Architecture
Image Studies
AIS Scientific Journal

Vol.4 , Issue 1, Turkey Architecture Studies, 2023

The Relationship between Circulation and Space in Architecture: An Investigation on the Integration of Supermarkets in Shopping Centers

Mohammadreza Adibi, Istanbul Aydın University, Master of Architecture,
mohammadrezaadibi@stu.aydin.edu.tr

Abstract

It is aimed to rank the installation forms in terms of the entrance area in terms of which actions should be at the forefront in the organization of the space, and to examine them in order of importance, to analyze and report on the selected shopping centers comparatively. Known as a temporal and perceptual concept that connects the sequences of spaces or different indoor and outdoor environments, circulation is one of the broad and very important issues in architecture and has become a design discipline that must be done within the framework of certain standards. In looking at the circulation structure framework, the way it is perceived, its main components, forms, horizontal and vertical planes and phases during use all play an important role in architecture.In this research, the relationship and interaction with the user, functionality requirements and accessibility levels of selected shopping malls in terms of circulation integration, for example; the relationship of the orientation areas from the main entrance of the shopping mall to the supermarket entrances with circulation or the parking area and the circulation line of the users will be. In this research, it is aimed to review the literature, examine selected venues (Kanyon Mall, Zorlu Center Mall) in the context of the principles of the circulation layouts, observe the clarity and perceptibility levels of the venue, document it by taking photographs from the selected places, and examine the examples.

Keywords: Architectural Space; Circulation; Motion; Supermarket; Shopping Centers.

Introduction

As one of the most important building components of architectural art from the past to the present, the circulation network system has undergone many changes, whereas new approaches, social behavior and many functional actions, optimal use and visual beauty depending on the user have emerged. It shows differences with circulation derivatives and for the purpose of the space. Examples of these spaces are comprised of residences, commercial areas, shopping malls, office buildings, terminals, and metro stations.

Since ancient times, circulation has been an important factor from the formal, conceptual and semantic context in the design process from the city scale to the building scale, becoming an important structural element that integrates spaces, experiences space as it performs the act of circulation and undertakes the function of transition from space. Concurrently, it is a significant component of the space, affecting its users physically, socially and psychologically in their experience and perception of the space.

It is equipped with interrelated space classes where users in shopping malls perform various and different social activities (socializing areas such as cinemas, cafes, restaurants, fast food and entertainment venues, playgrounds, supermarkets, etc.). With the inclusion of supermarkets, which have become a part of malls, into the circulation system, different requirements have arisen in terms of design discipline and service in these areas. In such venues, the plan layouts of malls are an important and impressive factor. Malls are examined under three main headings in terms of plan layouts. (Verdil, 2004).

Bedestens (a word of Persian origin, it is the name given to

large dome-covered structures and usually rectangular in plan, built for the sale of valuable goods), appear as traditional shopping venues. What we encounter is the 'cartesan' plan layout. Comprised of shopping blocks in a grid structure and circulation areas following each other rhythmically and occuring within the axis system buildings with this layout are spatial organizations where the shopping action occurs within the space. The second plan layout in the mall design can be defined as 'tree' or 'branch.' These types of shopping structures are referred to by this name because their circulation areas resemble branches that separate from a trunk, while reaching other space patterns from the entrance space. The final plan layout in the mall design is the 'dumb-bell' system based on mutual attraction, which is the most common type in current shopping mall structures. The elements comprised of this attraction system are usually the supermarkets located at the corners or bottom points of shopping malls.

Regarded as usage areas, the circulation line of the supermarkets in the shopping malls and the relationship between the spaces also emphasize the dynamic and statistical relationship of the building and show differences in accordance with its function. Thus, they can separate the usage areas, pass through, or end in it, and can make the venue more defined.

The aim of this research is to define and exemplify the concept of circulation and its types, the compatibility of circulation relations in the context of the spatial setup of the supermarkets within the shopping malls (AVM), the usage percentages of the circulation and access facility, the design disciplines for user needs, the design and plan scheme of the supermarkets with the shopping malls. It is aimed to analyze the circulation integration and which forms they are considered as modules on the plan chart.

The meaning of circulation

Architecture is the building element that connects a building or environment to each other and provides circulation, organizes spaces with each other, assumes the function of transition in the inner environment, as well as provides spatial transitions such as roads, streets, streets, atriums, passages, galleries, sofas and halls, and the connection between them.

According to Hasol (1993), the term 'circulation' is defined as "the circulation of users at the building scale and within the space, the vehicle traffic on the roads and the circulation of water in the installation system at the city scale."

Circulation is an integral component of building organization in structure design and is an abstract concept implying the existence of a space and an action (person and time). The circulation percentage determines the maximum use of the building volume and space. (Silviera, 2016).

Circulation should not be considered as just a linking function, otherwise circulation areas will turn into spaces like infinite corridors. The dimensions and form of the existing venue are effective in the design of the circulation area and encourage the users to dynamism and movement. (Ching, 1979).

In the experience of a building, circulation's relationship with the venue, the configuration of the venue with another venue, the relationship of the venue with the structure, the structure with the natural light, the definition of the unit, the balance and hierarchy of the building, the environment of the building and the relationship of the environment with the city on a micro-scale, a concept that adds up to the macro-scale and says there are three main factors in the formation of circulation areas. (Ataoglu, 2009). These factors are listed as follows.

- Physical: (ratio and proportion, scale, illuminated colored texture, composition and climate.
- Socio-Cultural: privacy, hierarchy, tradition and culture
- Psychological: Perception, orientation, movement and intersection

Ala (2002) states the circulation system consists of transportation, circulation and access points, circulation spreading to the building scale, circulation of pedestrians and vehicles at the city scale. He assesses the circulation system at the building scale in the table (Figure.1).

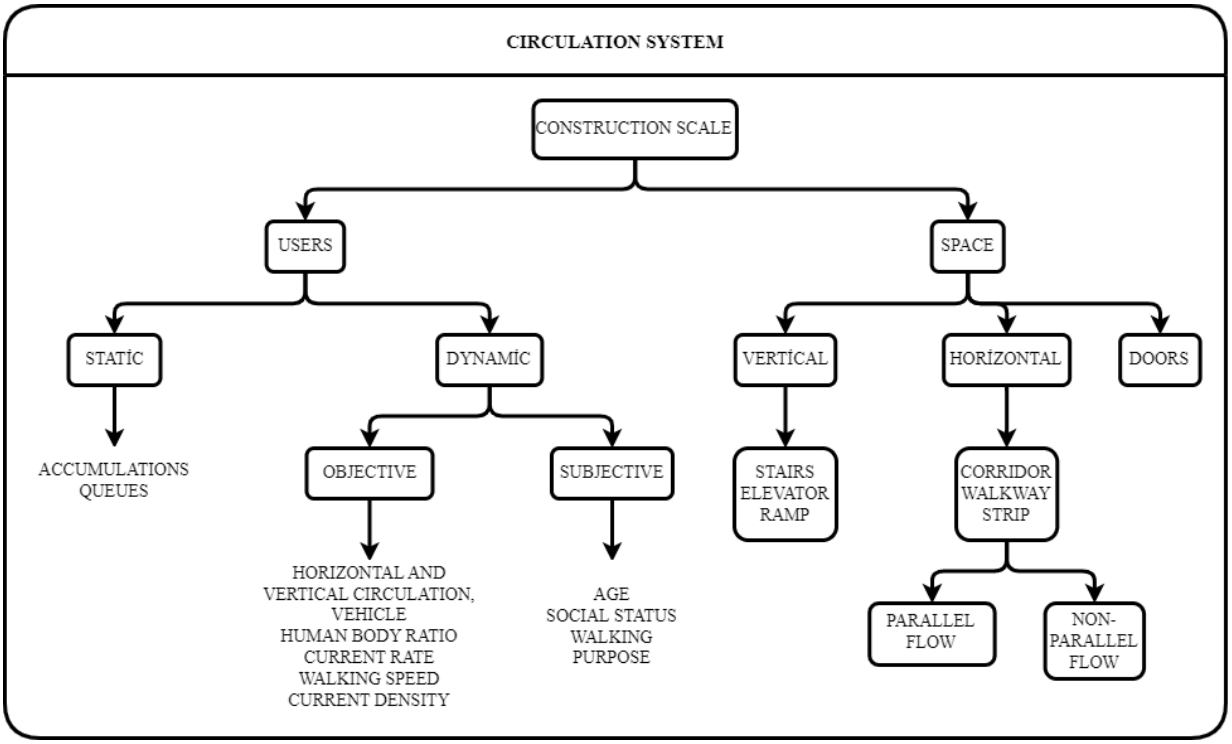

Figure 1. Circulation was taken from the system and rearranged (Ala, 2002).

