

ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE
ENGINEERING AND TECHNOLOGY

**THE CONTRIBUTION OF IMMEDIATE SURROUNDINGS OF SYMMETRIC
BUILDINGS TO WAYFINDING BEHAVIOR: TASKISLA AS A CASE**



M.Sc. THESIS

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Department of Architecture

Architectural Design Programme

OCTOBER 2016

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İSTANBUL TEKNİK ÜNİVERSİTESİ ★ FEN BİLİMLERİ ENSTİTÜSÜ

**SİMETRİK YAPILARDA YÖN BULMA DARANIŞINA YAKIN ÇEVRENİN
KATKISI: TAŞKIŞLA ÖRNEĞİ**

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To my better half,



FOREWORD

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M. Ataullah DİLSİZ
Architect

TABLE OF CONTENTS

	<u>Page</u>
FOREWORD	ix
TABLE OF CONTENTS	xi
ABBREVIATIONS	xiii
LIST OF TABLES	xv
LIST OF FIGURES	xvii
SUMMARY	xix
ÖZET	xxi
1. INTRODUCTION	1
1.1 Statement of the Problem	2
1.2 Aim and Objectives of the Thesis	2
1.3 The Significance and Contribution of the Thesis	3
1.4 Structure of the Thesis	3
2. LITERATURE REVIEW	5
2.1 Wayfinding	5
2.1.1 Spatial perception and wayfinding	6
2.1.2 Visuo-spatial perception and wayfinding	8
2.1.3 Spatial knowledge and wayfinding	9
2.1.3.1 Landmark knowledge	9
2.1.3.2 Route knowledge	10
2.1.3.3 Survey knowledge	11
2.2 Parameters Influencing Wayfinding Behavior	12
2.2.1 Environmental variables	12
2.2.1.1 Layout	13
2.2.1.2 Symmetry - similarity	14
2.2.1.3 Landmarks	16
2.2.1.4 Visibility	18
2.2.1.5 Signage	19
2.2.2 Personal variables	20
2.2.2.1 Familiarity	20
2.2.2.2 Age differences	20
2.2.2.3 Gender differences	21
3. RESEARCH DESIGN	23
3.1 Research Questions	23
3.2 Hypothesis	24
3.3 Research Strategy and Methodology	24
3.4 Selection Procedure of the Case Study Area	29
3.5 Participants	30
4. CASE STUDY	33
4.1 Analysis of Taskisla	33
4.1.1 History and location	33
4.1.2 Spatial analysis	34
4.1.3 Functional analysis	38

4.1.4 Information system analysis	39
4.2 Results of the Study	40
4.2.1 Findings of cognitive maps and discussion	40
4.2.2 Findings of pointing out task and discussion.....	43
4.2.3 Findings of wayfinding task and discussion.....	47
4.2.4 Findings of Likert scale questions and discussion	52
5. CONCLUSION	57
REFERENCES	61
APPENDICES	67
CURRICULUM VITAE.....	73



ABBREVIATIONS

ITU : Istanbul Technical University





LIST OF TABLES

	<u>Page</u>
Table 3.1 : Participants' durations.	30
Table 3.2 : Participants' departments.....	30
Table 3.3 : Participants' genders.....	31
Table 3.4 : Participants' ages.....	31
Table 4.1 : The accuracy of pointing out tasks.....	44
Table 4.2 : The content analysis of verbal representations with regards to landmarks that is taken reference points.	44



LIST OF FIGURES

	<u>Page</u>
Figure 2.1 : A mind map about the concept of wayfinding process.	6
Figure 2.2 : A schema about the relation between spatial knowledge and wayfinding.	9
Figure 2.3 : Landmark, route and survey knowledge.	12
Figure 2.4 : Symmetric form of Taj Mahal (left) (URL 1, 2016) and symmetric ornamentation of Isfahan Lotfollah mosque ceiling (right) (URL 2, 2016).	14
Figure 2.5 : Similar shell structures of Sydney Opera House (URL 3, 2016).	14
Figure 2.6 : Symmetric brackets (left) and similar dots (right) (URL 4, 2016).	15
Figure 2.7 : Lynch's (1960) sketch for "landmarks".	17
Figure 2.8 : Façade transparency samples, Yale University (left) (Url 5, 2016) and Elenor and Wilson Greatbatch Pavilion (right) (Url 6, 2016).	18
Figure 2.9 : Arrows that show the destinations (left) (URL 7, 2016) and guidelines (right) (URL 8, 2016).	19
Figure 2.10 : Identification signage (left) (URL 9, 2016) and orientation signage (right) (URL 10, 2016).	19
Figure 2.11 : A concept map about wayfinding.	22
Figure 3.1 : The process of the second step of the research method, episode 1 and 2.	27
Figure 3.2 : The process of the second step of the research method, episode 3 and 4.	28
Figure 4.1 : A synoptic of Taskisla.	33
Figure 4.2 : Immediate surroundings of Taskisla	34
Figure 4.3 : Formal disjunction of Taskisla. A-B: Long corridors; D-C: Short corridors; 1-2-3-4: Towers.	35
Figure 4.4 : Façades looking at courtyard.	36
Figure 4.5 : Long corridors.	36
Figure 4.6 : Short corridors.	36
Figure 4.7 : Finishing differences on the roof floor.	37
Figure 4.8 : Venus sculpture (left) and Sinan the Architect sculpture (right).	37
Figure 4.9 : Functional diagram of Taskisla	38
Figure 4.10 : Exit signs.	39
Figure 4.11 : Informative signs.	39
Figure 4.12 : You are here maps.	39
Figure 4.13 : Samples of the cognitive maps.	40
Figure 4.14 : The frequency of the drawn landmarks in immediate surroundings.	41
Figure 4.15 : Selected outer landmarks and related inner spaces with the outer landmarks.	42
Figure 4.16 : View from the studio 3400. Students can see the immediate surroundings of Taskisla from this point.	46
Figure 4.17 : View from in front of Registrars' Office. Students cannot see outside from this point.	46

Figure 4.18 :	View from stationery store. Students cannot see the immediate surroundings of the building from this point. However, still they can see the courtyard.....	47
Figure 4.19 :	View from the studio Çatı 2. Students can partially see the immediate surrounding of the building.	47
Figure 4.20 :	Participants' routes during wayfinding tasks.	48
Figure 4.21 :	Percentage of taking outer landmarks as reference points during wayfinding task-1 (from the courtyard to the studio 3400) and percentage of taking outer landmarks as reference points according to open-ended question-1.	49
Figure 4.22 :	Percentage of taking outer landmarks as reference points during wayfinding task-2 (from the studio 3400 to the Registrars' office) and percentage of taking outer landmarks as reference points according to open-ended question-2.	50
Figure 4.23 :	Percentage of taking outer landmarks as reference points during wayfinding task-3 (from the Registrars' office to the stationery) and percentage of taking outer landmarks as reference points according to open-ended question-3.	51
Figure 4.24 :	Percentage of taking outer landmarks as reference points during wayfinding task-4 (from the stationery to the studio Çatı2) and percentage of taking outer landmarks as reference points according to open-ended question-4.	51
Figure 4.25 :	Participants' ability to correlate the studio 3400 with the predetermined outer landmarks.	53
Figure 4.26 :	Participants' ability to correlate Registrars' Office with the predetermined outer landmarks.	54
Figure 4.27 :	Participants' ability to correlate the stationery with the predetermined outer landmarks.	55
Figure 4.28 :	Participants' ability to correlate the studio Çatı-2 with the predetermined outer landmarks.	55
Figure A.1 :	The first pointing out task.	68
Figure A.2 :	The open-ended question related to the first pointing out task.	68
Figure A.3 :	The first wayfinding task.	68
Figure A.4 :	The open-ended question related to the first wayfinding task.	68
Figure A.5 :	The second pointing out task.....	68
Figure A.6 :	The open-ended question related to the second pointing out task.....	68
Figure A.7 :	The second wayfinding task.	69
Figure A.8 :	The open-ended question related to the second wayfinding task.	69
Figure A.9 :	The third pointing out task.	69
Figure A.10 :	The open-ended question related to the third pointing out task.	69
Figure A.11 :	The third wayfinding task.	69
Figure A.12 :	The open-ended question related to the third wayfinding task.	70
Figure A.13 :	The fourth pointing out task.	70
Figure A.14 :	The open-ended question related to the fourth pointing out task.	70
Figure A.15 :	The fourth wayfinding task.	70
Figure A.16 :	The open-ended question related to the fourth wayfinding task.	70
Figure A.17 :	The first Likert scale question.	71
Figure A.18 :	The second Likert scale question.....	71
Figure A.19 :	The third Likert scale question.	72
Figure A.20 :	The fourth Likert scale question.	72

THE CONTRIBUTION OF IMMEDIATE SURROUNDINGS OF SYMMETRIC BUILDINGS TO WAYFINDING BEHAVIOR: TASKISLA AS A CASE

SUMMARY

The aim of the thesis is investigating the contribution of immediate surroundings of symmetric buildings to wayfinding behavior and examining the cognitive relations constituted between indoor and outdoor environments by people. When users of a symmetric building, which consists of similar architectural elements, tend to reach a space in the building, the image comes to the mind is validated for some other spaces of the building. In such situations, users link the destination with another space or landmark located in the building to distinguish the destination from the other similar spaces. The hypothesis of the study is based on distinguishing a space from the other similar spaces by linking it with not only spaces and landmarks located in the building; but also spaces and landmarks in the immediate surroundings of the building. To test the hypothesis, the first step was to decide which buildings or spaces are outer landmarks that are located in immediate surroundings of Taskisla; for this aim, participants were asked to draw a sketch map of immediate surroundings of Taskisla with in 1 km diameter. Then, a mix of tasks and questionnaires were applied to participants. There were two types of tasks that are pointing out, and wayfinding tasks; in addition, there were two types of questionnaires that are open-ended and Likert scale questionnaires applied to the participants. The data obtained from the first step was became a pedestal for both pointing out and wayfinding tasks. Thus, at first participants were asked to point out a space, which is related with an outer landmark that determined in the first step. Subsequently, results were evaluated whether it was accurate or not. Then an open-ended question, which is asking why they pointed out that direction, was asked to participants. After that, participants were asked to perform a wayfinding task. Concordantly, each and every participant was required to get the destination point, which was determined by pointing out by participants. The task recorded by a camera. Upon arrival, participants were asked to answer an open ended question, which is asking how they found the destination. This process was repeated four times for every participant until all pointing out tasks and wayfinding tasks were finished. At last, a Likert scale questionnaire was applied. Participants were requisite for filling a Likert scale questionnaire that evaluates the relation between the destination point and outer landmarks. It is found that immediate surroundings of a symmetric building have a significant effect on wayfinding behavior. It is also observed that people section the building according to immediate surroundings of that building and distinguish similar spaces from each other by linking the spaces with another space or landmark located in immediate surroundings of the building.



SİMETRİK YAPILARDA YÖN BULMA DARANIŞINA YAKIN ÇEVRENİN KATKISI: TAŞKIŞLA ÖRNEĞİ

ÖZET

Bir noktadan diğerine seyahat günlük hayatın önemli bir parçası olan aktivitelerdendir. Bu aktivitenin yapılaş şekli günlük hayatı kolaylaştırabileceği gibi acil durumlarda can kurtaran bir özellikte de olabilir. Bu bağlamda, herkes için tasarlanan kapalı mekanlar için bir tasarım kriteri olan yön bulma, acil durumlarda vazgeçilmez öneme sahip oluyor.

Carolina State Üniversitesi'ndeki Evrenel Tasarım Merkezi (The Center for Universal Design at Carolina State University), tasarlanmış mekanların genç, yaşlı ve engelli ayrımı olmaksızın bütün insanların kullanabilmesi gerektiğini söyler (Story et al., 1988) ve evrensel tasarımın yedi kriterine dikkat çeker (Story et al., 1988, pp. 73 – 79). Evrensel tasarım kriterleri özellikleri taşımayan yapılarda, kullanıcılar kendilerini yönlendirebilmek ve yönlerini kolayca bulabilmek için dışardan yardım alma ihtiyacı duyarlar. Bir yapı içerisindeki tasarım bileşenleri kullanıcılara nerede olduklarını bilmelerinde ve yönlerini bulmalarında kolaylık sağlayabilir. Bu tasarım bileşenleri, grafik ve mimari tasarım elemanlarıdır: kat planları, işaretler, röper noktaları, hatta aydınlatma ve renk olabilir. Çevresel değişkenlere bağlı olarak, bu tasarım elemanlarından biri veya bir kaç diğelerinden daha önemli olabilir.

İnsanlar mekan organizasyonunu röper noktaları aracılığı ile anlama yeteneğine sahip oldukları için; yön bulma bağlamında, röper noktaları en önemli tasarım elemanlarından biri konumuna gelir. İnsanlar okunabilirliği düşük yapılarda kendi pozisyonlarını belirlemek için bu röper noktalarına ihtiyaç duyarlar. Röper noktaları, zihinsel mekan modelleri oluşturmak için referans noktaları olma özelliğinin yanı sıra; rota kararlarında da önemli rol oynar. Bu tezin bağlamında, röper noktaları iç ve dış röper noktaları olarak tanımlanmıştır. Eğer kişi iç mekanda kendi konumunu belirlemek, ardından varış noktasının konumunu belirlemek ve son olarak rota seçiminde bina dışında bulunan bir röper noktasını kendine referans alıyorsa, o röper noktası 'dış röper noktası' olarak tanımlanır.

Tasarım elemanları ile yön bulma arasındaki ilişkiyi inceleyen bir çok çalışma mevcuttur (Arthur and Passini, 1992; Passini, 1984; Weisman, 1981; O'Neill, 1991; Caduff et. al., 2006; Garling and Evans, 1991; Golledge, 1991). Özellikle, iç mekandaki yön bulma söz konusu olduğunda bu çalışmaların sayısı fazlalaşmaktadır. Bu çalışmaların bir kısmı, iç mekandaki yön bulma ile gene iç mekanda bulunan röper noktaları arasındaki ilişkiyi incelerken; diğere bir kısmı ise dış mekandaki yön bulma ile gene dış mekanda bulunan röper noktalarının ilişkisini inceleyegelmiştir. Simetrik mekanlarda yön bulma davranışını inceleyen çalışmalar da mevcuttur (Remolina and Kuipers, 2004). Hölscher et al. (2006) ise bir çalışmasında simetri ve benzerliğin mimarlık tarihi boyunca kullanılan bir tasarım kriteri olduğunu belirtmiştir. Simetrik mekanlarda benzer mekanları birbirinden ayırt edebilmek için iç röper noktaları kullanılacağı gibi; yeterli miktarda ya da nitelikte iç röper noktası olmayan yapılarda kişilerin bina dışında yer alan röper noktalarını da kullanabileceği öngörülmüştür.

Bu bağlamda, literatürde iç mekandaki yön bulma davranışı ile dış mekandaki röper noktalarının ilişkisini inceleyen çalışmalar düşünüldüğünde bir boşluk söz konusudur. Bu yaklaşım bir araştırma sorusunu da beraberinde getirir; dış mekanda bulunan röper noktalarının, simetrik ve benzer mimari elemanları bir arada bulunduran yapıların iç mekanlarındaki yön bulma davranışına bir katkısı var mıdır?

Robertson (2003), literatür taramasında da belirtildiği gibi, gözler, kulaklar ya da dokunma gibi reseptörlerin mekansal çevrenin bir imajını zihnimizde canlandırdığını söyler. Peki ya zihnimizde canlanan bu imaj, mekanın benzer başka bir noktası için de geçerliyse? Bu durumda simetri ve benzerlik zihnimizde canlandırdığımız imajlarla, o imajların kaynağı olan mekanları birbiri ile ilişkilendirmeği zorlaştıracaktır. Zihnimizde canlanan bu imajların daha sonra hangi mekana ait olduğunu bilmek için o mekanları başka bir obje ile ilişkilendirme ihtiyacı duyabiliriz. Bunu dış mekandaki röper noktalarını kendimize referans alarak yapabilir miyiz? Başka bir deyişle, dış mekandaki röper noktalarının iç mekandaki yön bulma davranışına katkısı var mıdır? Çalışmanın ana amacı bu sorulara cevap bulmaktır.

Bu amaca ulaşmak için önce, dış mekandaki röper noktalarının iç mekandaki kullanıcıların mekansal bilgisine katkısı bilişsel haritalama ve işaret etme çalışmalarıyla (pointing out task) aracılığı ile analiz edildi. Daha sonra, dış mekandaki röper noktalarının iç mekandaki kullanıcıların yön bulma davranışına katkısı referans alınan röper noktaları bağlamında yön bulma çalışmaları (wayfinding task) aracılığı ile analiz edildi. Bunlardan sonra, iç mekandaki kullanıcıların önceden belirlenmiş iç mekanlar ile dış röper noktalarını ilişkilendirme yetenekleri Likert ölçek anket aracılığı ile analiz edildi.

