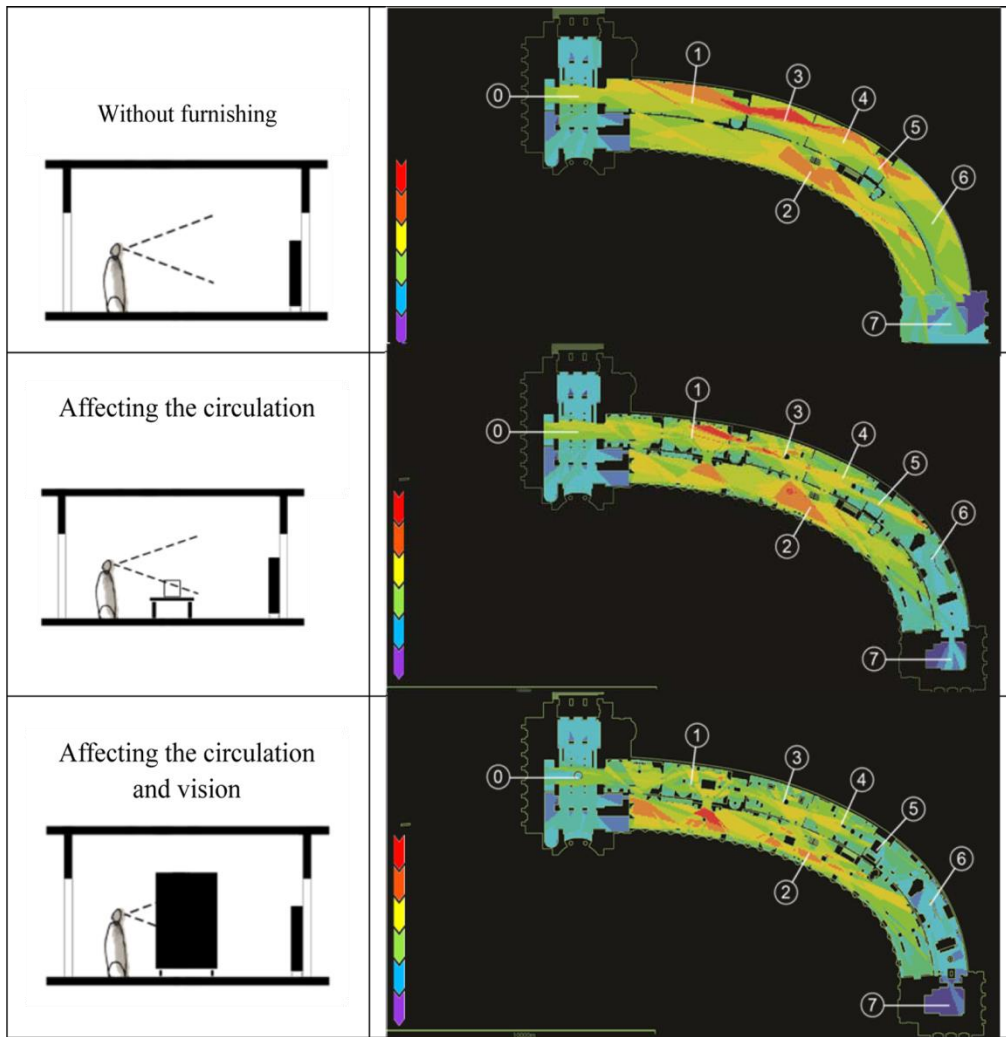
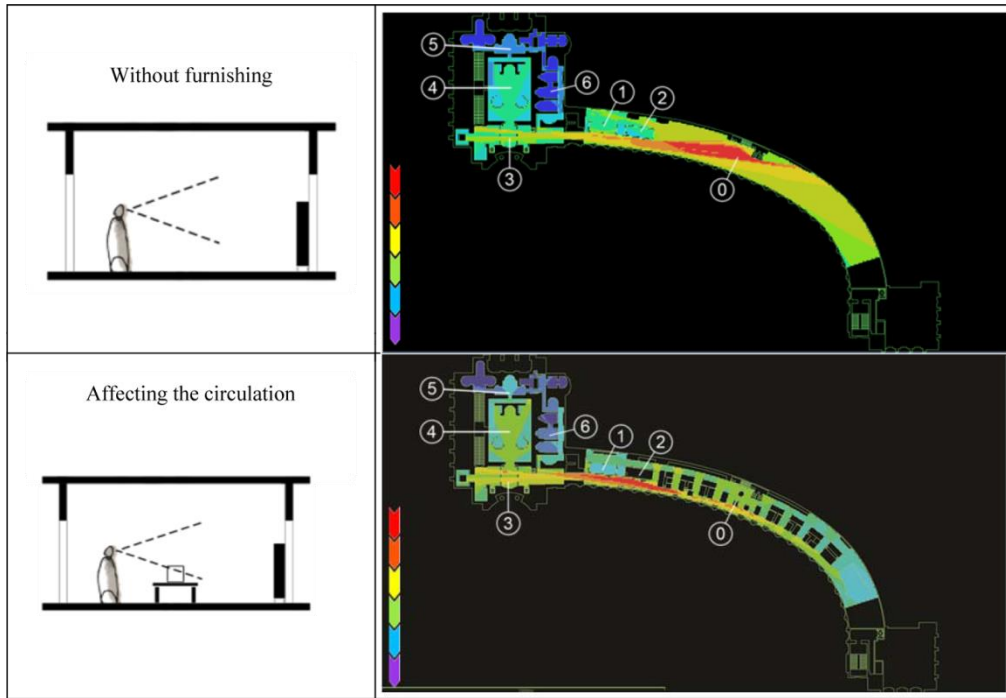