According Kazanasmaz (2004), the structure elements comprising of the circulation system can be listed as: halls, stairs, ramps, escalators, moving platforms, moncharge and elevators starting from the main entrance door.

Floor differentiation at malls, spatial dimensions, functional reinforcement elements are effective in circulation setup and one of the important factors in architectural and interior design for the user to find direction. (Açıcı, 2018).

Vertical Circulation

They are fixed or movable building components designed for users of the existing space to easily access the connection between different heights and vertical movements in the shortest way, and provide the best possible way through stairs, escalators, ramps and elevators. Since the physical environment constituting the actions of the users differs, these building components are based on the fact that the users provide the link between the spaces without tiring, and that they are durable, safe, comfortable and economical.

The concept of circulation is one of the factors that is an architect or designer's most formal, physical and originally artistic phenomenon in the emotional context. When we act upon the circulation tools (vertical or horizontal), it can affect the emotions and orientations of the users. (Rockwell, 2018).

Figure 2. The Roy and Diana Science Center URL-1, 2016

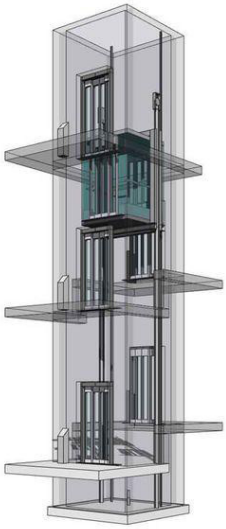

Figure 3. Elevator detail. URL-2, 2021

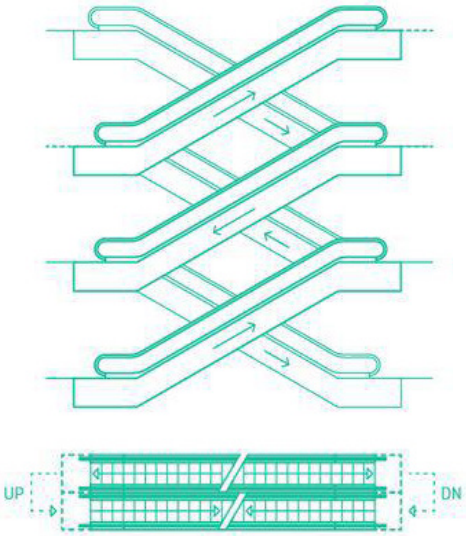

Figure 4.Dimension guide, escalator URL-3, 2021

Horizontal circulation

This constitutes a linear layout since it has the maximum viewing distance from the circulation basic systems (Hillier, 1996). It can follow a direct or random order within the scope of a sequential or axial order. It can be accommodated in various venue organizations, such as wide or narrow, short or long. Linear systems can differ in symmetry in the organization of functional units. (Natapov, 2019).

They constitute building components that provide the relationship and spatial transitions of the spaces on the same floor and its surroundings, with each other and the connection between the atrium, passage, gallery, antechamber, hall, etc. (Ala, 2002).

Figure 5. Vatican Museum, Italy URL-4

Figure 6. Robbin Chapel, Japan URL-5v

Minimizing and following the distances in horizontal circulation design is a decisive factor in the building's geometric form and mass. In this type of circulation, the area that users can access and cover, the direction they want to go and the main routes can be divided into different types. Firstly; according to the direction of horizontal or vertical movement, (Direction of movement). Secondly; according to their usage types, public or private places (Type of use: public or private). The third type of use; Frequency of use is common and for emergencies. Finally: it is defined as the usage phase and time period (time of use) (Hamer, 2015).

In the context of the neighborhood principle, venues in the circulation plane can share a common area or be linked and separated into a common area in terms of visual and spatial continuity. Having a linear configuration, the circulation area has the ability to directly associate spaces and link unrelated spaces to each other. (Ching, 1979).

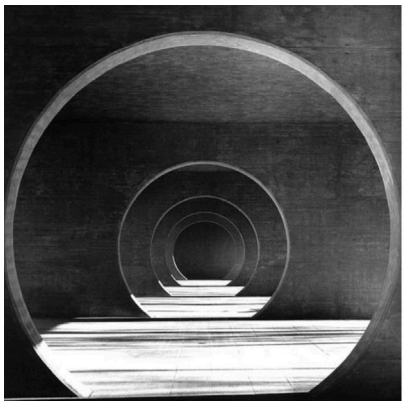

Figure 7. Casa Rotunda, Mario Borata, 1969. URL-6

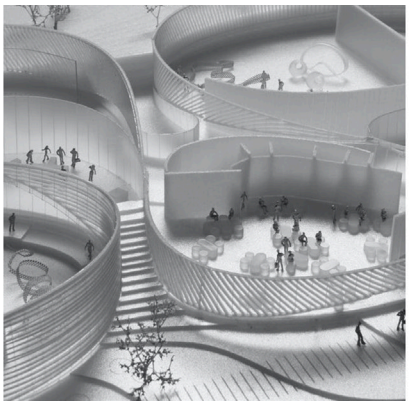

Figure 8. Human Body Museum, France 2013.URL-7

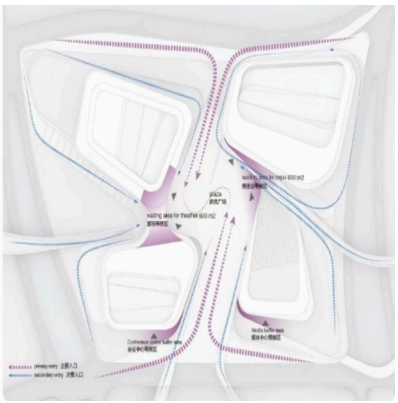

Figure 9. Plants Fair, China 2014. URL-8

As shown in the Manisor work in Fig. 9, the circulation area can be passed between two spaces, it ends with entering the space, and the atrium space between the two buildings creates and defines the aura of the space by using natural light to create different textures in the space. It also includes the concepts of static and dynamic space, as in Fig. 10, as it functions as a delimiter, a separating plane and links venues between floors, and continues to function as a transition element and enables users to perceive and experience space more clearly. (Ataoglu, 2009).

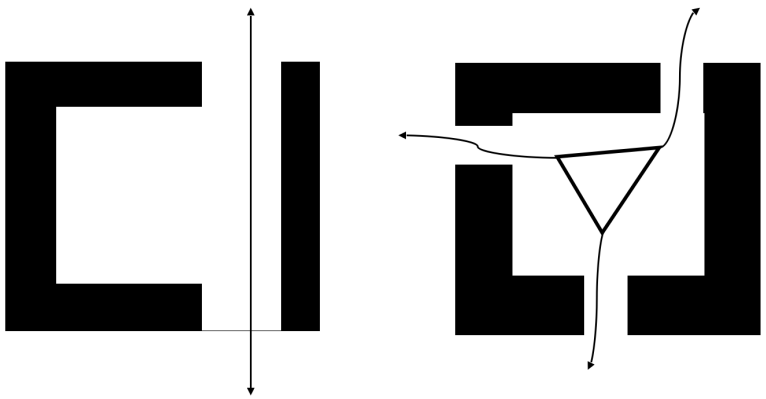

Figure 11. Static and dynamic space. (Ataoglu,2009)

Circulation configuration formats

As one of the most important components of the architectural design process, circulation design is listed in five main categories. These configuration forms, the organization and use of space by the users are considered as the most attractive and active area of the built environment. (Clarck, 1996)

Configuration styles highlighting the circulation relationship can be defined as linear circulation, central circulation, dual-centered, clustered, nested, concentric, dual-core, and complex. These circulation forms are exemplified by visuals.