Yukarıda anlatılan hedeflere ulaşmak için üç aşamalı bir yöntem uygulanmıştır. İlk olarak katılımcılara bilişsel haritalama yaptırılmış, daha sonra işaret etme testleri ve bu testlerle ilişkili açık uçlu sorulardan oluşan anketler, ardından yön bulma testleri ve bu testlerle ilişkili açık uçlu sorulardan oluşan anketler, ve son olarak Likert ölçek sorulardan oluşan anketlerin bir arada kurgulandığı bir metot uygulanmıştır. Asistanı olduğum Visual Communication 2 dersi öğrencilerinden Taşkışla'yı merkeze alarak 1 km yakın çevresinin eskiz haritasını çizmeleri istenmiştir. Bu eskiz haritaları Lynch'in (1960) eskiz haritalarını değerlendirme yöntemi esas alınarak değerlendirilmiştir, böylelikle çok sayıda ortak çizilen lokasyonlar potansiyel landmark olarak tanımlanmıştır. Bu veriler daha sonraki işaret etme testi, yön bulma testi ve Likert ölçek anket için altlık niteliğindedir; uygulanacak olan testlerde katılımcılardan işaret etmeleri veya gitmeleri istenilen mekanlar eskiz haritalarında belirlenen röper noktaları ile mekansal ilişki kuracak şekilde seçilmiştir. Bütün testlerden ve açık uçlu sorulardan oluşan anketlerden sonra ise, testler için Taşkışla içerisinde seçilen mekanların Taşkışla'nın yakın çevresindeki röper noktaları ile mekansal ilişki içerisinde olduğunu doğrulamak için Likert ölçek sorulardan oluşan anket uygulanmıştır. Böylelikle uygulanan metotun güvenilirliği ve kabul edilebilirliği doğrulanmıştır. Katılımcılara önce belli bir mekanı parmakları ile işaret etmeleri istenmiş, doğru ya da yanlış gösterdikleri kayıt altına alındıktan sonra neden o yönü işaret ettikleri açık uçlu bir soru ile sorulmuştur. Cevap alındıktan sonra, işaret etmeleri istenen mekana gitmeleri istenmiştir. Bu yön bulma testi esnasında katılımcılardan sesli düşünmesi istenmiştir ve test kamera ile kayıt altına alınmıştır. İstenilen noktaya varan katılımcıya, varış noktasını nasıl buldukları açık uçlu bir soru ile sorulmuştur. Bu aşamaya kadar olan testler ve açık uçlu sorulardan oluşan anketler daha önce belirlenmiş üç farklı mekan için tekrarlanmıştır. Bu aşamadan sonra katılımcılardan, araştırmacı tarafından belirlenen bazı iç mekanlar ile daha önce bina kullanıcıları

tarafından bilişsel haritalama tekniği ile belirlenen dış mekandaki röper noktaları arasındaki mekansal ilişkiyi sorgulayan bir Likert ölçek anket doldurması istenmiştir.

Kişisel ya da çevresel değişkenlerin yön bulma davranışı ile ilişkisini sorgulayan bir çok çalışma yapılmıştır. Çevresel değişkenlerin yön bulma davranışı ile ilişkisi söz konusu olduğunda, röper noktaları şehir, bölge ya da bina ölçeğinde çalışılmıştır; ancak, röper noktaları – yön bulma davranışı ilişkisini bu ölçekler arası geçişli olarak inceleyen çalışma neredeyse yoktur. Bir başka deyişle, dış mekanda yer alan bir röper noktası ile iç mekandaki kullanıcıların yön bulma davranışı arasındaki ilişkiye dikkat çeken çalışma mevcut değildir. Bu çalışma dış mekandaki röper noktalarının iç mekandaki yön bulma davranışına bir katkısının olup olmadığını arz etmek açısından önemli bir yere sahiptir. Bu çalışmanın bulguları, tasarımcılar, mimarlar hatta şehir plancıları için kılavuz niteliği taşımaktadır. Bu çalışma bina kullanıcılarının bina dışındaki röper noktalarını kendilerine referans almalarının yön bulmayı kolaylaştıracağını öngörür.

Tez, beş kısımdan oluşmaktadır. İlk kısım olan giriş kısmında, yön bulmanın öneminden kısaca bahsedilmiştir. Bunun yanında tezin amacı ve hedefleri açıklanmış, araştırma sorusu ve kullanılan metod anlatılmıştır.

İkinci kısım olan literatür taraması kısmında ise yön bulma kavramı anlatılmış, ardından, yön bulmanın mekansal algı ve mekan bilgisiyle ilişkisine değinilmiştir. Takip eden adımlarda yön bulmayı etkileyen parametrelere çevresel değişkenler ve kişisel değişkenler başlıkları altında değinilmiştir. Çevresel değişkenler, plan, simetri ve benzerlik, röper noktaları, görünebilirlik ve işaretler ele alınarak incelenmiş; kişisel değişkenler aşinalık, yaş ve cinsiyet değişkenleri ele alınarak incelenmiştir.

Üçüncü kısımda ise araştırma tasarımı beş ana başlıkla incelenmiştir, bunlar: araştırma soruları, hipotezler, araştırma stratejisi ve metodu, alan çalışması seçim kriterleri ve katılımcılardır. Araştırma soruları kısmında ana araştırma ve alt araştırma soruları yer almaktadır. Hipotezler kısmında ise gene ana hipotez ve alt hipotezler her almaktadır. Araştırma stratejisi ve metodu kısmında ise araştırmanın nasıl yürütüleceği ve sonuçların nasıl elde edileceği anlatılmıştır. Son olarak alan çalışması yapılacak yapının ve katılımcıların seçim kriterleri açıklanmıştır.

Dördüncü kısımda, alan çalışması için seçilen İstanbul Teknik Üniversitesi Taşkışla Yerleşkesi, tarihi, mekansal ve fonksiyonel analizi ve işaret sistemleri bağlamında analiz edilmiştir. Buna ek olarak alan çalışması sonucu elde edilen bulgular ve bulguların yorumları bu kısımda yer almaktadır.

Beşinci kısım, tezin sonuç kısmıdır. Tezin sonuçlarının özetlendiği bu kısımda mimarlar ve gelecek çalışmalar için bir kaç öneride bulunulmuştur.



1. INTRODUCTION

Traveling from one place to another is a crucial activity and an integral part of daily life. Assuredly, it can make people's everyday life easier, besides it can save a life in case of emergency. Wayfinding in a built environment comes into prominence especially in case of emergency; thus, it is an imperative design criterion to provide inclusive built environments.

The Center for Universal Design at Carolina State University declares that from young to elder all people of all abilities and disabilities must be able to use designed environments (Story et. al., 1998). In this context, seven assumptions have been addressed for universal design (Story et. al., 1998, pp. 73 – 79). Nonetheless, in illegible buildings, users are in need of help to orient themselves or find their way effortlessly; that is to say, design components in a building assist people to make easier to find out where they are and find their way. Aforementioned components are graphics and architectural design elements such as: layout, signages, landmarks, even lighting and color. According to environmental variables, one of those design elements can become more significant from the others.

Since people are able to comprehend layout arrangement of a specific setting by landmarks, one of the most important design elements are landmarks. They determine one's own position in a built environment especially if it is an illegible building. Landmarks are able to be accepted as reference points and help people to constitute their spatial mental models; besides, they take a significant role for route decision. In the context of this thesis, landmarks are identified as 'inner' or 'outer' landmarks. If an individual uses an outer reference point to recognize his or her own position, then use them to determine the position of the destination point and finally to decide the route; that reference point becomes an 'outer landmark' even though the individual is in a building and the landmark is located out of the building.

1.1 Statement of the Problem

There is much research around the argument, which examine the interrelation between physical design elements and wayfinding. Especially, when it comes to indoor wayfinding, there are a plethora of research about landmarks and wayfinding association; majority of them investigate indoor wayfinding concerning landmarks that are already in that setting. Yet, some of them work on symmetric settings (Remolina and Kuipers, 2004; Hölscher et al., 2006). In spatial problem solving processes like wayfinding, one of the foremost hardships is symmetric architectural settings (Remolina and Kuipers, 2004). Hölscher et al. (2006) assert that although symmetry and similarity are well-recognized genotypes that form the buildings in history of architecture, they contrast with the imperative need of distinguishing built environments. To distinguish similar spaces in a symmetric setting, inner landmarks can provide useful points of reference. However, if there are not enough interior landmarks, users of the building might use outer landmarks such as a park, a building, sea or any essential place can be approved as a reference point for people who attempt to find their way in such settings.

There is an obvious gap in literature about the interrelation between indoor wayfinding behavior and the effects of landmarks in the immediate surroundings of that building. From this point of view, a research question comes to the forefront: Do outer landmarks contribute to wayfinding behavior in a particular symmetric building that consists of similar architectural elements?

1.2 Aim and Objectives of the Thesis

Robertson's (2003) assertion in the literature review chapter, receptors such as the eyes, ears or touch receptors build up an image of the spatial layout of our environment. What if the image, which is built up by brain, similar to another image belonging the different part of the same building? In this case there would be a confusion thus symmetry or similarity can be a reason to that confusion. The main goal of the study is simply understanding the contribution of outer landmarks to indoor wayfinding behavior in illegible buildings. In other words, realizing how landmarks in immediate surroundings of illegible buildings, which are symmetric and include more than one similar architectural elements together, affect people's wayfinding behavior.

To reach that goal, certain objectives were supposed to be found out. First, the contribution of the outer landmarks to users' spatial knowledge was analyzed by cognitive maps tasks and pointing out tasks. After that, the contribution of outer landmarks to users' wayfinding behavior was analyzed by investigating the content analysis of the wayfinding tasks with regard taking outer landmarks as reference points. One other objective was finding out participants' ability to correlate preset spaces with predetermined outer landmarks by likert scale questionnaire. Moreover, the last objective was finding out the effects of building geometry and personal differences on users' wayfinding behavior.

1.3 The Significance and Contribution of the Thesis

Many studies sustained to find out the interrelation between certain personal or environmental characteristics and wayfinding behavior. Personal and environmental characteristics were studied extensively in this manner. When it comes to environmental variables affecting wayfinding behavior, landmarks were studied in city, district or building scale; however, there is next to no study investigating correlation between them. In other words, there is almost no study, which asserts that a binding can be, occur between a landmark located in an outdoor setting and a wayfinder in a building that is located next to that landmark. This research attempted to make public whether outer landmarks have contributions to indoor wayfinding behavior or not. The findings of this study will provide information for designers, architects and even planners to improve wayfinding. Other studies, which are investigating relation between wayfinding and landmarks, also have suggestions for designers; however, they discussed the effect of inner landmarks on inner wayfinding behavior or outer landmarks on outer wayfinding behavior. This study brought forward that wayfinding can be easier if people take outer landmarks as reference points to find their own position, the destination position and finally decide the route in an indoor setting.

1.4 Structure of the Thesis

The thesis is constructed in five chapters. Introduction is the first chapter, which contains the significance of wayfinding shortly discussed. Besides, the purpose and

objectives of the thesis is explicated by way of a research question and method statement. In addition, the significance and contribution of the thesis are mentioned.

The second chapter puts forward the notion of wayfinding. At the beginning of the chapter wayfinding is defined, later on, its relation with spatial perception and visuo-spatial perception is discussed. Spatial cognition and its relation with wayfinding takes part. In the following, parameters influencing wayfinding behavior are emphasized under two main headings, the first one is environmental variables, which are layout, symmetry, similarity, landmarks and signage; and the second one is personal variables, which are familiarity, age differences and gender differences.

The third chapter states research design in five main topics, which are research questions, hypothesis and research strategy and methodology, selection procedure of the case study area and participants. So the research questions part states the main and sub questions of the research; likewise, hypothesis part asserts the main and sub hypothesis. Research strategy and methodology section explains the way how this study is maintained and results are obtained. Moreover, selection procedure of the case study area and participants' characteristics are explained.

In the fourth chapter case study is discussed. In the main topic case study, first Istanbul Technical University, Taskisla Campus is analyzed under favor of history and location, spatial analysis, functional analysis and information system analysis. Then, Moreover, in this section, obtained the results and discussions are stated.

In the fifth and the last chapter, conclusions of the thesis are asserted; moreover, a few architectural design suggestions are brought out and some recommendations for future studies are indicated.

2. LITERATURE REVIEW

2.1 Wayfinding

How do we define wayfinding? Certainly, in its early conception, the term became synonymous with the concept of a sense of direction in early analyses of navigation (Trowbridge, 1913). Indeed, navigation and wayfinding as concepts share a number of similarities grounded in the notion. People count on identified methods of traveling from A to B with the help of landmarks, route recognition, and survey knowledge or, as will be explicated in this review, the cognitive representations of the distance and direction of objects to one another (Gallistel qtd. in Cornell et al., 1993). Golledge (1999) however makes a distinction between these two similar yet different types of guiding processes of human movement. Golledge (1999) asserts that, colloquially navigation might mean to deliberately walk or make one's way through some space or density; wayfinding has less to do with the use of cartographic maps, charts and compasses, and more to do with "traveling over roads or tracks using either physical or cognitive maps" (Golledge, 1999, pp. 7).

The modern usage of the term *wayfinding* in the context of architecture refers to orientation experience and path choosing within the built environment. Within this context, Lynch (1960) defined *wayfinding* as a logical use and organization of categorical neurological cues from external environment. In addition to that, environmental psychologist Passini and graphic designer Arthur (1992) brought together three components of wayfinding in the built environment, which are architecture, graphics and verbal human interaction. Over and above this, they defined wayfinding as spatial problem solving (Arthur and Passini 1992).

In rather reductionist terms, Gabbert has also defined wayfinding as "the simple but essential act of getting from place to place" (Gabbert, 2007, pp. 181) while Nori and Giusberti have defined "wayfinding as the ability to move successfully through the environment" (Nori et al., 2009, pp. 7-16). While both of these definitions articulate that there is a starting point and a destination point that needs to be reached, what they

do not put an emphasis on is the *means* by which that destination is reached. In contrast, Golledge (1991) notes that the process of wayfinding is the process of determining and following a *path* or *route* between an origin and a destination; it is a purposive, directed, and motivated activity (Figure 2.1).

By taking these measures into account, we begin to get a sense of a manifest, which is *ability* or *sense* of direction that lies at the heart of the concept of wayfinding. Cornell et al.'s (2008) experiments have for example placed an emphasis on the importance of a sense of direction in spatial decision making and choice. For wayfinding, sense of direction is essential which is given that maps and orientation devices are generally used when travelling through only in an unfamiliar rather than familiar area.

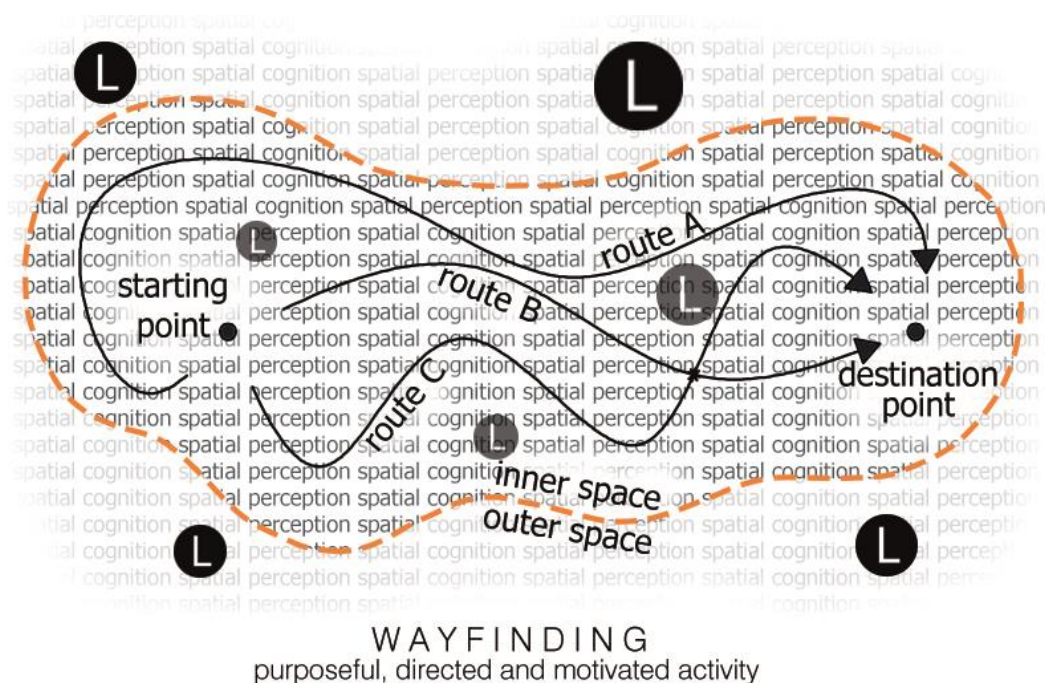


Figure 2.1 : A mind map about the concept of wayfinding process.

2.1.1 Spatial perception and wayfinding

In any sustained analysis of how people recognize their position in a setting, it is essential to first begin by exploring people's ability to mentally associate themselves with the objects that form or *make up* that setting. Undoubtedly, a plethora of critical discourse has sought to establish causal links between wayfinding and spatial perception or ability. This is because methods by which people position and orient themselves in a setting is critical in situations where innumerable objects present themselves as either obstacle or avenues of access. Devlin (2001) has recently

problematized the relationship between wayfinding and perception by suggesting that spatial perception is not a single unified entity. Indeed, an understanding of the concept of spatial perception as a series of *spatial abilities*, involving both a visualization factor and an orientation factor (Stanic and Owens, 1990), has more or less remained the basic reference point for many authors' critiques on wayfinding and its justifying factors.

By this common prognosis in the literature, spatial perception refers not only to the perception of a person's own location relative to the environment surrounding him or her and the objects in his or her immediate environment, but also to a person's perception of the spatial properties of the setting and those objects, i.e. their shape, dimensions and number of group of them. Thrift (2014), for example, has noted how objects in cities have effects on subjects to "sense their environs". According to him (2014), the relationship between object and subject is co-dependent; therefore, without a clear understanding of how objects relate to the environment in which we perceive them, we cannot consequently understand our *own* position relative to that setting.

As is also understood from the explanation above, ability of *spatial perception* has been argued to be both inherently individualist; which is to say each individual has his or her own special perception of the spatial objects, their characteristics and the interrelationship between the two (Andersson and Dahlgren, 1974), or collectivist; given that individual decision making in wayfinding is influenced by common landmarks, routes and surveys (Siegel & White, 1975). Thus, while wayfinding is necessarily related to choices made by an individual (Emo et al., 2012) and at the same time those choices are provided by the measurements of space, integration and arrangement of the objects through spatial perception.