Table 8 shows the visible integration maps drawn based on the visible area graphs of the second floor. According to the layout plan without furnishings, it is observed that the left-hand side of the main exhibition hall number 0 is the space with the highest visual integration value and thus, the most integrated space. Standing out as the space with the highest expected social interaction, as a result of the observation this was the area where visitors headed most. According to the map of the layout plan containing all the elements, although the space with the highest integration was again the main exhibition hall number 0, as an area, it was the region where passage is made to the space number 3 on the front side.

Considering in terms of social interaction, it was observed that regardless of the exhibitions located in this area, the fact that it has an unmatched view of the Eiffel Tower indeed causes visitors to frequently pause and concentrate in this area.

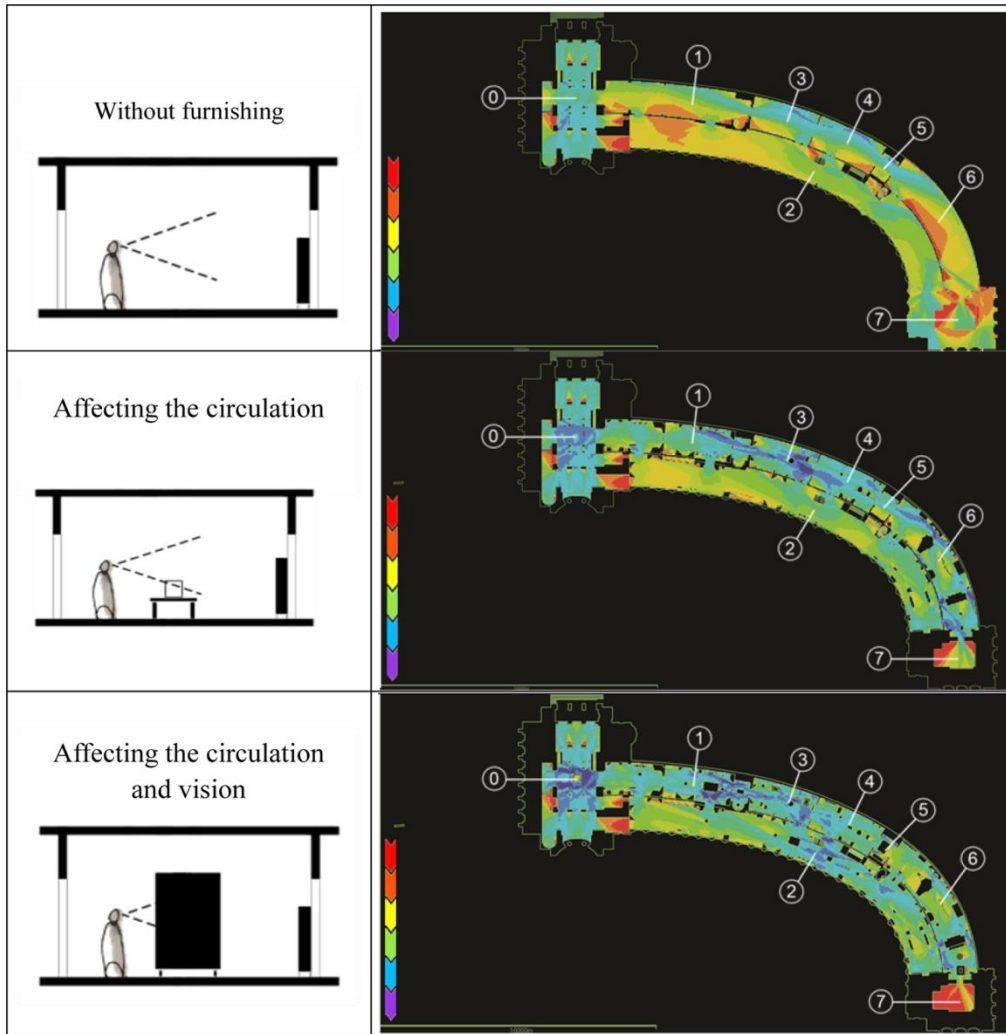
Table 8. Visual Integration Maps of Second Floor