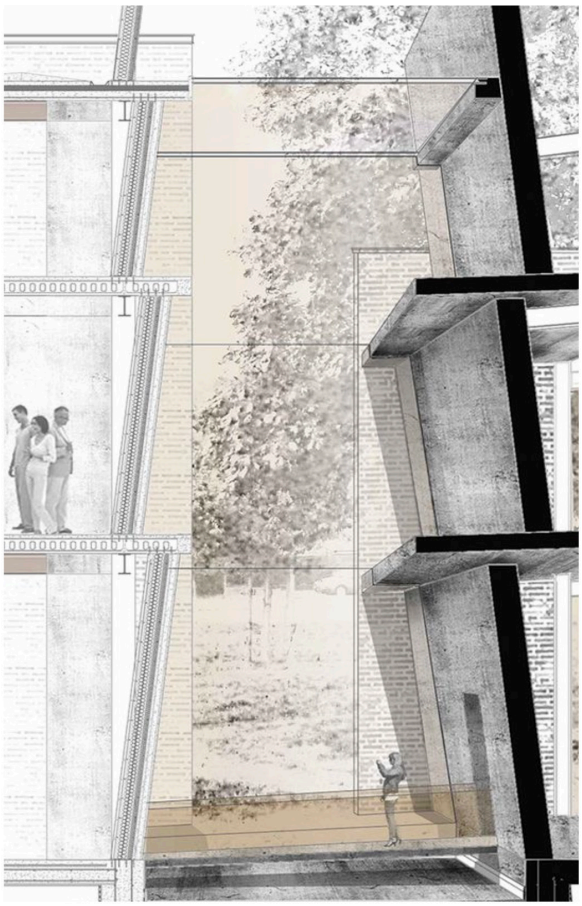

Figure 10. Venue Relation, Cali Manisor, 2017. URL-9

Linear Circulation

As the most basic type of circulation, linear circulation can accommodate various spatial features that progress in a linear, sequential manner and extend to an axial order. Linear circulation can be wide or narrow, short or long. Divided into two groups, this circulation system aims to provide a transition to the venue, with the feature of linking the spaces in the first layout. In the second layout, it completes a single space on a linear plane, experienced by the user. Concurrently, linear system functional units may differ as they demonstrate a symmetrical action in a single or multiple circulation organization.

Figure 12.. Sliska Avenue Poland.2017. URL-10

Figure 13. Sliska Avenue, Poland. 2017. URL-11

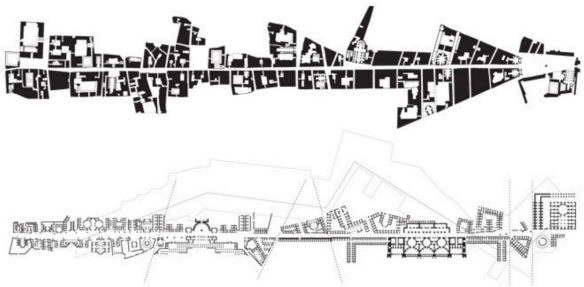

Figure 14. Formal analysis. Urban diagram, Bryan Maddock. 2014. URL-12

Figure 15.. Lucy Vete. 2017. URL-13

Central circulation

In this type of circulation composition, since it consists of many venues around a central, focal venue, the secondary venues appear equal in terms of their function, form and dimensions. Being integrative, spiraling, collecting and directing, which assumes the function of transition between spaces from the starting point, they provide wide transition areas for users, while having become an important design discipline for them to perceive the space more clearly.

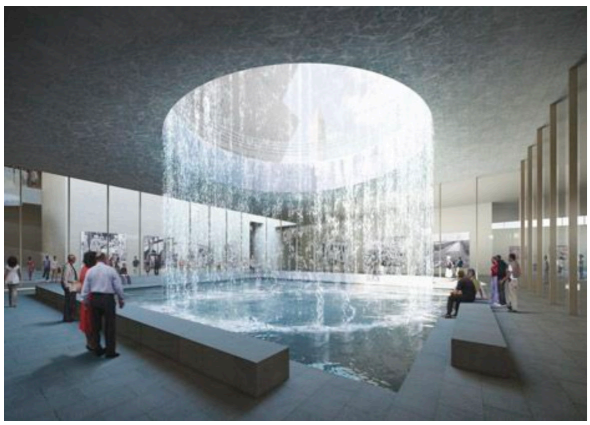

Figure 16. African - American Cultural Museum. Smith Group.2012. URL-15

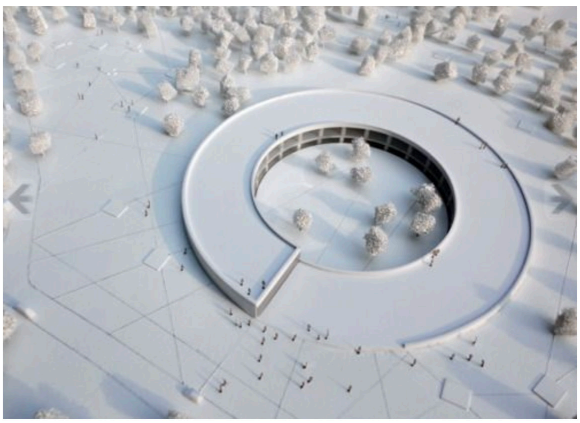

Figure 17. Red House, Canada, 2013. URL-14.

Figure 18. French gardens. 17th cent. URL-16

Figure 19. Burj Khalifa, 2013. URL-17

Nested circulation

Nested circulation configurations are circulation patterns in which each space is sequentially contained within the next and larger unit, so that each unit has a different center.

Figure 20. Belval, Luxembourg. 2018. URL-18

Figure 21. Arts and Culture Building, Beirut 2009. URL-19

Concentric circulation

Concentric circulation types are defined as configurations in which each circulation area is located in succession to the next larger circulation area, so that each unit has the same center.

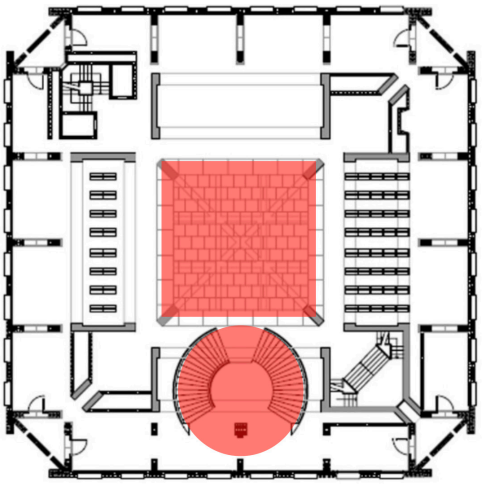

Figure 22. Exeter Library. Louis Kahn. 1972. URL-20

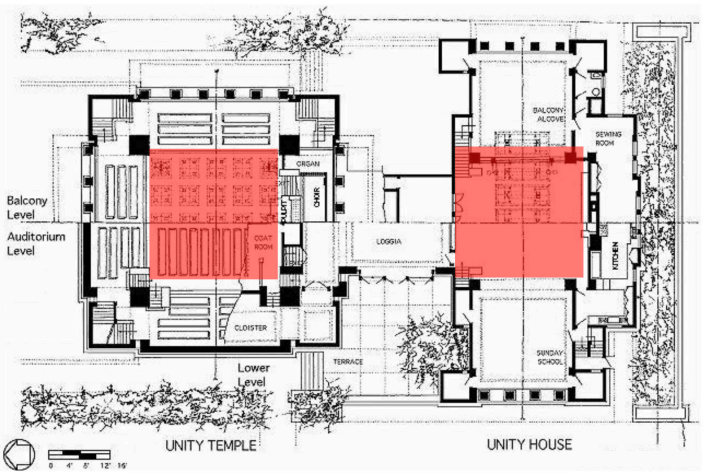

Figure 23. Unity Temple. F.L.Wright. 1908 URL-21

Binuclear circulation

In this type of circulation composition, it provides the link between the components in the inner cores of two equally dominant separate venues with the main use or a bridge, the separated but one-piece form with a single entrance area. As with the Salk Institute, dual-core circulation elements can be arranged in a venue or a void, two different geometries can be drawn up, positive and negative forms can be constructed as a common function and show differences.