Spatial perception thus has a number of implications for our understanding of wayfinding. In order to understand where we are in space, we must first utilize skills of spatial cognition to sense the orientation and arrangement of objects in the space around us. Since those objects constitute the physical setting we operate in, we must first understand them in order to understand our place in contra distinction. Certainly this relationship between how we measure objects and how we measure our perception of 'self' in relation to those objects has been a subject of much critical and interdisciplinary debate in the fields of psychology, sociology, anthropology and philosophy alike. Hatfield (1990) for example, has traced the work of philosophers

such as Descartes, Locke, Hume and Kant whose investigation of the knowing mind and its relation to space and spatial properties which has become central to what we would now call early modern psychology. More recently, research in the field of psychology has tended to look at the link between spatial abilities and success in various occupations. For example, the works of David Lubinski in particular (Kell et al., 2013; Shea et al., 2003; Webb et al., 2007; Lubinski 2010), has looked at the role of spatial ability that plays in youth's development and the development of creative and STEM (science, technology, engineering and mathematics) talent.

In terms of spatial perception's impact on *individual* and *collective* decision making processes during wayfinding, an understanding of the mind's sensory and cognitive activity during spatial perception is an essential issue. While it might seem logical to assume that the process of perception and construction of spatial relationships is done predominantly through sight, neural scientists such as Robertson (2003) have argued that sensory systems do not deliver the world as a unified whole to our brains but rather 'bind' together different modes of reception into experience. As Robertson (2003) suggests, signals from different sensory modalities are registered in separate brain areas to produce spatial perception. As these different areas of the cortex receive sensory information through receptors such as the eyes, ears or touch receptors, they are able to build up an image of the spatial layout of our environment and thus enable us to understand our position within that environment.

2.1.2 Visuo-spatial perception and wayfinding

Visuo-spatial perception as a component of cognitive functioning refers to the ability to visually take in information and create a mental image of our surroundings, thus enabling us to perceive and interact with our visual world. This process happens unconsciously and is crucial for the completion of everyday activities such as our ability to reach for objects which we see, to shift our attention to different points in space and finally to orient ourselves appropriately. Discourse surrounding visuo-spatial perception has largely centered on the field of visual neuroscience and how our brain constructs a stable representation of the external world from the sequence of retinal images, which we produce from our eyes, head and body movements. Turi and Burr (2012) suggest that one possibility is that a spatial representation encoded not in retinal but in spatiotopic coordinates that exists in our brain.

Visuo-spatial skills are imperative for wayfinding since they allow us to translate retinotopic to spatiotopic information, allowing us to recognize such fundamentals as brightness from darkness and angles from curves. This makes it possible to recognize layout configuration, landmarks, spatial differentiation and other such signages as room numbers and directions. An interesting branch of research in medicine has even looked at the effects of visuospatial or simply ‘spatial’ dysgeusia, which refers to a loss of the sense of ‘whereness’ in relation of oneself to one’s environment and in the relation of objects to each other (Cogan, 1979). Since “the ability to ask ‘where?’ is such a basic element of what might be mooted as awareness” (Thrift, 2014, pp.11), undoubtedly a lack of visuo-spatial perception has lasting implications for wayfinders.

2.1.3 Spatial knowledge and wayfinding

Wayfinding is not merely the travel between A and B, but also it is about how that travel is determined, how routes and landmarks are identified and how one’s own current position is recognized (i.e. the destination). The question of *how*, spatial knowledge might be the answer under favor of those three concepts: landmark knowledge, route knowledge and survey knowledge (Figure 2.2).

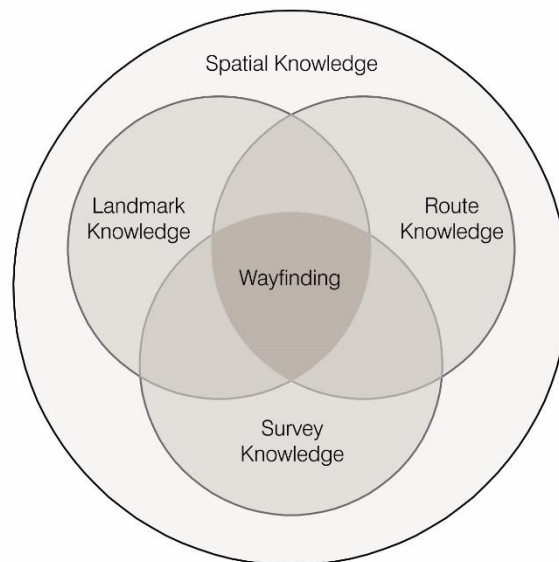


Figure 2.2 : A schema about the relation between spatial knowledge and wayfinding.

2.1.3.1 Landmark knowledge

Despite the complexity to measure the relation between landmark knowledge and wayfinding experience, there are several different findings related to how individual landmark knowledge contributes to the magnitudes of wayfinding. Landmarks are

defined as instinct figures assisting the navigation as reference points. Landmarks are often noticed and remembered because of dominance of visible form, peculiarity of shapes or structure, or because of sociocultural significance (Appleyard, 1969). There are different varieties of landmarks, which have unique characteristics within universal standardization (Weisman, 1981); however, it is a commonly agreed fact that a landmark is expected to be distinctive which determines the salience of the landmark.

Therefore, landmark knowledge refers to the encoded details in human memory, where familiarity of landmarks increases the efficiency of wayfinding experience (Jansen-Osmann et al., 2004). However, landmark knowledge only works if there is chain of landmarks connecting each turning point at indoor environment, where a lack of particular landmark reduces the quality of wayfinding experience because indoor navigation is one point to another journey (Richardson et al., 1999). In addition, central point strategy on landmarks used as architectural elements prioritise the common points in a particular point and distribute the other arrival points through landmark mapping. A recent study has revealed that central point strategy cooperates with the human memory in regard of landmark knowledge, and individual navigators are historically familiar with the distribution of subroutes (Richardson et al., 1999).

The cognitive development researchers also suggest that individuals initially learn about the landmark knowledge and then they start to construct route and survey knowledge and to this extent, benefiting from landmarks on architectural planning is necessary to activate route and survey knowledge among navigators (Timpf et al., 1992). Another important dimension is that, individuals who are unfamiliar with the building initially tend to use their landmark knowledge for proper route and survey navigation, thus the proper use of landmarks reduces the complexity of buildings in terms of wayfinding (Timpf et al., 1992).

2.1.3.2 Route knowledge

Within the indoor of a building, individuals are mobile navigators who follow a particular route to arrive a desired point. Along with landmark knowledge studied previously, route knowledge plays a crucial role to define the navigation experience, since wayfinding relies on particular pattern based on directional movement. Abrams (2010) defines route knowledge as having three-dimensional knowledge about a particular formation of a building. To this extent, familiarity to a particular

architectural design leverages wayfinding behavior among individuals (Jansen-Osmann et al., 2004). Since, the coordination between neural activity and physical attitudes is the primary determinant of wayfinding; route knowledge has a connection to the accuracy of arrival. According to Münzer and Stahl (2009), there is a positive correlation between accurate and optimized wayfinding within an indoor environment and degree of route knowledge. However, the crucial issue is how human brain classifies different architectural structures in terms of route knowledge. Allen (2000) investigates the communicational route knowledge, and concludes that connections between different departments in a complex building are primary decision points, where individuals unintentionally communicate in forms of following in such crossing locations.

It also needs to be stressed that individuals' directional assessment either approves the preferred route or eliminates the falsified options. Then, human brain reshapes the current route knowledge with the upcoming information, which is not verified (Makri et al., 2015). In response to that, an architect needs to have standardize the routes within complex buildings via differentiating the main routes from each other to leverage the individual wayfinder's knowledge. Weisman (1981) also mentions that, route planning is a complex process where the route assistance optimizes the wayfinding approximation similar to outdoor navigation. However, the linkage between the starting point to the arrival destination has to remain informative during the route to increase the navigator's knowledge about the other departments (Weisman, 1981), and such particular focus leverages integration of the mobile individual to the indoor wayfinding process.

2.1.3.3 Survey knowledge

Apart from landmark and route knowledge, survey knowledge is an abstract relationship between objects and route points in a closed environment, which is under influence of the navigators' experience in particular buildings. The ones, who spend time in a building at regular basis, unintentionally construct a survey knowledge and they have higher accuracy on wayfinding than the new comers (Timpf et al., 1992). Therefore, external influencers such as indoor illumination cannot limit the wayfinding experience via survey knowledge, since individuals' familiarity with objects and routes is already protected. In addition, in the cases of that, there are no landmark signs

and route maps; survey knowledge particularly assists wayfinding showing the experience-based accumulation of knowledge among mobile individuals (Hunter, 2011). In addition to that, survey knowledge leverages the ability to make predictions in similar buildings (Tenbrink, 2008); therefore standardization in architecture in terms of route modelling while constructing the public buildings, is an accurate approach to minimize the inefficiencies of wayfinding. However, we have to say that survey knowledge depends on familiarity and recognition based on long term experience (Timpf et al., 1992), whereas landmark and route knowledge can be realized via universal standardization (Abrams, 2010). Thus, survey knowledge remains as an exclusive mind set derived from earlier practices, while the others are adaptive and responsive even in initial visits to a particular building (Figure 2.3).

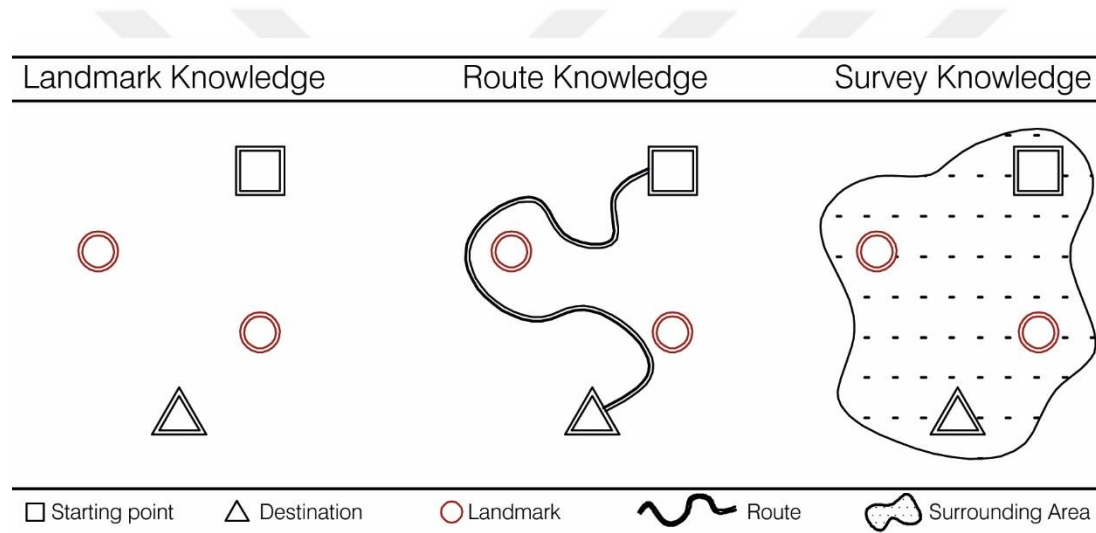


Figure 2.3 : Landmark, route and survey knowledge.

2.2 Parameters Influencing Wayfinding Behavior

In this part, parameters influencing wayfinding behavior were investigated against the backdrop of two matters, which are *environmental variables* and *personal variables*.

2.2.1 Environmental variables

Environmental variables effected on wayfinding behavior are enarged to discuss for some spesific variables which are layout, symetry and similarity, landmarks, visibility and finally signage.

2.2.1.1 Layout

Given its importance, a number of studies have therefore sought to establish the link between architectural design and human spatial cognition (Holscher 2006; Freska 2003). Indeed, research looking at the fundamental aspects of a building's route network has shown that the problems of wayfinding do not simply lie in inherent spatio-cognitive ability but also in architecture. Undoubtedly, the layout and form of buildings and places either facilitates cognitive mapping by providing users with the ability to mentally structure settings into coordinate maps or contrarily disorients their wayfinding progress and leads to navigational breakdowns. For this reason, it is crucial that an evaluation of wayfinding does not simply restrict itself to abstract theorizations about the body's spatial perception but also takes into account the concrete and immutable by-laws of structure.

In terms of layout, floor plan configuration and signage in particular have been shown to correlate with improved levels of wayfinding accuracy and efficiency. Garling et al's (1983) study, for example, revealed the impact of layout complexity on wayfinding performance and cognitive mapping by investigating the progress of 64 undergraduates walking through a large building complex. While reducing the students' visual access to the building by restricting their sight inevitably resulted in less orientation, this effect was attenuated for by showing the students a floor plan displaying the pathways in the building prior to the tour (Garling et al., 1983). The findings of this research showed that knowledge of the environmental layout of the setting facilitated orientation and enhanced wayfinding ability.

Therefore, since it is therefore important for successful wayfinders to learn the spatial layout of a setting, the manifest ambition of an architect during the design process should be to make that layout facilitate cognitive mapping in the easiest possible ways. Indeed, another interesting study that details the importance of layout is Dogu and Erkip's (2000) study on spatial factors affecting wayfinding and orientation in a shopping mall in Turkey. The researchers examined how wayfinding behavior is influenced by factors such as building configuration, visual accessibility, circulation systems and signage and showed that people did not find the signage system sufficient. Undoubtedly, wayfinding and layout has significant implications for consumer behavior, determining whether a shopper will visit a certain store depends on their

ability to ascertain where they are in the mall and where they must go in order to get to the store they wish to visit.

2.2.1.2 Symmetry - similarity

In architecture, symmetry shows up in every scale. It can be observed from the form of a building, a layout or ornamentation of an interior space (Figure 2.4). In addition, similarity in architecture shows itself at façades and layout commonly (Figure 2.4). From the beginning of the architectural history, symmetry and similarity have been used on buildings that denote political power and religiosity (Figure 2.5).



Figure 2.4 : Symmetric form of Taj Mahal (left) (URL 1, 2016) and symmetric ornamentation of Isfahan Lotfollah mosque ceiling (right) (URL 2, 2016).



Figure 2.5 : Similar shell structures of Sydney Opera House (URL 3, 2016).

Those two concepts were evaluated by Gestalt laws of grouping which are a set of principles in psychology. Most known of the principles are proximity, similarity, closure, good continuation, common fate and symmetry. Those laws, which are developed by German psychologists in the 1920s, attempt to define how people tend to organize visual elements in groups. The law of symmetry submits the idea that people tend to perceive objects as symmetrical shapes that form around their center. For example, when people see two separate symmetric elements, they unintentionally

participate them into one coherent object (Figure 2.6). The law of similarity declare that people group the objects perceptually if they are similar to each other (Figure 2.6).

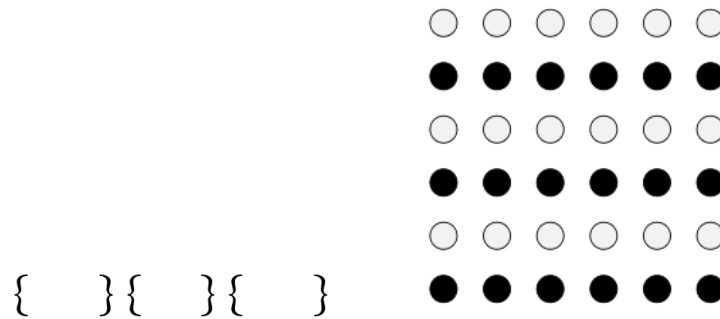


Figure 2.6 : Symmetric brackets (left) and similar dots (right) (URL 4, 2016).

Further studies have shown that symmetrical architectural design can have negative consequences on orientation. Baskaya et al's (2004) study investigated the wayfinding behavior of newcomers in unfamiliar environments using an operational method involving one setting in which a symmetrical layout was used and another setting in which an asymmetrical layout was used. According to the results of the study, negative way finding performance was found to correlate with greater symmetry in the layout of the environment; while participants of the asymmetrical setting could complete a sketch map with a minimum number of errors, in the symmetrical setting the sketch maps were incomplete (Baskaya et al., 2004).

Similarity in architectural configuration and spatial structure will make wayfinding difficult at junctions to navigate and mentally construct landmarks. Christopher Kueh (2008) makes note of this situation especially in radially structured shopping malls that have multiple junctions where all walkways are similar. The distinctiveness rather than monotony of the layout is essential for effective navigation. An interesting counter argument to this however is Weiss et al's study into animal spatial cognition, specifically the behavior of rats. Weiss et al's (2012) research into the behavior of rats in either a symmetrical or an asymmetrical setting proved that they preferred a symmetrical layout. In the study, the rats actually moved objects in the asymmetrical environment to establish a symmetric layout of key locations then used that to orient themselves on repeated visits (Weiss et al., 2012).

By this understanding of building symmetry alongside user expectations, memory can also be considered as a wayfinding indicator, as it becomes in essence a landmark itself differing it from the rest of the asymmetric environment. Again, however, if we are to deal in absolutes, a completely symmetric environment looking the same at every angle is undoubtedly more disorientating. Rather a mix of asymmetric and symmetric seems most advantageous to the successful experience of wayfinding.

2.2.1.3 Landmarks

Undoubtedly, landmarks play a vital role in wayfinding, navigation and the understanding of and reasoning about physical large-scale spaces and environments. Recently, Lingwood et al's (2015) study showed that learning routes and wayfinding ability without landmarks is much poorer than where there are landmarks. Landmarks are orientation cues for wayfinders; they function as a guidance tool for movement in space when the navigator knows where a landmark is in relation to his present position and can thus say something about where he or she is, the direction they are facing and their proximity to the interceding landmark. According to Hirtle (2001), landmarks are both an organizing concept for an environment and a defining part of the neighborhood.