Clustering coefficient value can be defined as the number of lines of vision between all the locations constituting the field of vision. Clustering coefficient gives a measure of the ratio of the mutually visible space inside the visibility adjacency of a point. This indicates the extent to which the field of vision remains the same and the extent to which it is lost when the observer distances from that point. It therefore indicates the rate of change of the spatial perception of the observer. Clustering coefficient is directly related to the decision-making process in path finding and touring clearly specifies the key decision points in complex arrangements (Atak, 2009, p.44). Depending on the movement of the user within the space, coefficient clustering has low values at locations with decreasing visible areas when distancing from the space.

Table 9 shows the clustering coefficient maps drawn based on the visible area graphs of the ground floor. According to the map of the layout without furnishing, the locations with the lowest value were observed to be the passage points between the exhibition halls number 3, 4 and 5 and the spaces.

Table 9. Clustering Coefficient Maps of Ground Floor

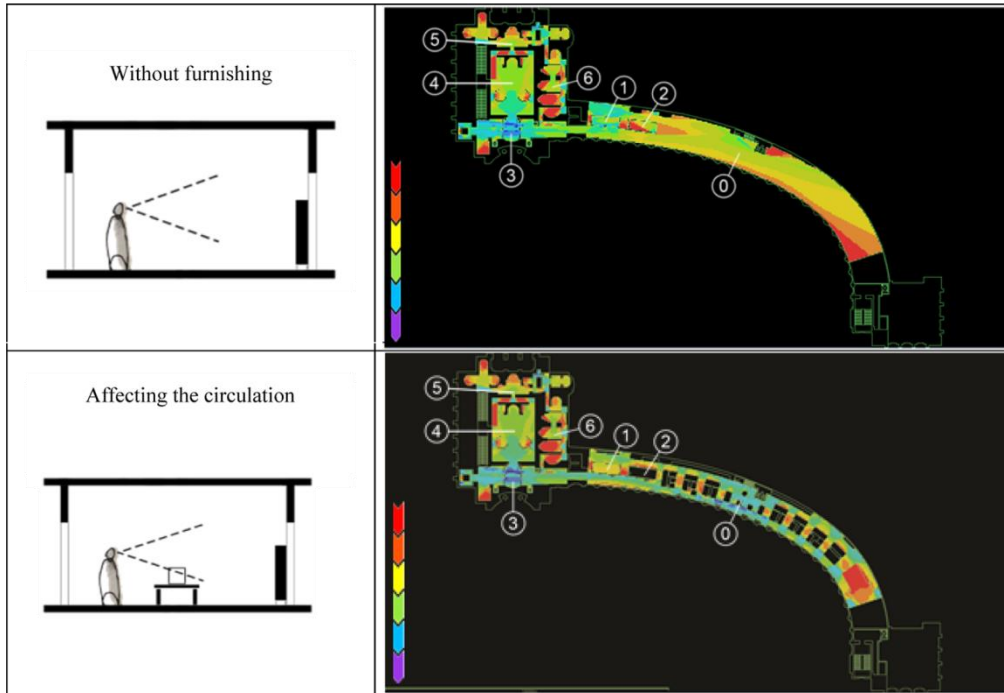


As result of the analysis of the layout plan containing the elements that impact circulation, it was observed that more areas with low value were created. However, the areas where low values were concentrated were the spaces number 1, 3, 4, 5 and 6, similar to the first graph.

The fact that the map of the layout containing all the elements, also includes exhibition elements at heights that block vision, has caused different results to be received with respect to the previous graphs. According to the analysis results, it is striking that the exhibition hall number 2 and the center of the main entrance of the structure also have low-value locations. This result is expected to cause people to encounter more locations of indecision.

Table 10 shows the coefficient clustering maps drawn based on the visible area graphs of the second floor. According to the layout without furnishing, the region with the lowest value is located in the passage space number 3. It was observed that the other sections outside this area had close values. According to the map of the layout plan containing all the elements, areas with the lowest value are observed also in certain sections of the main exhibition hall number 0 in addition to the passage space number 3 on the layout plan without furnishing. These areas correspond to locations from which entry is made to the space through vertical circulation elements.