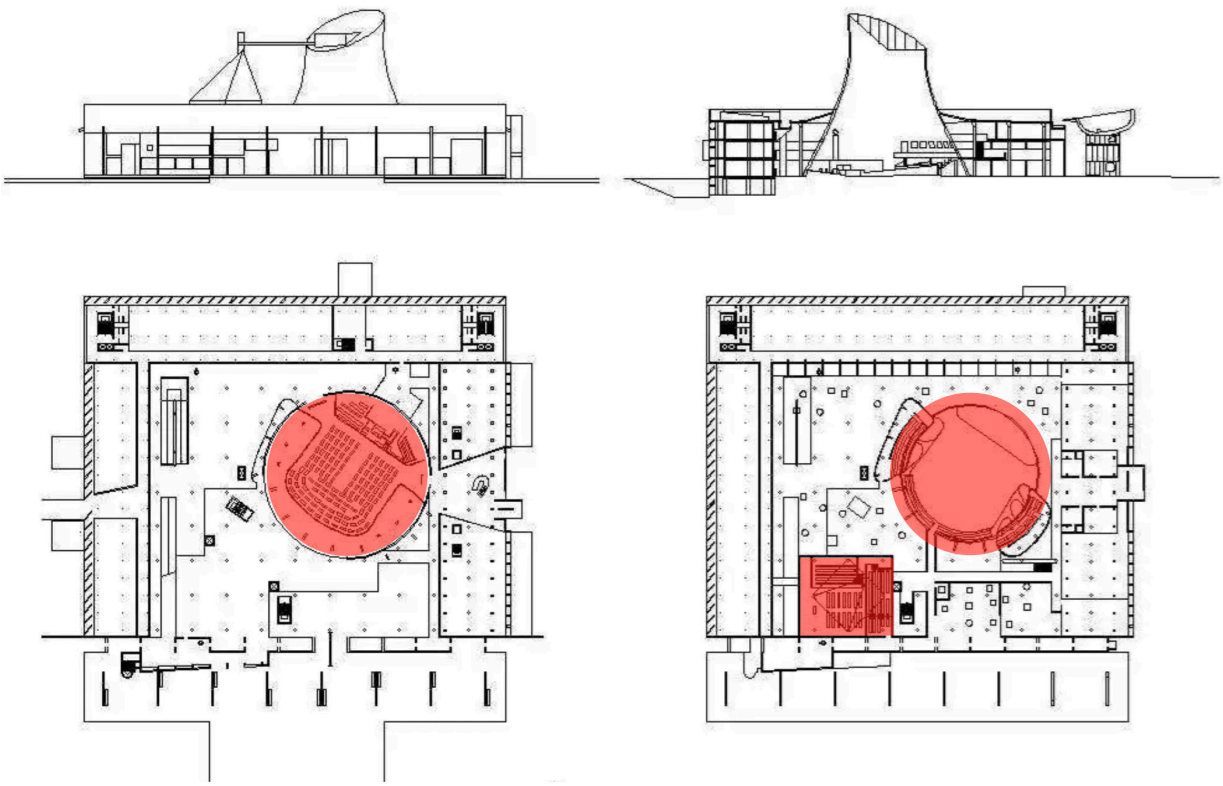

Figure 24. The Place of the assembly, Le Corbusier, URL-22

First Case Study: Kanyon Mall

In analyzing the Kanyon Mall, which is an example of urban interior, determining its relation with the city and transportation areas, pedestrian entrance areas, arrival distance to the supermarket area, service areas, parking area, shopping mall as (goods acceptance, storage, distribution and service) plan will be examined. They are shown in different colors in Figures 25 and 26.

Mall plan analysis, placement of spaces and circulation lines are separated. It is observed that it features a central and dual-core approach in circulation design. In this design approach, it provides the transition between venues and enables users to orient themselves to other venues around a focal point.