Certainly, the urban planner Kevin Lynch (1960) stressed this defining quality of landmarks and the environment in his interviews with residents of major US cities during which he asked them to draw maps of their city from memory. Lynch notes that, respondents often marked the same places as memorable locations during these sketch-map interviews. Assuredly, it is this memorability of places that speaks to their status as landmarks –common, recognizable points of reference are those, which we remember after visiting a place (Lynch, 1960). Caduff and Timpf (2006) however have held the view that rather than an inherent property of the object itself, what makes a landmark a landmark or 'landmarkedness' is based on the relationship between observer, physical environment and potential landmark.

In terms of perception, Lynch (1960) discusses landmarks in an urban context and describes their defining physical characteristic as “singularity, some aspect that is unique or memorable in context” (Figure 2.7).



Figure 2.7 : Lynch’s (1960) sketch for “landmarks”.

A landmark must be able to capture a wayfinder’s attention (Raubal and Winter 2002; Xia, Arrowsmith and Jackson 2008), it must be big enough to be visible in a large frame of reference and unique to its otherwise homogenous surroundings so that it can be told apart from its setting. Visibility plays a key role in the construction of a cognitive spatial representation. For this reason, it is useful to keep the number of landmarks relatively small number of unique buildings. Since a landmark is often designated as a distinct or global object; one which is well known, unmistakable or otherwise unique, too many of these would reduce their comparative affect. Yet to offer a counter-argument to this, Omer and Golblatt’s (2007) study on inter-visibility between landmarks actually found that the overlap between the visual fields of two landmarks helped people construct spatial knowledge and perform navigation-orientated tasks. The study showed that more than one landmark in close proximity to another allowed the user to construct a visual chain; so that a landmark became effectively a series of landmarks or collectively a memorable location containing memorable objects linked by a chain of associations. However, the study found that a short visual chain made it easier to complete navigation tasks than a relatively longer visual chain; visual chain here is referring to the number of visual steps needed for reaching the (next) target (Omer and Goldblatt, 2007).

The constitution of landmarks has wide-ranging implications for wayfinding. In their study, Caduff and Timpf (2006) looked at the ‘salience’ of landmarks to make an assessment of what makes landmarks such a crucial aspect of many wayfinding related tools such as generating routes or navigation systems. They suggested that, “The integration of appropriate landmarks in such applications decreases the cognitive load put on the wayfinder” (Caduff and Timpf, 2006, pp.1), by allowing the navigator to associate landmarks with memorable decision points makes wayfinding easier. The design consequences of a system of landmarks are therefore important and should be

used at junctions, intersections and paths in physical settings in order to facilitate cognitive functioning and memory recall. As Hirtle suggests “landmarks can serve as navigational aids by providing choice points along a route of travel, confirmation of the correct route of travel, verification of arrival at the destination, or evidence of the present orientation in the case of distal landmarks” (Hirtle, 2001, pp. 1246 - 1248). Overall, the importance of landmarks to wayfinding cannot be understated.

2.2.1.4 Visibility

Characteristics of a built environment could have an impact on wayfinding behavior. There is an other parameter from evaluated ones above, which is visibility. It has an obvious potential to make wayfinding easier or harder.

Visibility or visual access is handled as a phenomenon, which is whether destination points and landmarks can be observed or not by wayfinder through the journey.

Visibility takes a significant role on generating a cognitive spatial representation. Since wayfinding is highly related to remember the sets of landmarks and its relation with the built environment, Cornell et. Al. (1994) suggested to investigators that learning environment by experience it directly with visual access.

Visual access between an indoor space and outdoor environment can be provided by transparency. There are two types of transparency according to Rowe and Slutzky (1963), which are literal and phenomenal transparency. “Literal transparency occurs where a physical form is ‘pervious to light and air’, while phenomenal transparency occurs when a building exhibits ‘stratifications’ that, whether implied or real, are ‘devices by means of which space becomes constructed, substantial, and articulate’ (Rowe and Slutzky, 1963 qtd. in Vaughan and Ostwald, 2014)”. Literal transparency is directly related with seeing through. Façade material and openings can provide that visual permeability (Figure 2.8).



Figure 2.8 : Façade transparency samples, Yale University (left) (Url 5, 2016) and Elenor and Wilson Greatbatch Pavilion (right) (Url 6, 2016).

2.2.1.5 Signage

To direct people in an indoor environment, two different traditional methods are used with regard to signage system. The first one is that, grouping the destinations and placing arrows in decision points showing them (Figure 2.9). The second one is that, placing continuous lines, which are distinguished from each other by color or texture, from the entrance of the building to destinations (Smitshuijzen, 2007) (Figure 2.9). The first one is used commonly due to flexibility of use. In addition, people do not start their travel from the entrance of the building, that is to say, the second method cannot catch somebody's fancy all the time.



Figure 2.9 : Arrows that show the destinations (left) (URL 7, 2016) and guidelines (right) (URL 8, 2016).

The first and the most common wayfinding information system also contains that; identification signage and orientation signage. Identification signage simply show the name of a certain space (Figure 2.10); in addition, orientation signage helps people know where they are in a complex setting and make people determine the location of the destination points according to their position (Figure 2.10).

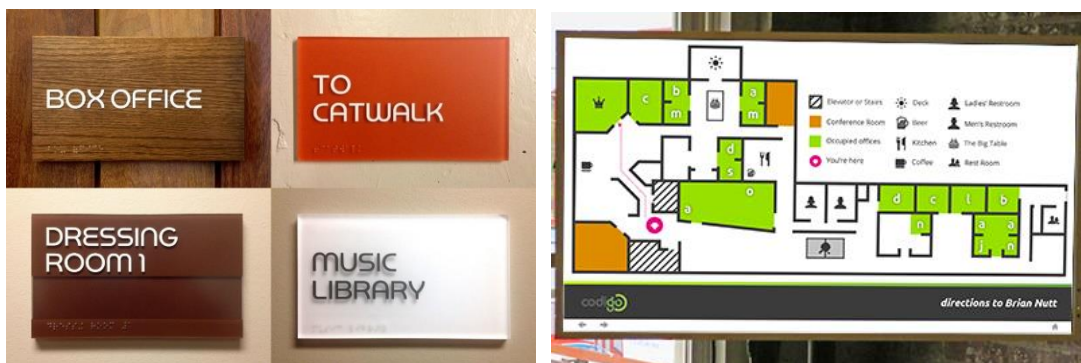


Figure 2.10 : Identification signage (left) (URL 9, 2016) and orientation signage (right) (URL 10, 2016).

2.2.2 Personal variables

Critical discourse has also sought to investigate the personal differences that play a defining role in what it means to be good at wayfinding. Personality traits for example, have been noted as playing a pivotal role in determining differences in spatial representation and ability (Nori et al., 2009). Personality traits influence decision-making choices by determining the extent to which a person will choose a longer, more familiar route over a potentially shorter but unfamiliar route. Indeed, Cornell et al (2008), draws attention to individuals' specific sense of direction and ability and how this influences wayfinding behavior with regard to the external environment, suggesting that "a person with a good sense of direction may be better able to look for areas likely to contain landmarks and can use that information to direct actions at intersections on routes" (Cornell et al., 2008, pp. 402).

2.2.2.1 Familiarity

As Michael O'Neils (1992) notes that, numerous studies have further confirmed the positive relationship between familiarity and the accuracy of the cognitive map (Devlin 1976; Evans et al. 1980; Garling and Evans 1991). While these studies have examined the relationship between environmental familiarity and spatial cognition – presuming that the accuracy of cognitive representation positively correlates to wayfinding performance, O'Neills' study is unique in its focus on actual wayfinding behavior. O'Neills' (1992) observational experiment showed that as plan complexity increases, the accuracy of the cognitive map and thus wayfinding performance is reduced. However, importantly this trend analysis showed that familiarity with the environment generally outweighed and override the negative impacts of highly complex architectural designs. One weakness of O'Neills (1992) study, however, is that the range of plan configurations used in the study were not complex enough to override the effects of familiarity on wayfinding performance. Indeed, it would be logical to assume that an environment with a greater degree of plan complexity will necessarily make it harder for the user to familiarize themselves with the building and thus inhibit wayfinding behavior.

2.2.2.2 Age differences

Research into wayfinding-related skills as assessed by experimental tasks and behavior as observed in field experiments have shown that age differences also affect spatial

navigation abilities which in turn has an impact on wayfinding performance. While the impacts of age on specific aspects of navigational skill are less documented, studies such as Denise Head and Marlisa Isom's (2010) have examined age effects on spatial navigation abilities considering the multiple cognitive and neural factors that contribute to successful navigation. Results of a study employing virtual environments and comparison between young and older adults, showed that there were undoubtedly age effects in recalling landmarks, and recognizing environmental scenes. Unsurprisingly, the older adults exhibited more difficulty with the directional information of landmarks during route finding which plays an essential part in wayfinding.

2.2.2.3 Gender differences

Further aspects that have been said to change wayfinding behavior, influence route planning and choice of destination, is gender. According to Lawton (1994), women are more likely to use a route strategy (use of instructions on how to get from place to place) whereas men are more likely to use an orientation strategy (sensing their own position in relation to environmental reference points). Lawton (1994) also suggests women report higher levels of spatial anxiety as a result of navigation than men, and indeed that the orientation strategy was positively correlated with spatial perception ability and negatively correlated with spatial anxiety.

Certainly a disparity in terms of wayfinding performance between male and females has been central to many contemporary claims however as Clint et al. (1994) suggests, contrary to established opinion, this gap is not due to adaptation in response to natural selection but that discrepancy in performance are due to hormonal differences between the two sexes. Indeed, Clint et al (2012) find no support for the hypothesis that there is a positive correlation between home range size (in species difference) and spatial navigation abilities. Rather males display of superior wayfinding performance in comparison to females is related to the hormone testosterone and the advantages that conveys to wayfinding ability.

The concepts discussed in the literature review were summarized in the figure 2.11.

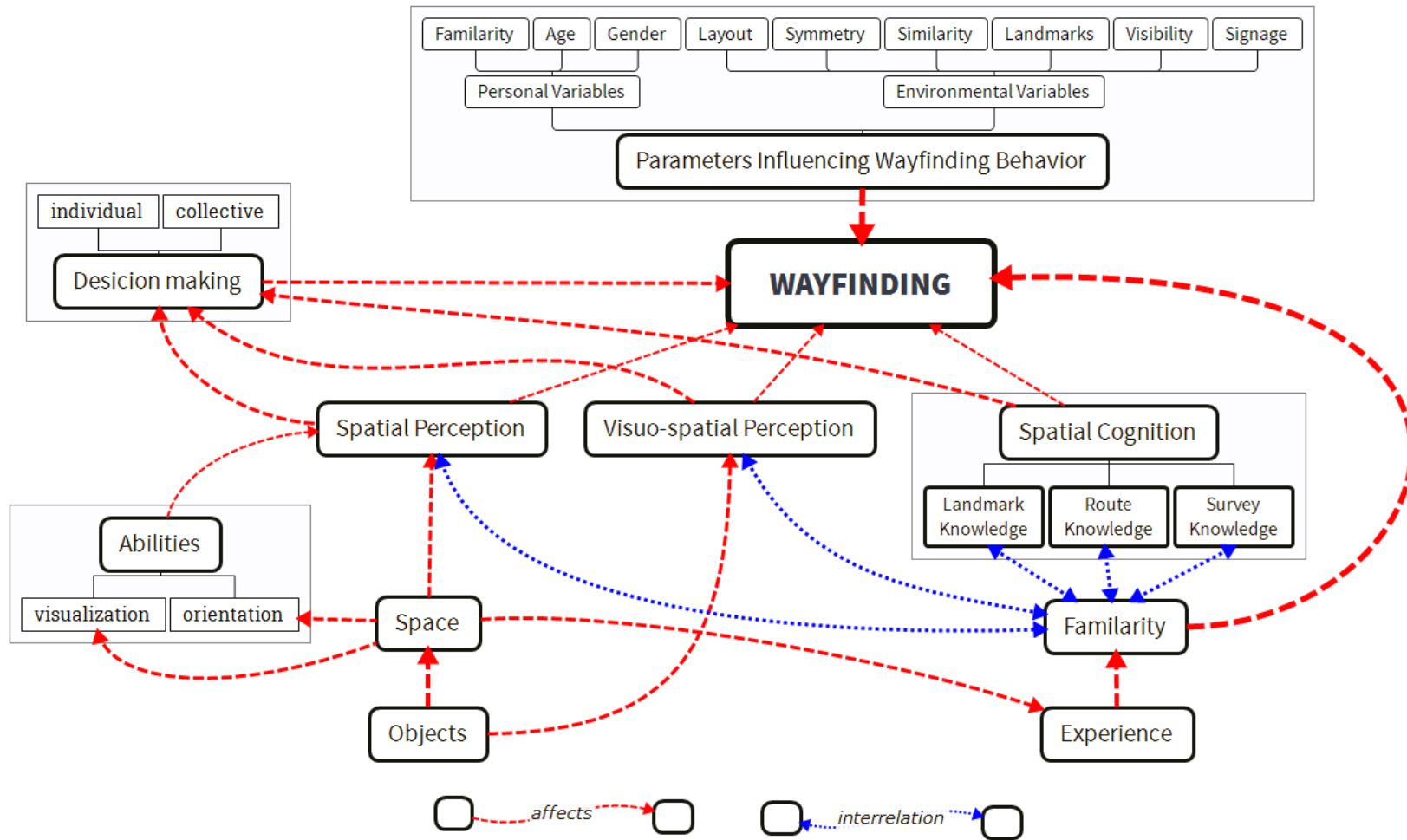


Figure 2.11 : A concept map about wayfinding.

3. RESEARCH DESIGN

The research grounded to a story that I star. When I first came to ITU Taskisla to take my first post-graduate course, I was very amazed to complication of the building. I even could not find the class; may be it was normal for a newcomer. In addition, I was new in city, so I was not so familiar to the environment and immediate surroundings of Taskisla. As the time went by, wayfinding in the building was supposed to be easier but it was not, the building still confused me. The corridors were very similar to each other; there were many similar vertical circulation areas. On top of that, the building was symmetric in both X-Y axis and had a courtyard that makes horizontal circulation a loop. There was not enough distinguished feature in the building except the roof floor.

In time, I found myself find my way by thinking outside of the building. I was correlating the inner spaces with outer landmarks. I was thinking like “now I have to go the studio 3400, and I know it is located the Bosphorus side of the building, and then I need to go to Bosphorus side to find the studio 3400”. Those thoughts made me realize that I take outer landmarks as reference points to find the destination. Was it just me using that method? Alternatively, combination of that and some other wayfinding methods? I doubted that. I was experiencing a wayfinding problem as an experienced user of the building, and that was my solution for the problem. The contribution of immediate surroundings of Taskisla to my wayfinding behavior was obvious. There had to be others. Without a moment to spare, I interviewed with my friends and lecturers to figure out how they find their ways. It was like an aha moment.

This study was shaped in order to disclose the contribution of immediate surroundings to indoor wayfinding. I believe the answer of the question would be genuinely useful; it has the potential to have an impact and effect change.

3.1 Research Questions

1. Do outer landmarks contribute to wayfinding behavior in particular symmetric buildings that consist of similar architectural elements?

If yes;

- a. How efficient are outer landmarks on wayfinding behavior in symmetric indoor environments with regards to;
 - i. Getting the outer landmarks as reference points?
 - ii. Accuracy?
- b. Is there any relation between building geometry and getting outer landmarks for wayfinding, with regards to;
 - i. Symmetry and similarity?
 - ii. Transparency?

3.2 Hypothesis

1. Outer landmarks contribute to wayfinding behavior in particular symmetric buildings that consist of similar architectural elements.
 - a. Outer landmarks are significantly efficient on wayfinding behavior in symmetric indoor environments from the point of getting them as reference points.
 - b. There is a relation between building geometry and getting outer landmarks as reference points for wayfinding in terms of symmetry, similarity and transparency.

3.3 Research Strategy and Methodology

This study is designed as a single case. Case study research has its limitations. One technical issue is a variant of what is known as selection bias whereby the choice of cases biases the findings of the research, particularly with respect to excluding cases that contradict favoured theory. Another concern raised is generalisability, particularly of single case studies. Certainly, if the research findings need to be generalised statistically then a case study approach is not suitable (Yin 2009). The conventional wisdom, which says "... one misunderstanding about the case study is that the case method is claimed to be most useful for generating hypotheses in the first steps of a total research process, while hypothesis testing and theory-building is best carried out

by other methods later in the process”, actually it can be generalized; “one can often generalize on the basis of a single case, and the case study may be central to scientific development via generalization as supplement or alternative to other methods. But formal generalization is overvalued as a source of scientific development, whereas ‘the force of example’ is underestimated” (Flyvbjerg, 2004). “The case study is useful for both generating and testing of hypotheses but is not limited to these research activities alone” (Flyvbjerg, 2004).

Three steps form the case study. In the first step, in order to decide which buildings or spaces are outer landmarks that are located in immediate surroundings of Taskisla; 60 students were asked to draw a sketch map of immediate surroundings of Taskisla within 1 km diameter. The students were not allowed to get help from external sources such as maps, asking other people. They had no time limit; still, cognitive maps were completed in approximately 15 minutes. Obtained outputs were evaluated objectively; the frequency of the drawn landmarks in immediate surroundings was calculated. This task was done as part of a class assignment.

In the following step, a mix of tasks and questionnaires were applied to participants. There were two type of tasks, which are pointing out and wayfinding tasks; after each and every task, there was an open-ended questionnaire applied to participants. The data obtained from the first step was became a pedestal for both the pointing out and the third wayfinding tasks.

In the second step; at first, participants were asked to point out a preset space, which is related with outer landmarks that determined in the first step (Figure A.1). Subsequently, results were evaluated whether it was accurate or not. Then an open-ended question, which is asking why they pointed out that direction, was asked to participants (Figure A.2).