Table 10. Clustering Coefficient Maps of Second Floor



Areas that take low values of clustering coefficient are foreseen to be the locations where the visitors will have the most indecision. As a result of the observation, it was observed that visitors had the most indecision regarding way finding in these locations. Therefore, in addition to spatial planning, elements such as guiding signs and graphic systems to assist visitors in way finding are required particularly in these locations.

The fact that the measured parameters gave different results depending on different layout plans indicates that elements that impact circulation and visibility are also items that should be taken into consideration during the design stages of spaces.

4. Conclusions and Recommendations

Discussing the interaction between visitor behavior and space in the case of architecture museums, this study showed that spatial configuration caused preferences in visitor behaviors.

Spaces have been assessed based their mutual passing relations according to the justified permeability graphs prepared as part of the permeability analyses. Assessing the relations between the spaces in the ground floor with respect to the entrance space, it was observed that the spaces in the system mostly have distributed and asymmetrical property. According to the justified graph created for the second floor, the spaces here mostly have non-distributed and asymmetrical property. The fact that while all the observed visitors toured the ground floor but not all the exhibition spaces on the second floor, enables distributed spatial organization to be interpreted as more successful.

Within the scope of Space Syntax analysis, visibility graph analysis of museum spaces were made over three parameters: connectivity, visual integration and clustering coefficient. When the areas with the highest connectivity value are assessed

without furnishings in both floors, it shows the areas where the vertical circulation elements are located. However, when all the exhibition elements are placed in the space, it was observed that the areas with high connectivity shifted elsewhere (Table 5 and Table 6). This indicates that the vertical circulation elements were placed in the most correct location with the highest connectivity when spatial organization was performed at the very start of the design; however, it lost this value with the placement of the exhibition elements. Assessing the connectivity value of the museum in general, the conclusion is reached that particularly common areas have a good level of accessibility. Examining the visual integration values, it is foreseen that spaces with high integration will have the highest movement potential. As a result of observations, it was also determined that spaces with higher integration value had more visitors. However, it was observed that context also influences the space preferences of visitors. Particularly in the second floor of the museum, it was observed that regardless of the exhibitions, the locations where the Eiffel Tower entered the field of vision from window openings, were points where visitors concentrated due to the preference to view the scenery. Examining the clustering coefficient values, considering that low values will be at points where a visitor will have the highest loss of visual information depending on his/her movement, these locations are expected to be the regions with the highest indecision in way finding. Compared to the observation results, it was found that it substantially coincides with the analysis results of points where visitors were in indecision the most. It was determined that clustering coefficient value is an important parameter in spatial planning in terms of achieving correct results.

Generally assessing all the analyses, the conclusion can be reached that the permeability and visible area structures of the museum coincide with each other. The fact that certain discrepancies arise when the parameters other than the clustering coefficient values are compared with the observation results, shows that personal factors including perceptive and cognitive

processes are also effective as much as environmental factors on the behaviors of visitors.

According to the results obtained in the study, it is considered that elements that impact circulation and visibility should also be taken into consideration when developing spatial configuration. Bununla birlikte, sergileme elemanları yerleştirilirken

In the light of the information gained in the study, environment has also stood out as a significant data in spatial configuration and visitor behaviors. It was observed that the inclusion of environmental factors such as view and daylight are effective particularly on the spatial preferences of visitors. Therefore, it can be stated that establishing a strong relation with the environment in spatial configuration, impacts the time spent in spaces and therefore, user behaviors.

It is considered that spatial configuration has a privileged importance in architecture museums where a strong relation is established regarding the interaction between space and humans. This is because, a space aiming to convey information about good examples of architecture, would itself be expected to be a really well-setup space in terms of its purpose and architectural design. The ability of visitors to tour it without much confusion, without concern over finding way and without much effort to reach the desired work is a significant problem in terms of spatial setup in architecture museums. The correct design decisions to be given in accordance with this problem will reflect onto the spatial behaviors of visitors to ensure that they experience a visit with higher quality.

The lands of Anatolia, which hosted many civilizations due to its geographical and geopolitical location, have a very rich history and cultural heritage. Accordingly, it can be stated that despite the presence of more than one hundred museums exhibiting works on various topics, the lack of an architecture museum where the mentioned heritage can be conveyed by viewing, experiencing and sensing, is a significant deficiency. It is hoped that the works to establish an architecture museum, which have been on the agenda for some time and for which various attempts were made, can be realized as soon as possible and it is considered that once an architecture museum is established in Turkey, this study will make a contribution in the context of spatial organization and space-visitor interaction.

5. Acknowledge

This article is based on the author's Ph.D Thesis completed under the supervision of Assist.Prof.Dr. Fehime Yeşim GÜRANİ at Çukurova University in 2020.

This study was also supported by Çukurova University Scientific Research Projects Unit with the number SSY-2017-7792 within the scope of the doctoral thesis project.

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