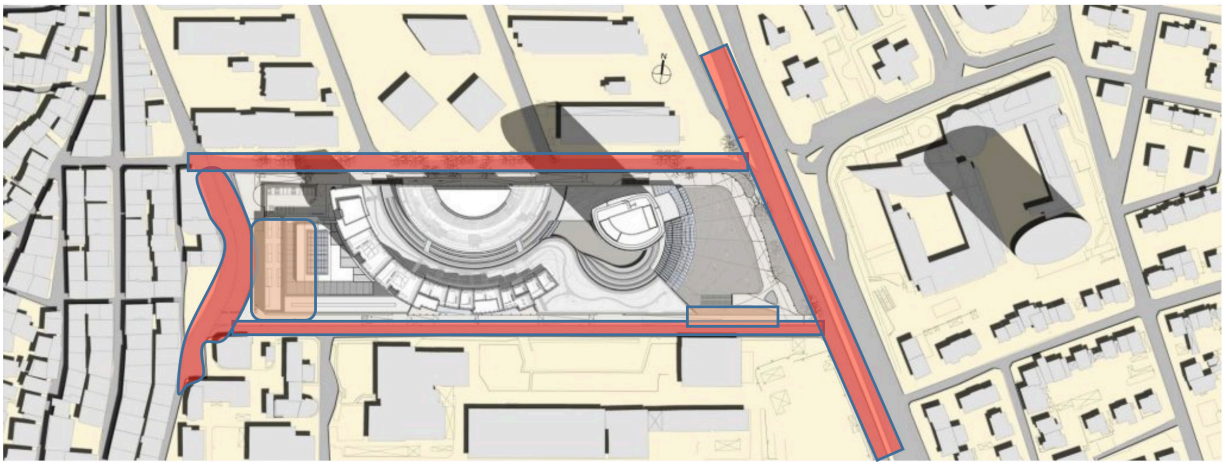

Figure 25. Kanyon property plan and transportation grids. URL-23

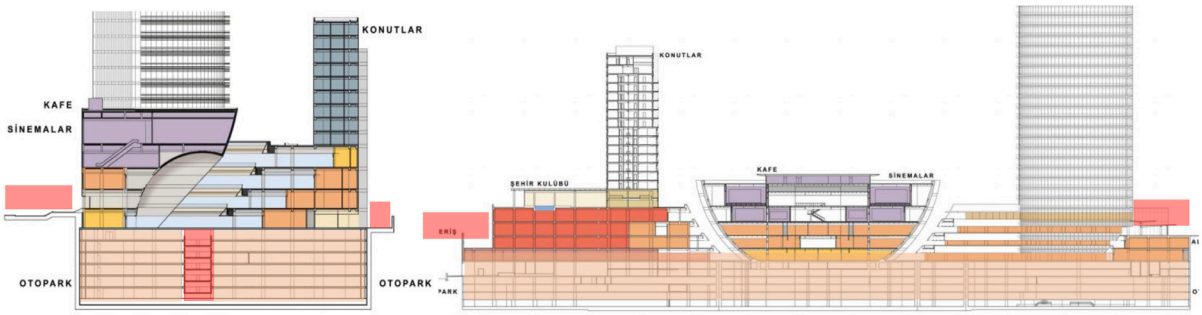

Figure.26. Kanyon Transport points Main entrance and carpark area, URL-24

Transport points
Main entrance and carpark area

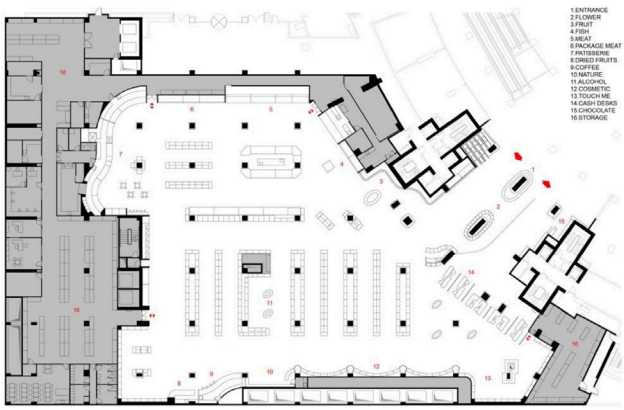

Figure 27. Muum Architects, 2006, URL-25

Figure 28. Muum Architects, 2006, URL-25

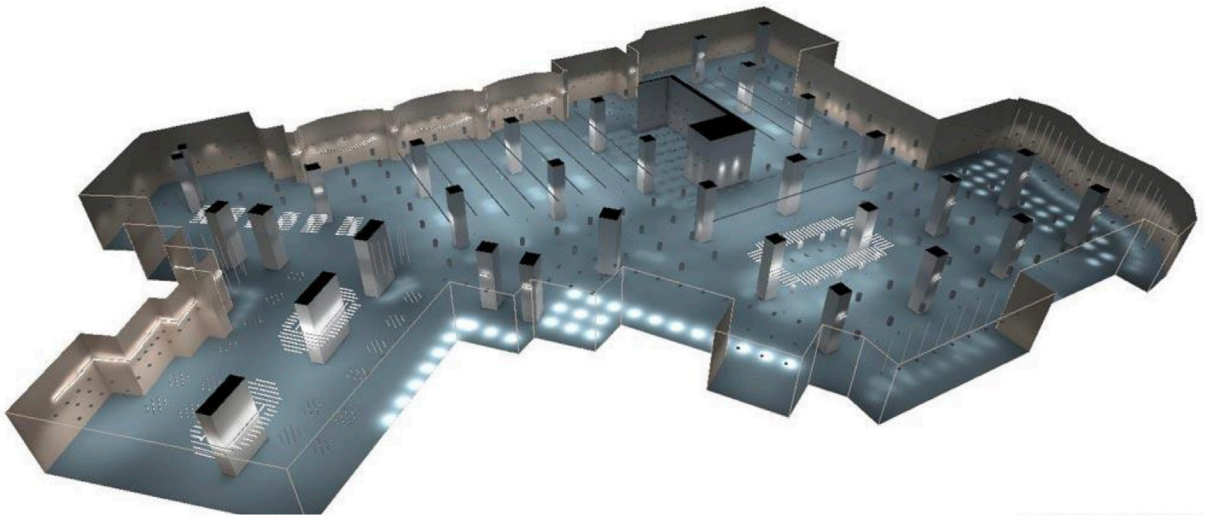

Figure 29. Muum Architects,, 2006, URL-25

The fact the central focal point is radial creates a mutually different action plan and dynamic venue concept. On the other hand, by making use of different vertical circulation tools (elevators, stairs, moving walkways and escalators), a design discipline is discussed in organizing the movements of users between different venues and different floors and experiencing the whole venue. Located within the mall, Macro Center supermarket is an approach made for the users to walk around or directly leave the place, where the indoor and outdoor relationship is established before or after shopping by using the circulation network of the venue.

As First Prize recipient of the 'Retail Renovation in the Supermarket Category' in 2007, Macro Center was designed to allow users to experience the venue and easily access the products, and to be product-oriented. Flexibility and functionality in the venue were brought together and solutions were developed according to demand. Having a linear circulation discipline in the layout and suspended ceiling movements, this space becomes more defined.

The store's needs, such as the car park circulation area, receiving, personnel entry and exit, product storage and distribution, packaging flow through a vertical freight elevator, were all designed in a manner that this bustling activity would not be perceived by the user. Likewise, the user entering via the car park can access the main venue on foot by using the moving walkways and the elevator. Thus, circulation within the venue is provided by means of both the internal and external environment. Studies in this area have been photographed and documented.

Figure 30. Plan pedestrian circulation area up to Macro Center at Kanyon Mall, Adibi 2022

Kanyon Mall Macro Center Transportation Line

Featuring double entrances, the Kanyon Mall and Living Center starts from the main entrance door on the main street ground level; pedestrian entrances reach Macro Center, accessing the supermarket from the ground level, via vertical circulation vehicles, (escalators and elevators) to reach the -2 level and the mall's main center circulation line. A walking distance is observed up to the square and the second entrance gate. If users come with private vehicles, they can use the private parking lot in the Macro Center area on p4 level. Users entering from the car park can access the supermarket area directly, thanks to the location of the Macro Center near the parking level.

In an interview conducted with the store manager, the reason why the Macro Center is located on the -2 level is generally because various household appliance stores are located on this floor area and the direct use of the second exit becomes one of the important issues. of Macro Center's neighboring department stores are identified as Paşabahçe, Jumbo and Godiva.

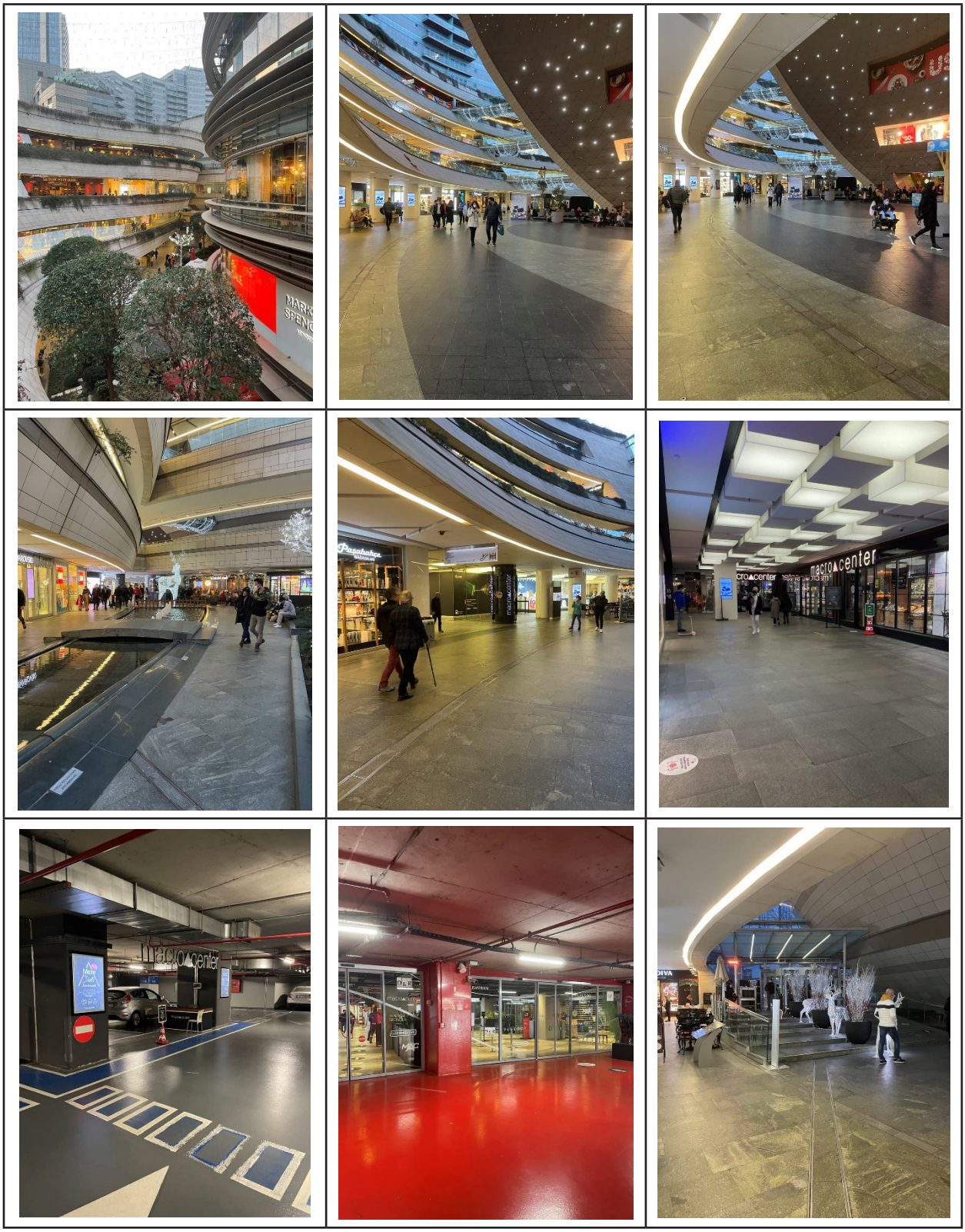

Figure 31. Macro Center parking lot, pedestrian circulation area and second exit point of Kanyon Mall. Adibi 2022