Later on, participants were asked to perform a wayfinding task. Concordantly, each and every participant was required to get the destination point, which is the same preset space with the pointing out task (Figure A.3). This task was evaluated under the topics of; time spent, stops, getting lost (how many time the participants leave the reasonable route), distance walked, distance walked divided by reasonable route distance and speed were calculated by recorded video. Upon arrival, participants were asked to

answer an open-ended question, which is asking how they came to the destination (Figure A.4).

The second step was repeated for other three preset spaces (Figure A.5, Figure A.6, Figure A.7, Figure A.8, Figure A.9, Figure A.10, Figure A.11, Figure A.12, Figure A.13, Figure A.14, Figure A.15, Figure A.16); in other words, four times each task were done for four different spaces, so it makes four pointing out tasks and four wayfinding task for four different preset spaces in Taskisla (Figure 3.1 and Figure 3.2).

A Likert scale questionnaire was applied in the third step (Figure A.17, Figure A.18, Figure A.19 and Figure A.20). Participants were requisite for filling a Likert scale questionnaire that evaluates the relation between the destination points and the outer landmarks.

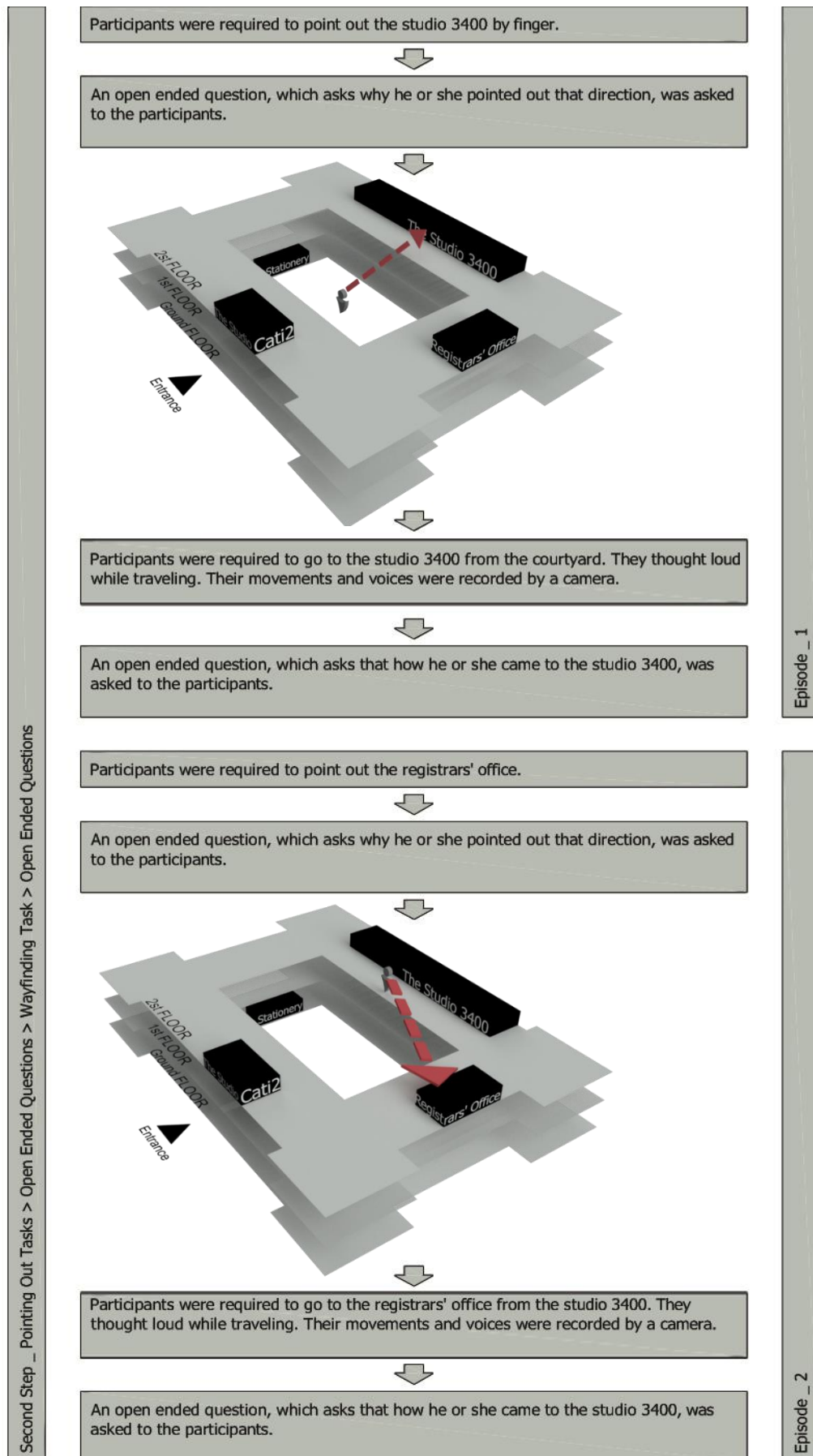


Figure 3.1 : The process of the second step of the research method, episode 1 and 2.

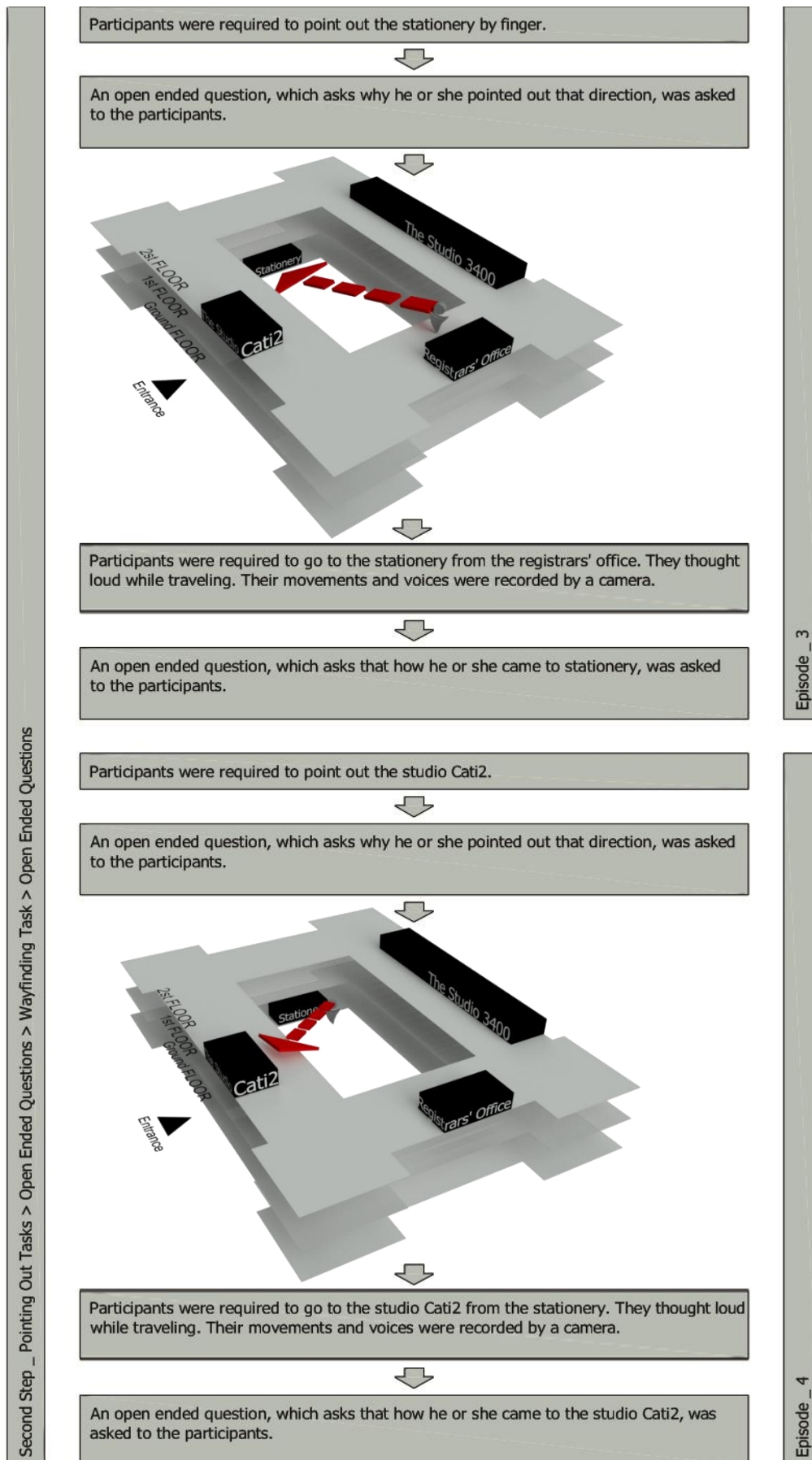


Figure 3.2 : The process of the second step of the research method, episode 3 and 4.

3.4 Selection Procedure of the Case Study Area

For the Taskisla case, there are number of studies. Unlu et. al. (2001 and 2009) and Dursun (2012) are researchers who wrote about Taskisla. Unlu et. al. (2001) investigated about social interactive spaces in Taskisla. They concentrated on social interactive spaces in Taskisla and investigated how these spaces are correlated to visual “e-partition” lines. They aimed at the visual impact of interior environment; they explored how social domains in Taskisla correlate to visual convex lines and how these settings are identified as “sociofugal” or “sociopetal” environments by using ‘Space Syntax’ method.

Taskisla was investigated in an other study by Unlu et. al. (2009). In the research, they focused on the comparison of the frequency of students’ occupancy in the interfacing areas of the ground floors and the syntactic values of these spaces both in clear and rainy weather comparatively. They took ITU Taskisla and an other university building MSGSU (Mimar Sinan Güzel Sanatlar Üniversitesi) as cases.

In Dursun’s study (2012), perceiving the space was investigated. She took attention to difficulty of symmetric layout in the context of wayfinding; “The symmetrical and introverted plan layout creates difficulties in way finding especially for the new comers in Taşkışla. The visual connection in the spatial structure is restricted between ground and first floor in the open courtyard and includes no circulation element” (Dursun, 2012).

As it is written above in the literature review chapter, layout has significant implication for wayfinding behavior. For Taskisla case, it is clear to see that the building has rectangular but radial layout with an open the courtyard and circulation around it; also, the circulation of Taskisla has multiple junctions, which are similar. Lack of distinctiveness, which gives monotony, is bringing forth illegibility. The idea, which radial architectural configuration makes wayfinding harder, agrees with Kueh’s (2008) argument discussed in the literature review chapter, which is evaluated in the case of radially structured shopping malls.

In rather reductionist terms; color, texture, shape and line constitutes a composition in an architectural design in order to create rhythm, pattern, symmetry, balance and contrast of a form. In this focalization, all these terms have meaning for wayfinding; in other words, it is possible to analyze a building in the context of its form and how

its form contribute or harm wayfinding behavior. This study investigates the effects of environmental variables on wayfinding behavior and it is differed from the previous studies above by consideration the form of the building and its relation with the landmarks, which are located in the immediate surrounding of the building.

3.5 Participants

Two different sample groups were selected. One of them comprised of 60 students and other one comprised of 30 students.

The members of the first sample group, who are enrolled students in ITU in the later the second semester, came into existence from 60 students for a preparatory work, which is drawing a sketch map of immediate surroundings of Taskisla. They were selected according to their familiarity to Taskisla due to understand which buildings or spaces are outer landmarks for the familiar users of Taskisla.

The second sample group, which is comprised of 30 participants, were enrolled students in ITU. They were selected according to their experience about Taskisla. The hypothesis of the study obliged us to select participants, whose knowledge about the building and the immediate surroundings of the building is well. Under these circumstances, selected participants were enrolled in ITU at least two semesters instead of newbies. Many of the participants had been in Taskisla for 2 semesters; besides that, five participants had been in Taskisla for 3 semesters and three participants had been in Taskisla 4 semesters (Table 3.1).

Table 3.1 : Participants' durations.

Duration	2 semesters	3 semesters	4 semesters
Number of Participants	22	5	3

There were 23 participants enrolled in the department of architecture; four participants enrolled in department of interior design; and three participants enrolled in department of landscape architecture (Table 3.2).

Table 3.2 : Participants' departments.

Department	Architecture	Interior Design	Landscape Architecture
Number of Participants	23	4	3

The study did not pore over effects of gender; thus, participants were selected nearly equal numbers as part of genders (Table 3.3).

Table 3.3 : Participants' genders.

Gender	Male	Female
Number of participants	14	16

A very big part of the participants are 20 years old; besides, there is one eighteen-year-old participant and one twenty-seven-year-old participant. The others are 19, 21, and 22 years old. Thus the mean is 20,4 (Table 3.4).

Table 3.4 : Participants' ages.

Age	18	19	20	21	22	27
Number of Participants	1	6	12	7	3	1
Mean: 20,4						



4. CASE STUDY

4.1 Analysis of Taskisla

In this chapter, Taskisla was analyzed briefly by personal experiences and observation under the title of *history and location, spatial analysis, functional analysis and information system analysis*.

4.1.1 History and location

Taskisla priorly known as Mecidiye Kışlası and so earlier a school of medicine is one of the two best-known projects of architect William James Smith for the Sultan Abdülmecid in Istanbul (Ağır et al., 2015). Taskisla, was built in between 1846 - 1852, has the characteristic of neo-renaissance architecture. With the proclamation of the republic, Taskisla was transferred to board of education. After the big restitution in between 1943 – 1950, it was started to be used under Istanbul Technical University. It currently is taken up with Faculty of Architecture, School of Fine Arts, Institute of Social Science and ITUSEM Continuing Education Center (Figure 4.1).



Figure 4.1 : A synoptic of Taskisla.

Taskisla is located in Istanbul, which has approximately one fifth of the population of Turkey. The building is located on Taksim, which is a very well-known district of Istanbul. On the north side of the building, where another campus of ITU that is Macka Campus is located, there is a valley containing a big park named Maçka Democracy Park. In addition to that, between those two faculty buildings a ropeway is located above the park properly. Just before reaching up the ropeway, a Burger King store welcomes us at the right side of the road named Taskisla Caddesi which is found on the west side of Taskisla. Furthermore, on the west, a big hotel called Grand Hyatt Hotel is located on the opposite of the portico of Taskisla. On the south side of the Taskisla, there is a campus of ITU that is Gumussuyu Campus, and between those two faculties, there is a library named Atatürk Kitaplığı. On the east side, a hotel - office complex, a stadium, a palace and the Bosphorus are located (Figure 4.2). For the east side, Taskisla has an open view thus all the surroundings above mentioned even Bosphorus and Anatolian side are in the field of vision.



Figure 4.2 : Immediate surroundings of Taskisla

4.1.2 Spatial analysis

Taskisla has four floors, which are a basement, a ground, a first and a roof floor. Building users can be characterized as students, academic and administrative staff and visitors.

Taskisla has a symmetric layout and has more than one similar architectural elements together. There are four towers located at corners similar to each other and there are two long corridors (A and B in Figure 4.3), likewise two short corridors the same (C and D in Figure 4.3). Each and every tower in the building has vertical circulation core including staircases and elevators. Those staircases are also similar to each other.

In addition, the building has a courtyard, which might be a disadvantage because it causes cyclic horizontal circulation on first and second floor. The courtyard enables some interior spaces to be able to have visual access with it (Figure 4.3).

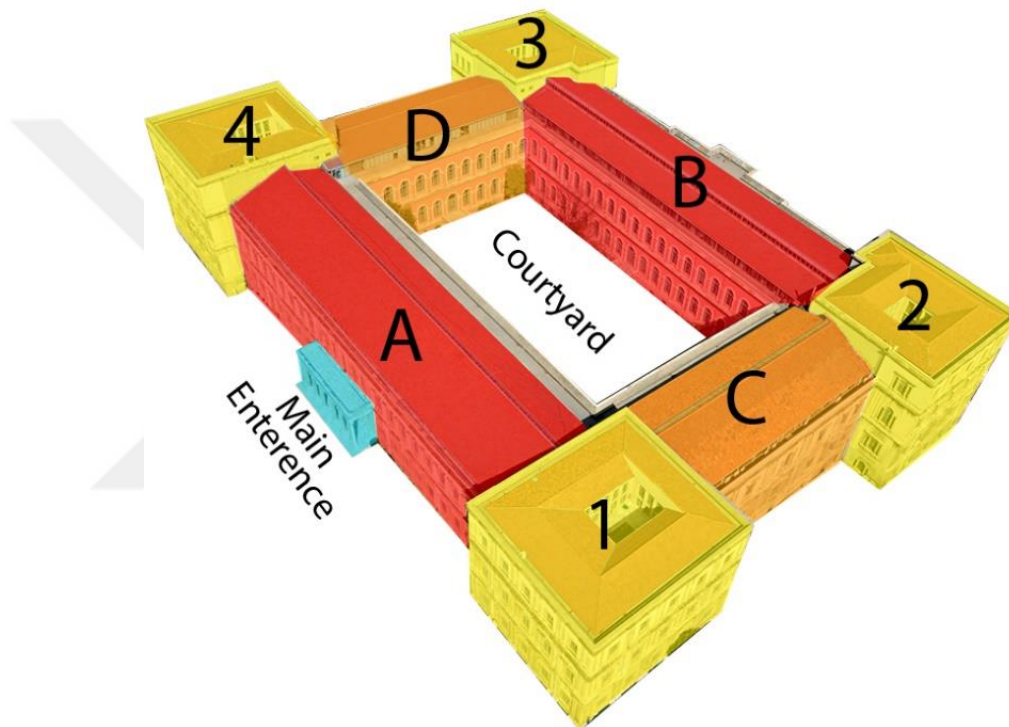


Figure 4.3 : Formal disjunction of Taskisla. A-B: Long corridors; D-C: Short corridors; 1-2-3-4: Towers.