Second Case Study: Zorlu Center Mall and Wellness Center

In examining Zorlu Center, it features a public space and a complex design, it is generally known as a living urban environment that fulfills social needs and lives. While this complex structure with different transportation routes allows its users to experience circulation and routes in different places, a linear circulation type is observed in the circulation design. There are shops located around the venues with a courtyard layout, promenade and cafe areas in the center area. On the other hand, it provides movement between floors and allows different space experiences, thanks to various vertical circulation mediums (elevators, stairs, moving walkways and escalators).

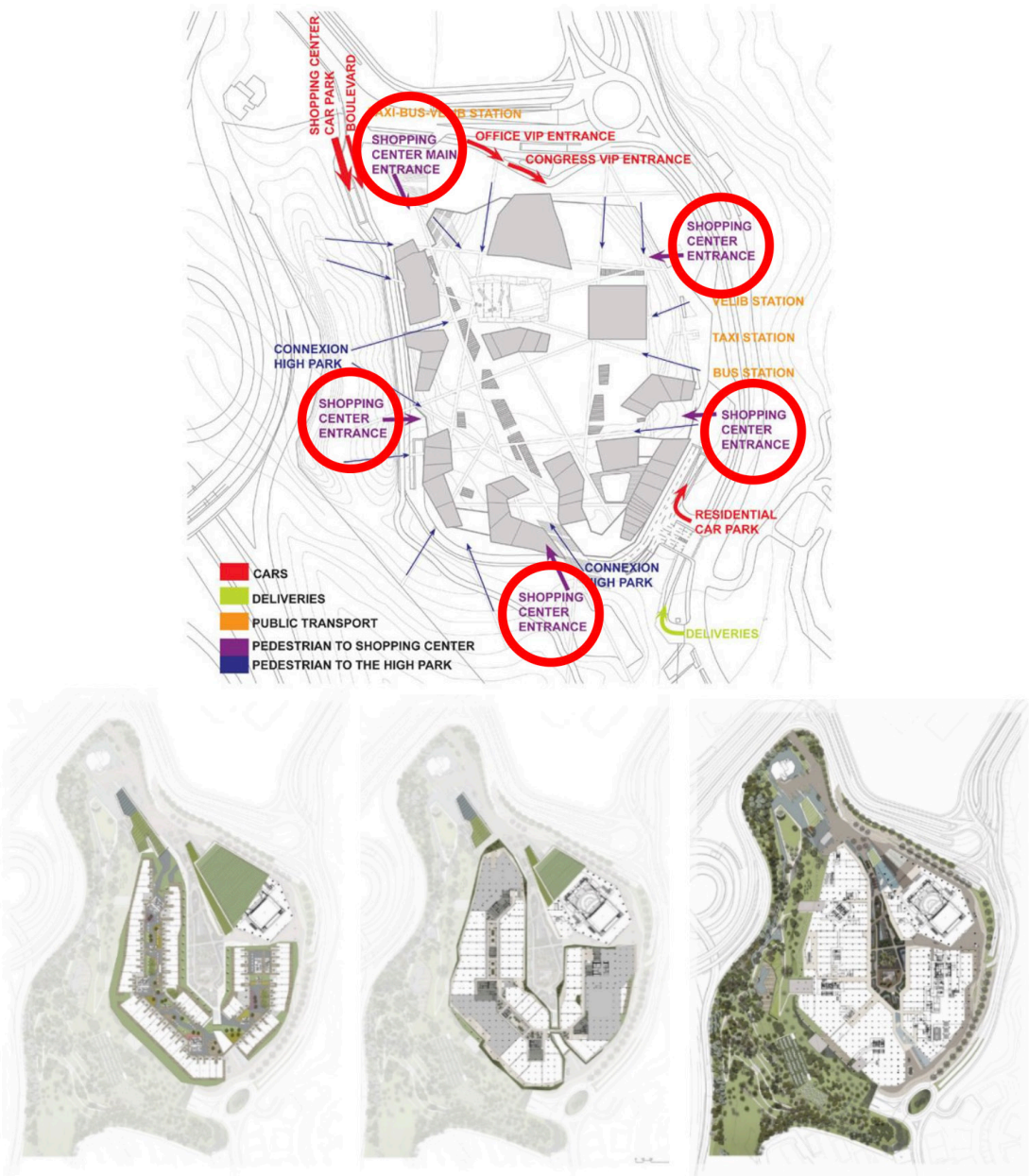

Figure 32. Zorlu Center, 2013, URL 26-27

Suggestions have been developed to reinforce the shopping mall area, which is divided into different pedestrian and vehicle entrances and floor blocks, as well as the metro connection, the pedestrian approach from the outside and transportation hubs via the Zincirlikuyu Metrobus and Zengintepe Metro Station.

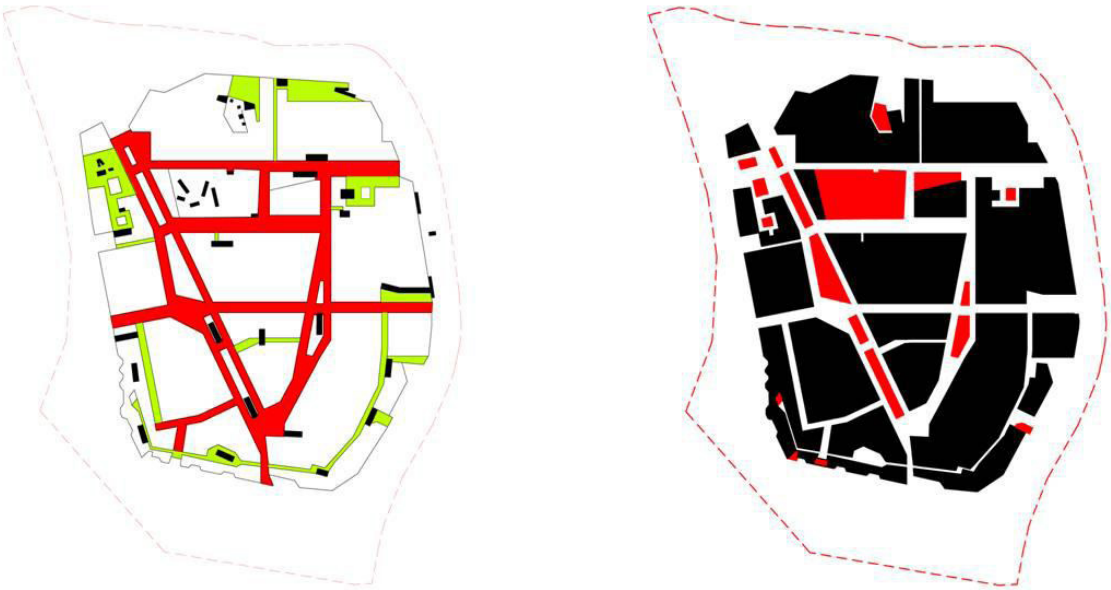

Figure 33. Zorlu Center, 2013, URL 26-27

Moreover, the use of the park arranged on the land in connection with public transportation stops in the transition from the Bosphorus Bridge axis to the city make transportation possible.Located on the bridge level of the mall, the way to the Macro Center supermarket are accessed by means of vertical circulation mediums (escalators and elevators), while on the other hand providing access to the garden area. Thanks to the different transportation arteries, the users' experience of the spaces and the separation of different common areas from each other continue their functions independently. Inspired by the urban makeup in the indoor circulation design, its semi-open spaces and courtyards exhibit a relationship of integrity. (Tabanlioglu 2013).

Figure 34. Zorlu Center, 2013, URL 26-27

Zorlu Mall Macro Center Transportation Line

In analyzing the transportation line and circulation of the Macro Center supermarket situated at the Zorlu Mall, the shopping center is divided into different categories in its spatial organizational structure, it is composed of blocks arranged as separate but linked spaces. In this context, the Macro Center is located on the bridge level. Thus, it is determined as a result of observation that the main venues of the shopping mall and the brand products in the circulation network are not intertwined. Considering pedestrian access routes, it is possible to reach the garden area by walking from the main entrance and proceed directly to the Macro Center, which is in a different space category, via vertical circulation vehicles. When the transportation line of the parking area is examined, the fact that the Macro Center market has its own car park is considered an advantage of this supermarket chain in interviews conducted with shoppers. Thus, users can use both the shopping mall and the Macro Center parking lot, and they can directly access the store area from the parking lot via vertical circulation mediums.

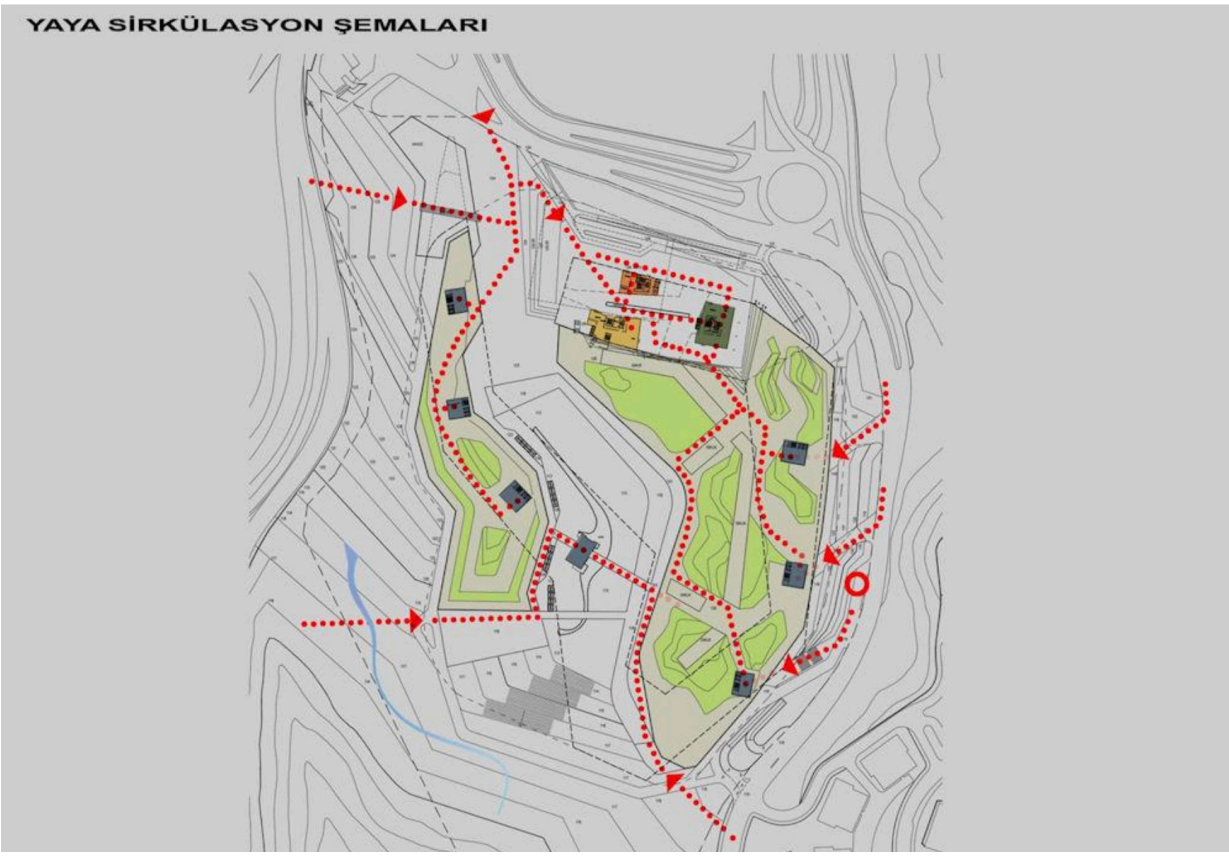

Figure 35. Zorlu Center, pedestrian circulation layout. Tabanlıoğlu Architects, 2013. URL

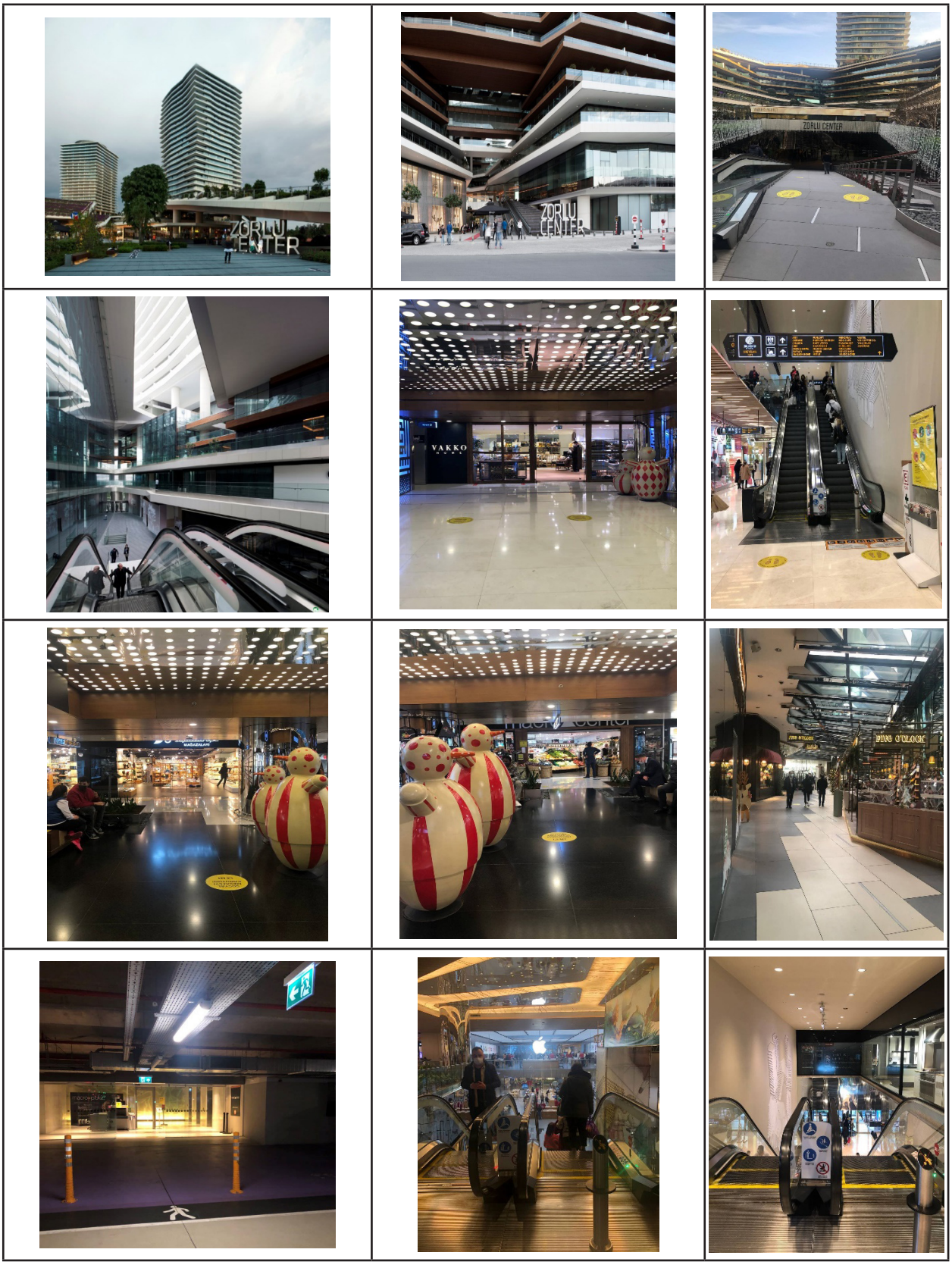

Figure 36. Zorlu shopping mall's Macro Center parking area, pedestrian circulation area. Adibi

Conclusion:

Not only does ensuring the spatial distribution and circulation relationship in shopping malls according to user needs and function provide a different experience for the users in each place, it also creates important effects on the user behavior in this context, circulation efficiency, spatial and visual continuity, time and physical environment.