When it is taken into account that symmetric and similar form of Taskisla; contrary to expectation, it has a labyrinthic spatial arrangement due to placing similar functions inconsequentially and irrelatively. Inexpediently, educational units, administrative units and the other units are aggregated in a complex way.

The fact is that, in a person's field of vision almost whole things are similar to each other. From in the middle of courtyard, an individual can see only arches, which are in the same dimension, and two exactly the same and two similar doors (Figure 4.4).



Figure 4.4 : Façades looking at courtyard.

Likewise, all interior facades that come into view are accurately the same with each other, by comparison with two long corridors (figure 4.5); suchlike, the same situation is ruling for the other two short corridors (Figure 4.6). However, there are a number of space that is diversifying at the roof floor, which is not an original floor but added in late time by ITU administration, by wall and floor finishing (Figure 4.7).



Figure 4.5 : Long corridors.



Figure 4.6 : Short corridors.



Figure 4.7 : Finishing differences on the roof floor.

When the form of Taskisla is taken into consideration, it has homogeneous and undifferentiated configuration due to mainly its symmetric layout.

In Taskisla, some part of the horizontal circulation areas has to be illuminated by artificial light. Almost whole studios, lecture rooms and faculty rooms have direct sunlight but studios, exhibition halls and some ateliers located in the basement floor are illuminated artificially. Although still there are succession of lamps located in corridors, they point the way to nowhere specific.

Taşkışla has some landmarks inside the building. In the second floor there is a sculpture, which is the Roman goddess Venus whose functions encompassed love, beauty, sex, fertility, prosperity, victory, and desire. In addition, there is an other sculpture, which was the chief Ottoman architect and civil engineer *Sinan the Architect* for sultans Suleiman the Magnificent, Selim II, and Murad III. These two sculpture rarely were used as landmarks (Figure 4.8).



Figure 4.8 : Venus sculpture (left) and Sinan the Architect sculpture (right).

4.1.3 Functional analysis

Taskisla consists of diversified units including educational and administrative as a college building. Occurring once in every architecture faculty building, also Taskisla has studios, library, lecture rooms, conference halls and exhibition halls belonging educational units; department head offices, registrar's office, personnel affairs and some other offices belonging administrative units. Apart from all these, Taskisla has a stationery, copy center, cafeterias and canteens as commercial units (Figure 4.9).

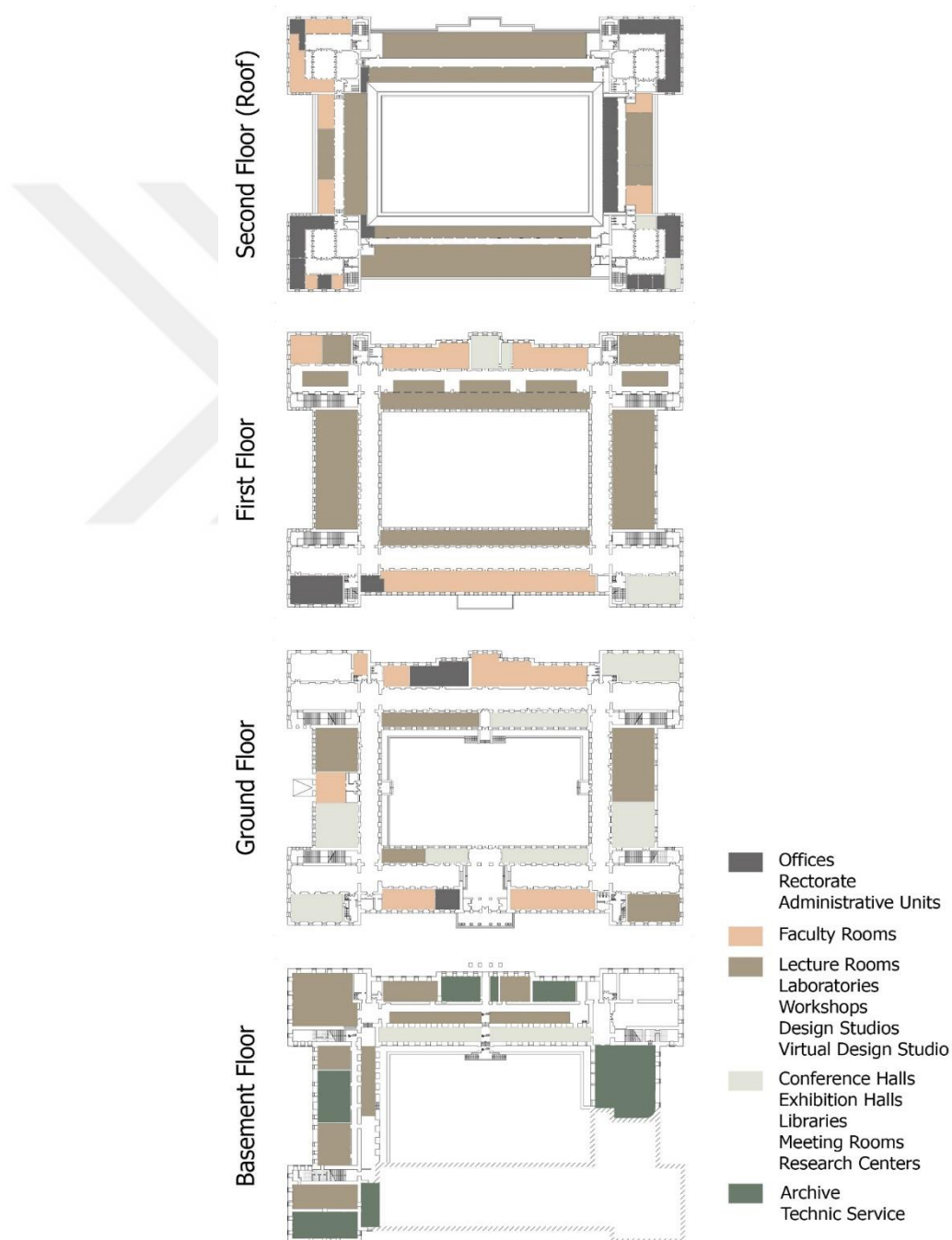


Figure 4.9 : Functional diagram of Taskisla

4.1.4 Information system analysis

Taskisla has different types of guide signs including informative ones, fire exits and you are here maps. The guide signs that show the exit and fire exit which are located on the interior walls (Figure 4.10). In addition, on the surface of the interior corridor walls, there are informative signages with regards to function of the rooms (Figure 4.11).



Figure 4.10 : Exit signs.



Figure 4.11 : Informative signs.

In Taskisla, there are *you are here maps* with regard to its belonging floor plan. Maps are painted according to the function of the spaces; thus, it makes people perceive the differences between different functions (Figure 4.12).

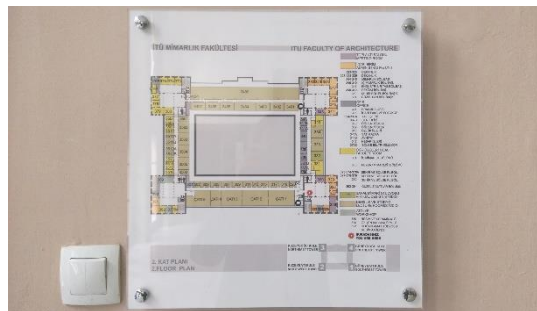


Figure 4.12 : You are here maps.

4.2 Results of the Study

In this section, findings of the study were presented in four main headings that are;

- findings of cognitive maps and discussions,
- findings of pointing out task and discussions,
- findings of wayfinding task and discussions,
- findings of Likert scale questionnaire and discussions,

4.2.1 Findings of cognitive maps and discussion

The cognitive maps were carried out for the aim of designating outer landmarks. To determine which buildings or spaces are outer landmarks, 60 participants were required to draw a sketch map cognitively that shows immediate surroundings of Taskisla within 1 km diameter. Accordingly, 60 cognitive maps of immediate surroundings of Taskisla were received (Figure 4.13).

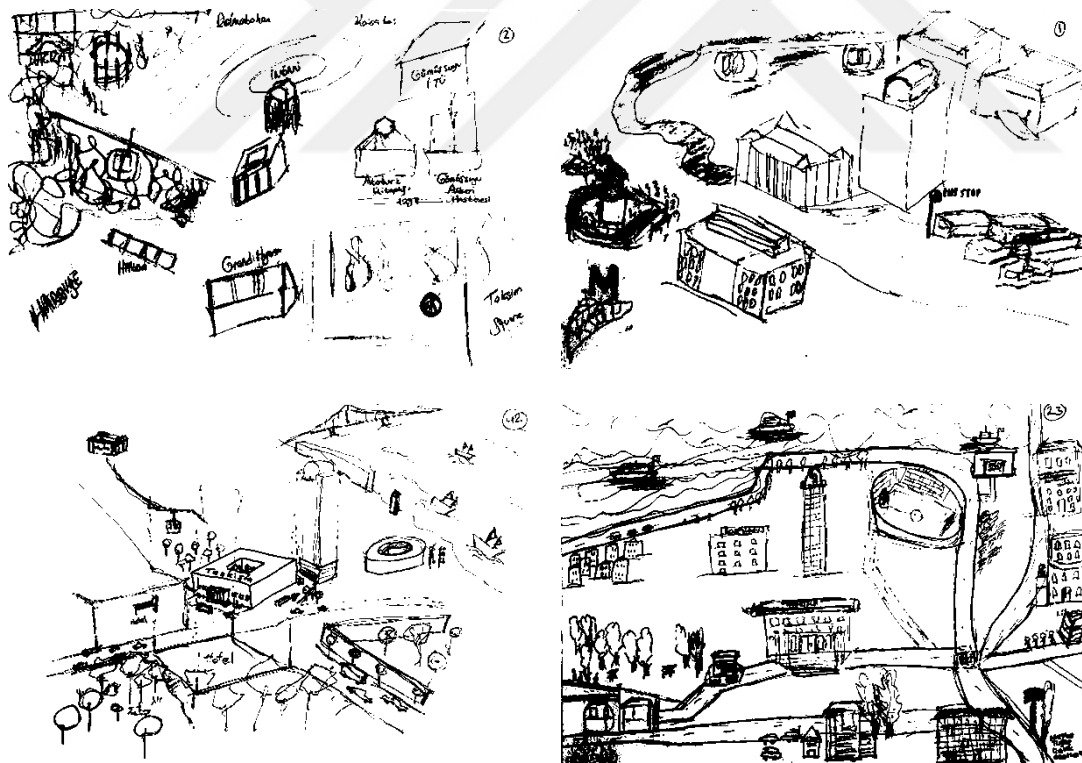


Figure 4.13 : Samples of the cognitive maps.

The cognitive maps indicate that 17 immediate surroundings were drawn commonly. In consideration of sketch maps; Hyatt Hotel, which is located across the street on west side of Taskisla, was indicated by the majority of the participants (88%). In addition

to that; the ropeway (72%), Gezi Park (68%), Intercontinental Hotel (65%), Süzer Plaza (58%), Atatürk Library (58%), Vodafone Arena (55%), Maçka Democracy Park (48%), ITU Gümüşsuyu Campus (48%), Bosphorus (43%), Divan Hotel (38) and Burger King store (37%) were drawn commonly. The other way around, Dolmabahçe Palace (12%), Taksim Square (17%) and Taksim Residence (20%) had the minimum frequencies (Figure 4.14).

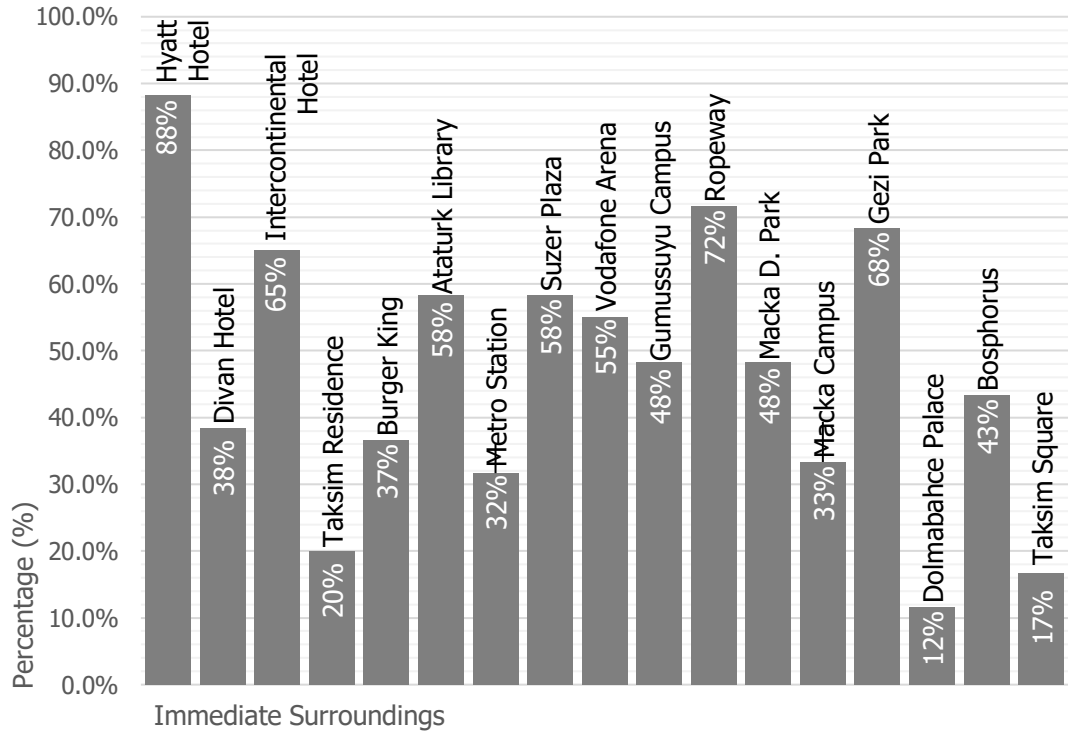


Figure 4.14 : The frequency of the drawn landmarks in immediate surroundings.

Outcomes of the cognitive map application was qualified as a pedestal for the pointing out task, the wayfinding task and most especially for the Likert scale questionnaire. Therefore, some of the top rated immediate surroundings were distinguished according to their whereabouts and their anticipated interrelation with specified interior spaces.

Therefrom, when we considered the data in the results, for the west side Hyatt Hotel and Gezi Park; for the east side Süzer Plaza and Bosphorus; for the north side the ropeway and Maçka Democracy Park; and for the south side ITU Gümüşsuyu Campus and Atatürk Library were selected (Figure 4.15).

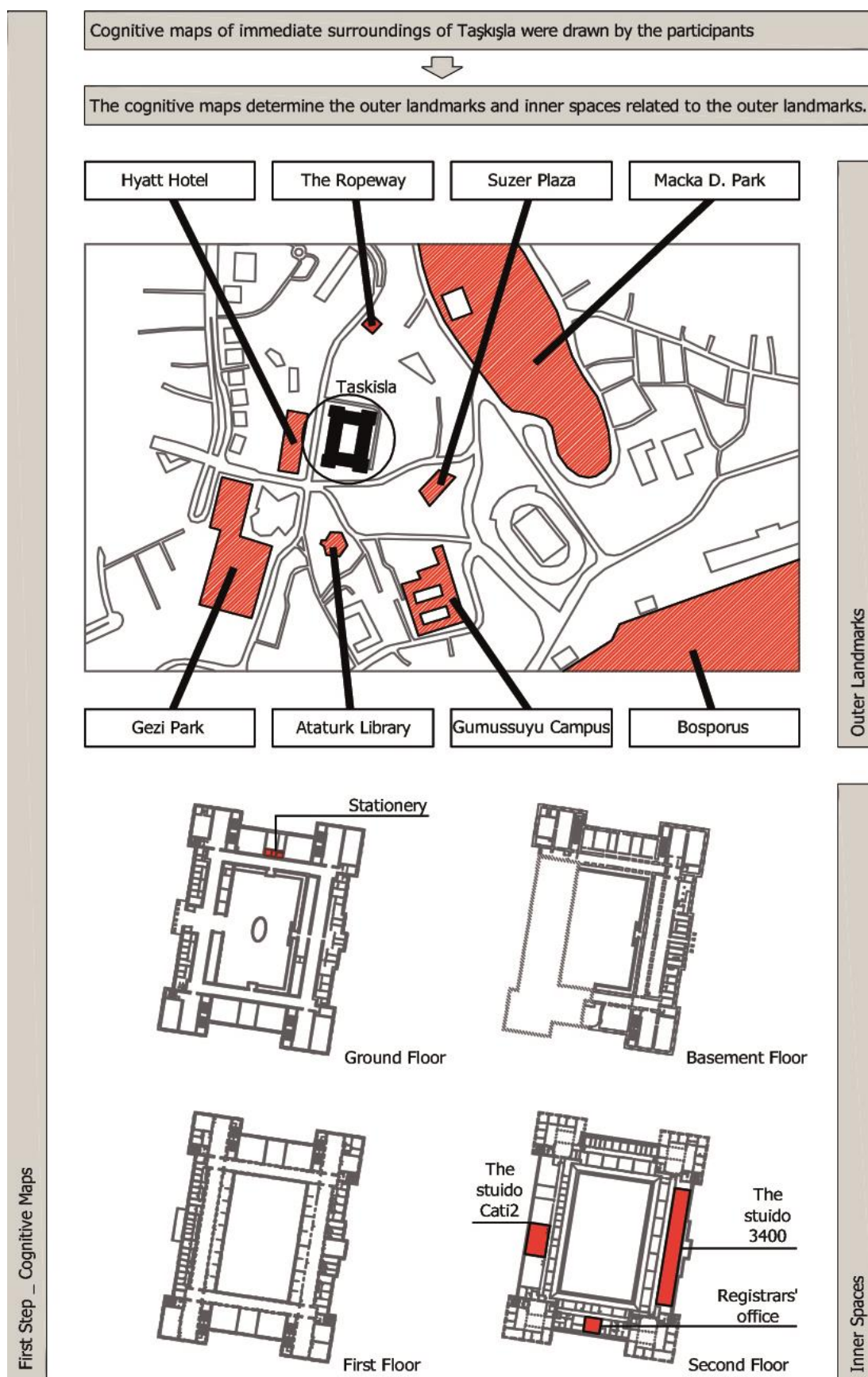


Figure 4.15 : Selected outer landmarks and related inner spaces with the outer landmarks.