Gaining sufficient equipment within the scope of circulation definition, types and design elements, gaining a new understanding about the environment, directing users from stagnation to dynamism in line with this information, providing a circulation with a more useful and visual perception at the highest level. In revealing a relationship with the environment and the relations within itself, as well as in circulation design, it is aimed to present innovative ideas in terms of aesthetics, flexibility, comfort and dimensional features.

As a result of examining the two shopping malls; In both shopping centers, it was determined the Macro Center supermarkets are located close to the main venues and user entrances from the car parks. On the other hand, pedestrian access routes can provide access to these venues by using the vertical circulation mediums of both malls and the main circulation line. Since these supermarkets, which are subject to certain restrictions, have limited circulation areas, whereas access to all places of the shopping malls is not allowed after shopping is finished. The mall location discipline criterion obliges these supermarkets in a way that doesn't permit them to disrupt the visual perception, thus preventing said visual perception of the shopping mall from being adversely affected.

As it is forbiden to take photos from the interior on macro center super markets due to the store policy, photos of these spaces could not be taken.

References

Ala, B. (2002). Bir Alışveriş Merkezi Örneğnde Sirkülasyon Ve İnsan Mekan Etkileşimi. Ankara Gazi Üniversitesi Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi.

Ataoğlu, C. (2009). Çağdaş Mimaride Bir Antitez: Sirkülasyon. Karadeniz Teknik Üniversitesi Fen Bilimleri Enstitüsü. Doktora Tezi.

Açıcı, F. K. Ertaş, Ş. Koç, S. (2018). Erişilebilirlik Kavramıyla Sirkülasyon: Trabzon Forum AVM Örneği. Online Journal of Art and Design. Volume 6, issue 2, April 2018

Ching, F.D.K. (1979). Architecture: Form, space, order. (fourth edition), jhon wikey & son ltd. Nobel akademik publishing. 2019

Coruh, S. Aydemir, I. (2019). Bina Sirkülasyon Alanlarinda (İç Mekân Ve Yakin Çevresi) Erişilebilirlik. İstanbul Ticaret Üniversitesi Teknoloji Ve Uygulamalı Bilimler Dergisi, Cilt 01, No 02

Hasol, D. (1993). Ansiklopedik Mimarlık Sözlüğü, (Seventh Edition) İstanbul: YEM Yayın, 21.

Hillier, B. (1996). Space is the Machine: A Configurational Theory of Architecture. Cambridge, UK: Cambridge University Press.

Hamer, S. (2015). Architectural Concept: Circulation, Portico Journal. New Zealand, [Online], Available At: http://portico.space/journal//architectural-concepts-circulation

Kazanasmaz, T. (2004). Sağlık Yapılarında Yön Bulma Tasarımı, Modern Hastane Yönetimi, 8 (2)

Napatov, A. Kuliga, S. Dalton, R. C. (2019). Linking Building-Circulation Typology and Wayfinding: Design, Spatial Analysis, and Anticipated Wayfinding Difficulty of Circulation Types. Architectural Science Review. issn: 0003-8628. https://doi.org/10.1080/00038628.2019.1675041

Roger, H, Clark. (1996). Precedents in Architecture, Second Edition Van Nostrand Reinhold Co Wiley.

Silveria, P. A. (2012). Le Parcours En Archıtecture: Modes De Représentatıon Et De Créatıon. Mastère Création et Technologie Contemporaine.

Sarı, A. (2019). Düşey Sirkülasyon Araçları, Merdivenler, Yem Yayın 10 Baskı.

Verdil, A. (2007). Mekan Davranış İlişkisinin Dönüşümü: Alışveriş Merkezlerinde Mekansal Dizim Yöntemiyle İncelenmesi, Yüksek Lisans Tezi.

Rockwell, D. (2018). https://www.ted.com/talks/david_rockwell_the_hidden_ways_stairs_shape_your_life?

Christian, S. (2013). Designing Circulation Areas: Stairs, Ramps, Lifts: Routing, Planning Principles.

Web Resources

https://www.archdaily.com/155922/ad-classics-ad-classics-palace-of-the-assembly-le-corbusier

http://www.dublincity.ie/Planning/DublinCityDevelopmentPlan/VariationstotheDevelopmentPlan/Documents/AdoptedVariationNo21Spec.pdf

https://muum.global/tr/interior/macrocenter-kanyon-avm/

https://archive.org/details/DavidRockwell_2018V

URL-1, https://www.area-arch.it/en/the-roy-and-diana-vagelos-education-center

URL-2,https://platformliftco.co.uk/news-pr/traction-versus-hydraulic-lifts-advantages-and- disadvantages

URL-3, https://www.dimensions.com/element/paired-discontinuous-escalators

URL-4, https://www.locationscout.net/italy/6458-vatican-museum-spiral-staircase

URL-5, https://www.archdaily.com/594947/ribbon-chapel-nap-architects

URL-6,https://www.archdaily.com/964065/architecture-stands-out-because-it-has-something-to-say-to-its-context-in-conversation-with-mario

URL-7,https://bustler.net/news/3182/big-to-design-museum-of-the-human-body-in-montpellier-france

URL-8,https://www.archdaily.com/512111/qingdao-world-horticultural-expo-theme-pavilion-unstudio

URL-9, https://www.behance.net/gallery/8989195/Final-Project_Yr3-The-Proposed-Venue

URL-10 https://concepturbanization.tumblr.com/post/82023422174/bryanmaddock-formal-analysis-nolli-and

URL-11, https://architektura.muratorplus.pl/projekty/przebudowa-schodow-terenowych-na-ulicy-sliskiej-w-krakowie_7506.html

URL-12, https://concepturbanization.tumblr.com/image/82023422174

URL-13,https://www.nzia.co.nz/awards/student-design-awards/2017-student-design-awards/winner-lucy-vete#Shifting%20Grounds,%20Lucy%20Vete

URL-14, https://redhousecanada.tumblr.com/post/67802307088/fabriciomora-museum-troya-aw-architektur

URL-15,https://www.archdaily.com/220462/update-smithsonian-national-museum-of-african-american-history-and-culture

URL-16, https://alchetron.com/French-formal-garden

URL-17, https://www.archdaily.com/882100/burj-khalifa-som

URL-18, https://metaform.lu/projects/beyond-the-memories/

URL-19,https://www.archdaily.com/18890/kaputts-proposal-for-the-new-arts-and-culture-house-in-beirut

URL-20, https://www.archdaily.com/63683/ad-classics-exeter-library-class-of-1945-library-louis-kahn

URL-21, https://www.archdaily.com/112683/ad-classics-unity-temple-frank-lloyd-wright-3

URL-22,https://visuallexicon.wordpress.com/2017/10/09/the-palace-of-assembly-le-corbusier/

URL-23, https://www.arkitera.com/proje/kanyon/

URL-24, https://www.arkitera.com/proje/kanyon/

URL-25, https://muum.global/tr/interior/macrocenter-kanyon-avm/

URL-27, https://www.arkiv.com.tr/proje/zorlu-center/2648