4.2.2 Findings of pointing out task and discussion

Pointing out tasks were carried out for the aim of determining their accuracy depending upon taking outer landmarks as reference points. There were four pointing out tasks applied to 30 participants so there were 120 pointing out tasks totally. Participants pointed the requested spaces out by fingers before each wayfinding task; then, they were asked to answer an open-ended question that investigates why they pointed out that direction.

For the first pointing out task, obtained results indicate that the accuracy was quite high. 90% of the participants pointed out the right direction that is the studio 3400. The task had the maximum frequency of accuracy. Immediately afterwards, participants were required to explain why they point out that direction; thus and so, participants' verbal represents were analyzed. Content analysis technic, which shows that 41 reference points are taken and almost half of them are from outside of the building instead the other half are from inside the building, was applied to verbal representations.

For the second pointed out task, achievement decreased; results show that half of the participants were successfully pointed out the right direction, as on the contrary of the other half. With this, the second pointing out task had the minimum frequency of the accuracy. The content analysis of the open-ended question for the second pointing out task shows that there was no reference point from outside of the building taken; conversely, all the landmarks that are taken as reference point were inside the building.

The third and the fourth pointing out task state similar results. About three quarters of the participants pointed out the right directions for both tasks. The open ended questions asked after each the third and the fourth pointing out task denote that approximately three quarters of the verbal representations of the landmarks that taken as reference points are inside the building and the other quarter are outer landmarks (Table 4.1 and Table 4.2).

Table 4.1 : The accuracy of pointing out tasks.

	pointing out task-1 (pointing out the studio 3400 from the courtyard)		pointing out task-2 (pointing out the Registrars' office from the studio 3400)		pointing out task-3 (pointing out the stationery from the Registrars' office)		pointing out task-4 (pointing out the studio Çatı2 from the stationery)	
	frequency (n)	proportion (%)	frequency (n)	proportion (%)	frequency (n)	proportion (%)	frequency (n)	proportion (%)
Accurate	27	90%	15	50%	21	70%	22	73%
Inaccurate	3	10%	15	50%	9	30%	8	27%
Sum	30	100%	30	100%	30	100%	30	100%

Table 4.2 : The content analysis of verbal representations with regards to landmarks that is taken reference points.

	Question-1A (the question asked after the pointing out task 1)		Question-2A (the question asked after the pointing out task 2)		Question-3A (the question asked after the pointing out task 3)		Question-4A (the question asked after the pointing out task 4)	
	frequency (n)	proportion (%)	frequency (n)	proportion (%)	frequency (n)	proportion (%)	frequency (n)	proportion (%)
Outer landmarks	18	44%	0	0%	11	25%	9	20%
Inner landmarks	23	56%	19	100%	33	75%	37	80%
Sum	41	100%	19	100%	44	100%	46	100%

When we considered the results of the first pointing out task, we can see that the accuracy was 90%, which means almost all participants pointed out the right direction. Plus, answers of the open ended questions about the first pointing out task indicates that almost half of the reference points were outer landmarks. Additionally, the second pointing out task had the minimum accuracy frequency that is 50%; likewise, the second open ended question about the second pointing out task shows there was no outer landmark taken as reference point. The third and the fourth pointing out tasks had similar results like the results of the third and the fourth open ended question. The accuracy for the third and the fourth pointing out task had average values, which are 70% and 73% respectively. Moreover, the frequency of the outer landmarks that is taken as landmarks was again at average value that are 25% and 20% respectively. By this data in the hand, we can say that, there was a direct proportion between the accuracy of the pointing out tasks and taking outer landmarks as reference points.

In this focalization, when we analyze the findings of pointing out task, it has been seen that, participants had hardly any objects to relate to Registrars' Office for the second pointing out task; that is why the accuracy of this pointing out task is so low. This result verifies the co-dependent relation between the object and the subject to understand our own position relative the setting (Thrift, 2014), since there is poor interrelation between Registrars' Office and the outer landmarks, which is agree with the Thrift's (2014) argument.

In addition, the transparency of the studio 3400, Registrars' Office, stationery store, the studio Çatı 2 might affect the taking outer landmarks as reference points. The frequency of the taking outer landmarks as reference points to point out the studio 3400 was the highest; likewise, the transparency of the studio 3400 was the highest. Students can see the outside and both Bosphorus and Süzer Plaza were in the people's field of vision when they were in the studio 3400 (Figure 4.16).

However, students when they were in front of the Registrars' Office, they had no vision to outside of the building. In this situation, students could not orient themselves by taking outer landmarks as reference points. Concordantly, frequency of taking outer landmarks as reference points to point out Registrars' Office was zero (Figure 4.17).

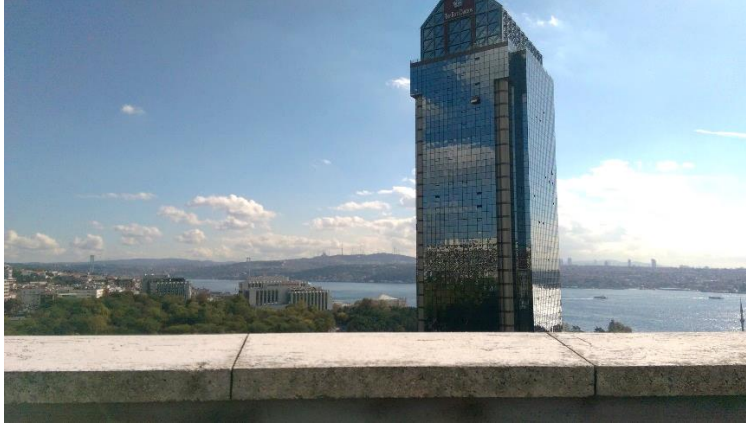


Figure 4.16 : View from the studio 3400. Students can see the immediate surroundings of Taskisla from this point.



Figure 4.17 : View from in front of Registrars' Office. Students cannot see outside from this point.

For the stationery store and the studio Çatı 2, frequencies of taking outer landmarks as reference points were in near the average value, likewise their transparency. Students could see outside partially when they were in front of the stationery store and in the studio Çatı 2. The courtyard of the building was visible from stationery store (Figure 4.18); moreover, the outside environment was partially visible from the studio Çatı 2 (Figure 4.19).

In this focalization, it can be said that, visibility is a player that affects taking outer landmarks as reference points. The effect is in positive way as transparency increases taking outer landmarks as reference points increases. The results matched up with the idea mentioned above in literature review by Thrift (2014), lack of visuo-spatial perception causes confusion for wayfinders.



Figure 4.18 : View from stationery store. Students cannot see the immediate surroundings of the building from this point. However, still they can see the courtyard.



Figure 4.19 : View from the studio Çatı 2. Students can partially see the immediate surrounding of the building.

4.2.3 Findings of wayfinding task and discussion

Wayfinding task has been implemented in order to find out whether participants takes outer landmarks as reference points or not while they oriente themselves. There were four wayfinding tasks applied to 30 participants, so there were 120 wayfinding tasks totally. For the first task, start point was the midpoint of the courtyard and the destination point was the studio 3400; then the studio 3400 became the start point and Registrars' Office was the destination point; likewise, all destination points became the start point for the next wayfinding task. During the wayfinding tasks, participants think loud and their thinking and routes were recorded by a camera, then the participants' routes were drawn (Figure 4.20). Between two wayfinding tasks, to verify the results obtained from wayfinding task, there was an open ended question asked to the participants, which is asking that how the participants found the destination points.

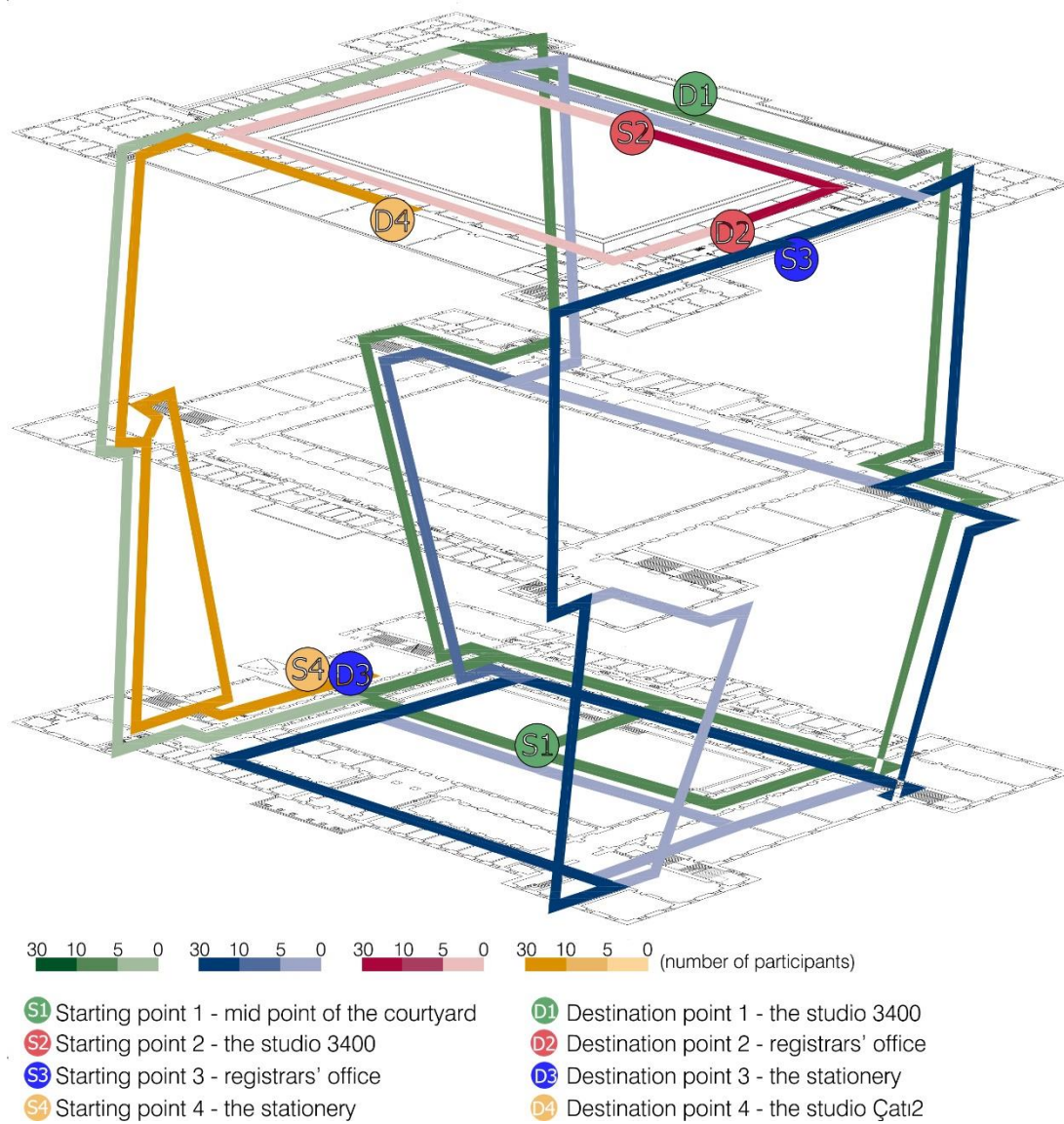


Figure 4.20 : Participants' routes during wayfinding tasks.

For the first wayfinding task, which is started from the courtyard and ended at the studio 3400, data obtained from content analysis indicates that the participants took outer landmarks as reference points. 24 reference points were taken during the tasks and 38% of them were outer landmarks, plus 63% of them are inner ones. 63% of the reference points were Bosphorus, 25% of them were entrance, 25% of them were rooms, 8% of them were circulation elements and 4% of them were objects. (Figure 4.21). The results of the open-ended question, which was applied just after the first wayfinding task, verified the righteousness of the results of the wayfinding task (Figure 4.21).

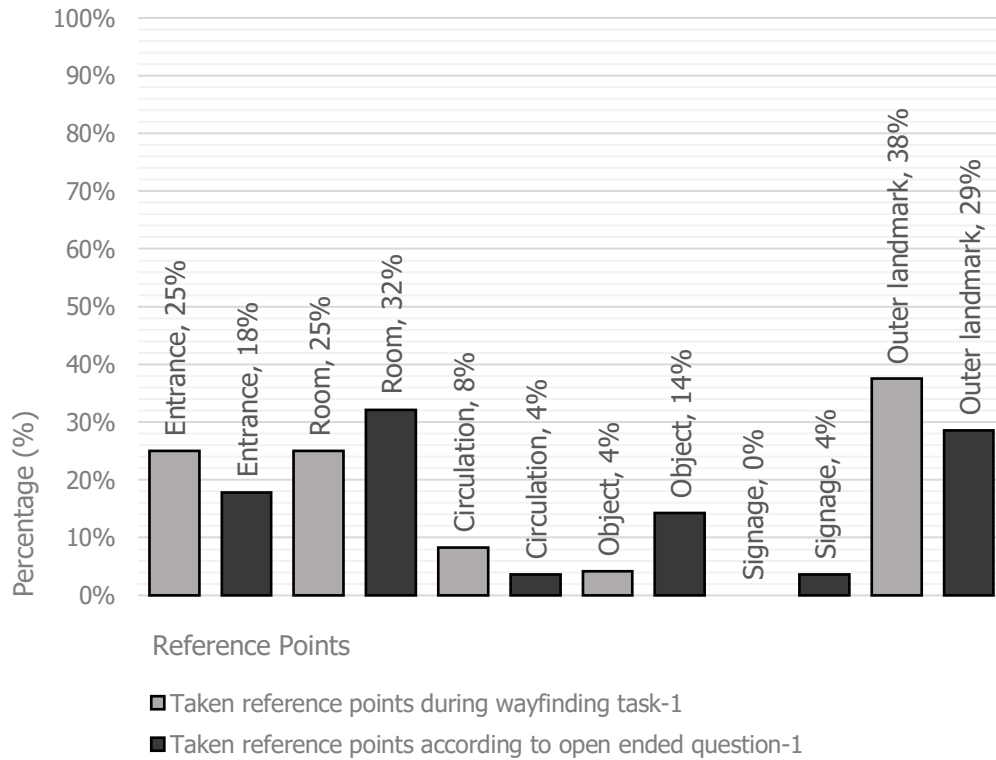


Figure 4.21 : Percentage of taking outer landmarks as reference points during wayfinding task-1 (from the courtyard to the studio 3400) and percentage of taking outer landmarks as reference points according to open-ended question-1.

For the second wayfinding task, which is started from 3400 and ended at Registrars' Office, obtained results show that the participants took the outer landmarks as reference points in the ratio of only 5% that is Bosporus. However, 58% of the reference points were rooms and 11% of them were entrance, 11% of them were objects such as furnitures and paintings. Finally, signage systems were taken as reference points at the ratio of 16%, which are not taken in the first wayfinding, task (Figure 4.22). Furthermore, the open ended question, which was applied after the second wayfinding task, verified of the results obtained from the second wayfinding task (Figure 4.22).

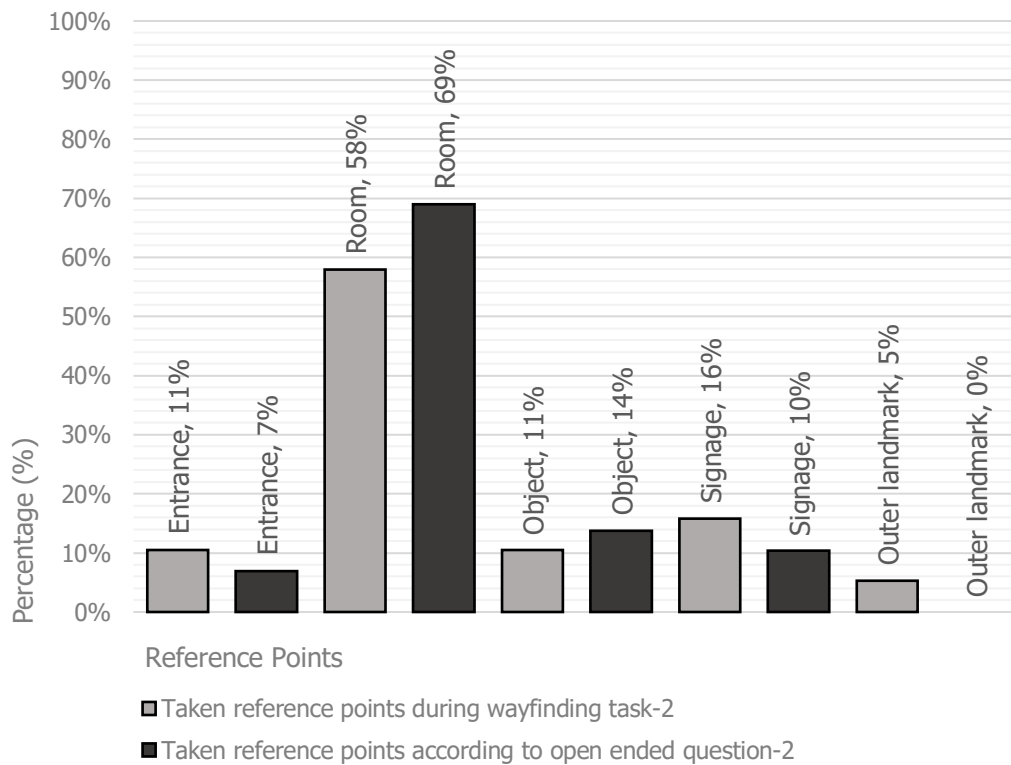


Figure 4.22 : Percentage of taking outer landmarks as reference points during wayfinding task-2 (from the studio 3400 to the Registrars' office) and percentage of taking outer landmarks as reference points according to open-ended question-2.

For the third wayfinding task, outcomes say the similar results with the second wayfinding task as follows; 5% of the reference points were outer landmarks as it was in the second wayfinding task. Additionally, 49% of the reference points were rooms, which is the similar ratio with the results of the second wayfinding task (Figure 4.23). Plus, as it was in the first and the second wayfinding task, the open ended question, which is asked after the third wayfinding task, also validated the results of the third wayfinding task (Figure 4.23).

For the fourth wayfinding task, 13% of the reference points were outer landmarks. On the other hand, 30 of the reference points were entrance, 4% of them courtyard, 32% of them were rooms, 15 of them were circulation elements, 6 % of them were objects and there was no signage taken as reference points (Figure 4.24). In addition, the last open-ended question affirmed the results of the fourth wayfinding task (Figure 4.24).

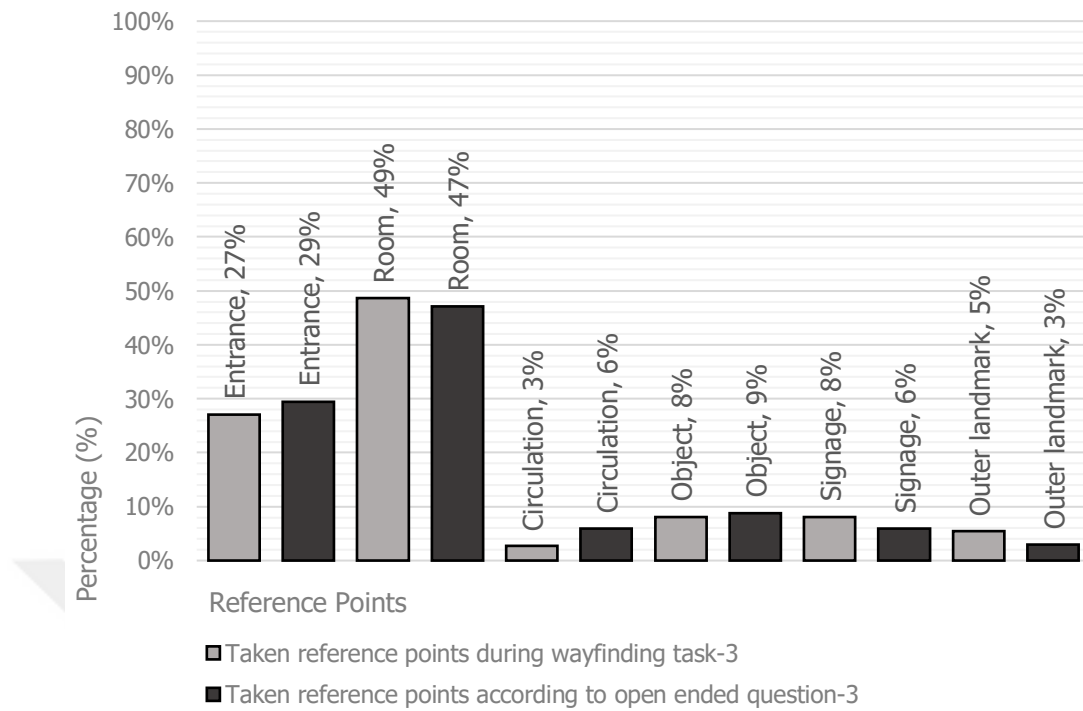


Figure 4.23 : Percentage of taking outer landmarks as reference points during wayfinding task-3 (from the Registrars' office to the stationery) and percentage of taking outer landmarks as reference points according to open-ended question-3.

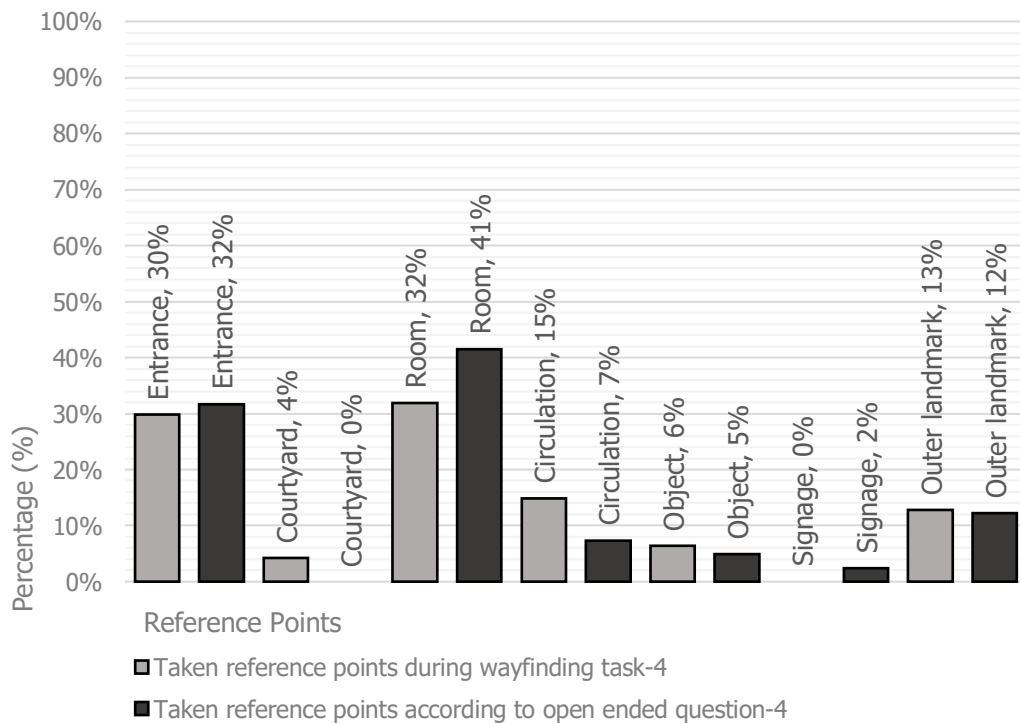


Figure 4.24 : Percentage of taking outer landmarks as reference points during wayfinding task-4 (from the stationery to the studio Çatı2) and percentage of taking outer landmarks as reference points according to open-ended question-4.

Obtained results from wayfinding tasks are most likely similar with the writers mentioned above in the literature review that is Siegel and White's (1975) idea as collectivist, which is to say people has his or her spatial perception by common landmarks, routes and surveys; instead of Andersson and Daghlgren's (1974) idea as individualist, which is declared each individual has his or her spatial perception of the spatial objects, their characteristics and the interrelationship between the two.

In addition to Emo et al.'s (2012) upholding, which is mentioned in the literature review, that is to say an individual makes choices while wayfinding and those choices are provided by the measurements of space; the results of the wayfinding tasks also indicate that those choices can be made by distance between that individual and outer landmarks, integration and tendency of the outer landmarks.

Also obtained results from wayfinding tasks matched up with Lingwood et al's (2015) argument, which is above in the literature review, that learning routes and wayfinding ability without landmarks is much poorer than where there are landmarks.

As it is mentioned in the literature review, Raubal & Winter's (2002) and Arrowsmith & Jackson's (2008) common idea that a landmark must capture a wayfinder's attention and must be big enough to be visible in a large frame of reference; nevertheless, results of the wayfinding task shows that participants took outer landmarks as reference points even though they could not see the landmarks.

4.2.4 Findings of Likert scale questions and discussion

Likert scale questions were administrated in order to reveal the participants' ability to correlate preset spaces with predetermined outer landmarks. After all tasks, there were four Likert scale questions applied to the participants. It was quantified that participants' ability to link inner spaces with outer landmarks. Obtained results shows that participants were cognizant of the spatial relation between indoor spaces and the outer landmarks.

The first question asks that the spatial relation between the studio 3400 and the predetermined outer landmarks. The results for the first question asserts that there was a strong relation between the studio 3400 and both Bosphorus and Süzer Plaza. 90% of the participants agreed and strongly agreed that there is a spatial relation between the studio 3400 and Bosphorus; additionally, 80% of the participants agreed and strongly agreed that there is a spatial relation between the studio 3400 and Süzer Plaza. Besides,

Maçka Democracy Park and İTÜ Gümüşsuyu Campus had over 50% of *agree* and *strongly agree* frequencies. According to participants, there was no spatial relation between the studio 3400 and both Hyatt Hotel and Gezi Park, which are located completely opposite side of the studio (Figure 4.25).

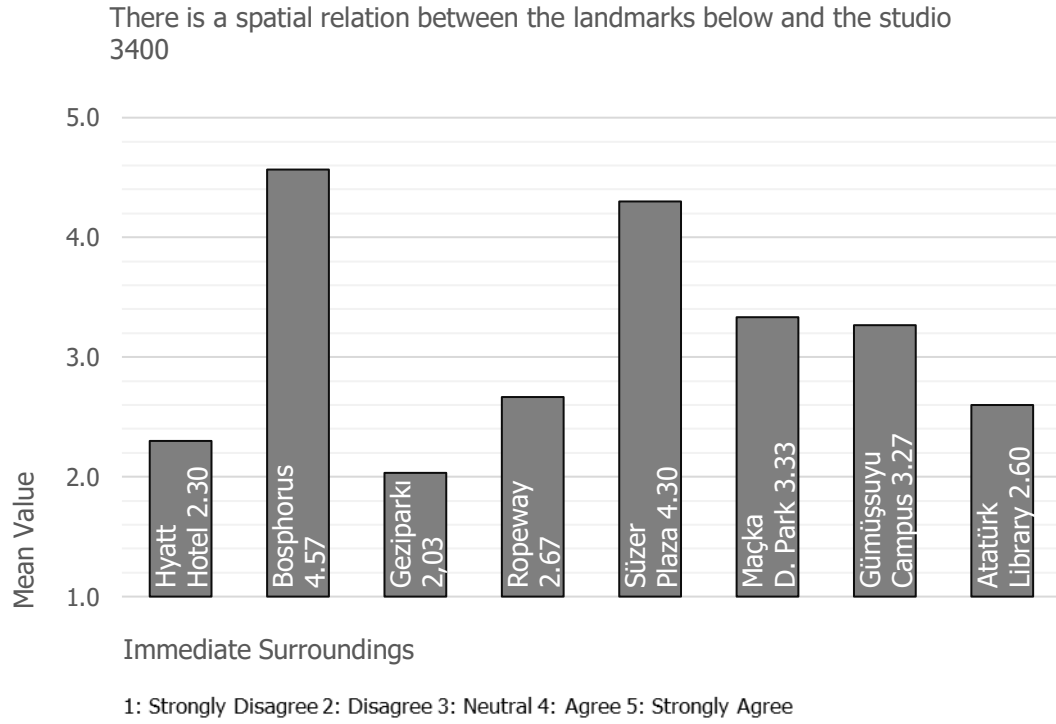


Figure 4.25 : Participants' ability to correlate the studio 3400 with the predetermined outer landmarks.

The second Likert scale question seeks an answer to the spatial relation between Registrars' Office and the predetermined outer landmarks. The participants indicate that the spatial relation between Registrars' Office and the outer landmarks were poor. For the second question, maximum frequency of *agree* and *strongly agree* were 50% which is belonging to the spatial relation between Registrars' Office and İTÜ Gümüşsuyu Campus. Obviously, participants could not link with Registrars' Office and landmarks (Figure 4.26).

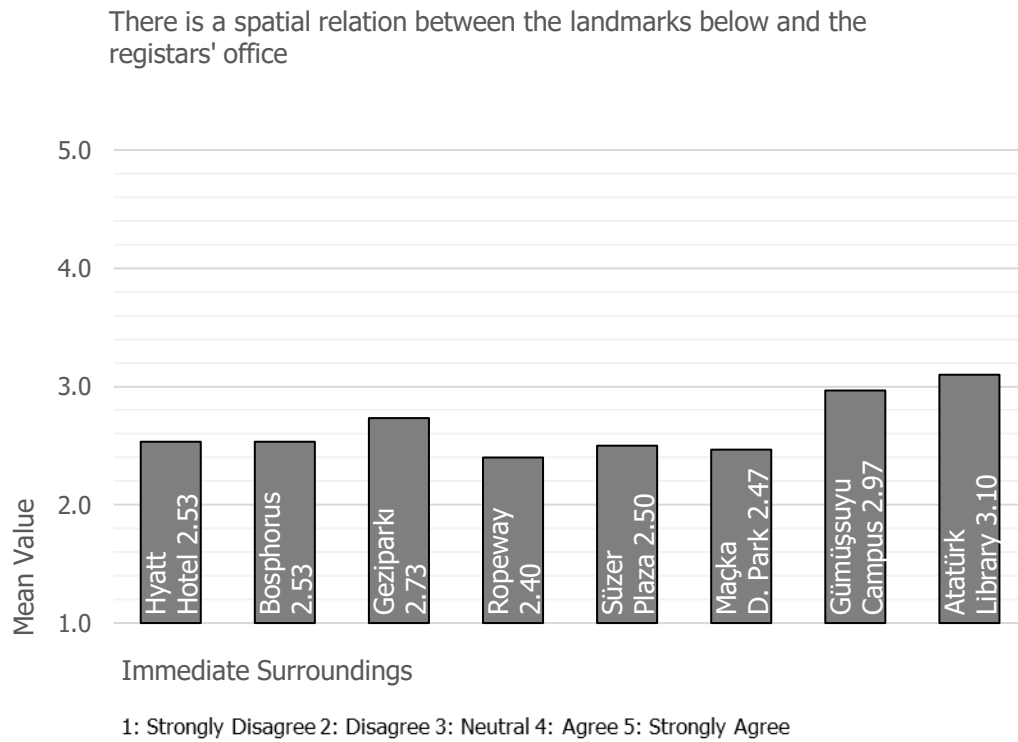


Figure 4.26 : Participants' ability to correlate Registrars' Office with the predetermined outer landmarks.

The third question examine that the spatial relation between the stationery shop and the outer landmarks. When we considered the responses of the third question of the Likert scale questionnaire, we can understand that outcomes were quite similar with the question two. The spatial relation found between the stationery shop and both Maçka Democracy Park and the ropeway that is located near Taskisla yet it was poor as 50% and 53% respectively. The significant outcomes were the frequency of *disagree* and *strongly disagree*, which are 83% for Süzer Plaza; 80% for Gezi Park; 77% for İTÜ Gümüşsuyu Campus and Atatürk Library; and 70% for Bosphorus respectively (Figure 4.27).

The fourth question investigate that the spatial relation between the studio Çatı 2 and the outer landmarks. The answers point that the spatial relation between the studio Çatı 2 and Hyatt Hotel was strong. 84% of the participants chose *agree* and *strongly agree* for the existing of the spatial relation between the studio Çatı 2 and Hyatt Hotel. Süzer Plaza and Bosphorus had the maximum frequency of *disagree* and *strongly disagree* with 64% and 63% respectively (Figure 4.28).

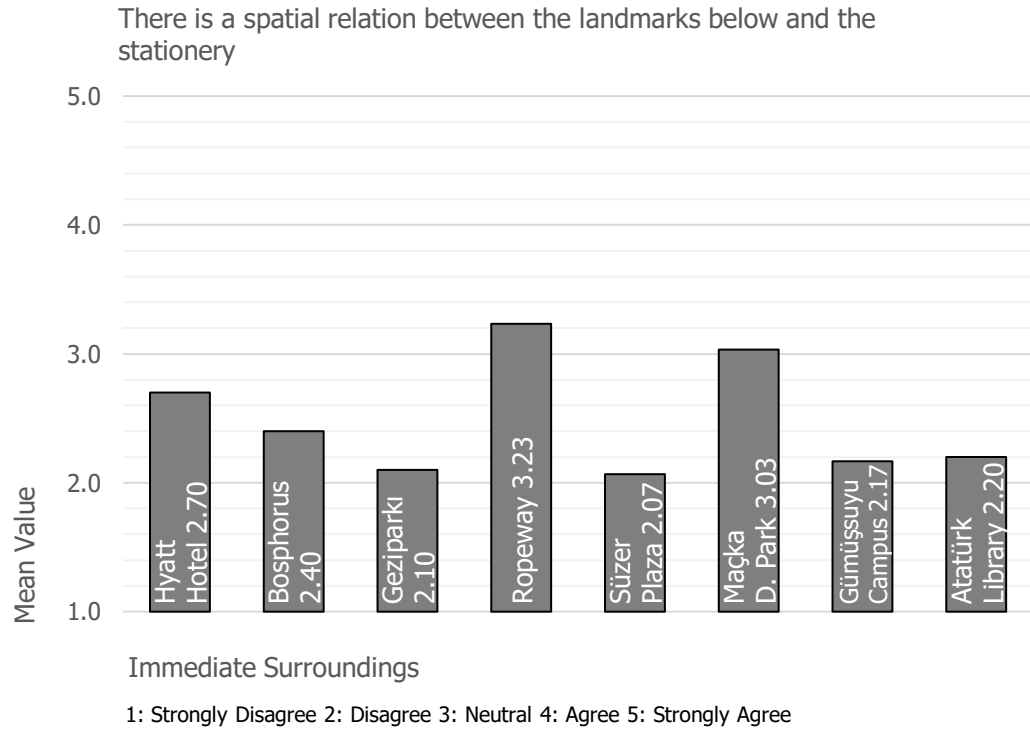


Figure 4.27 : Participants' ability to correlate the stationery with the predetermined outer landmarks.

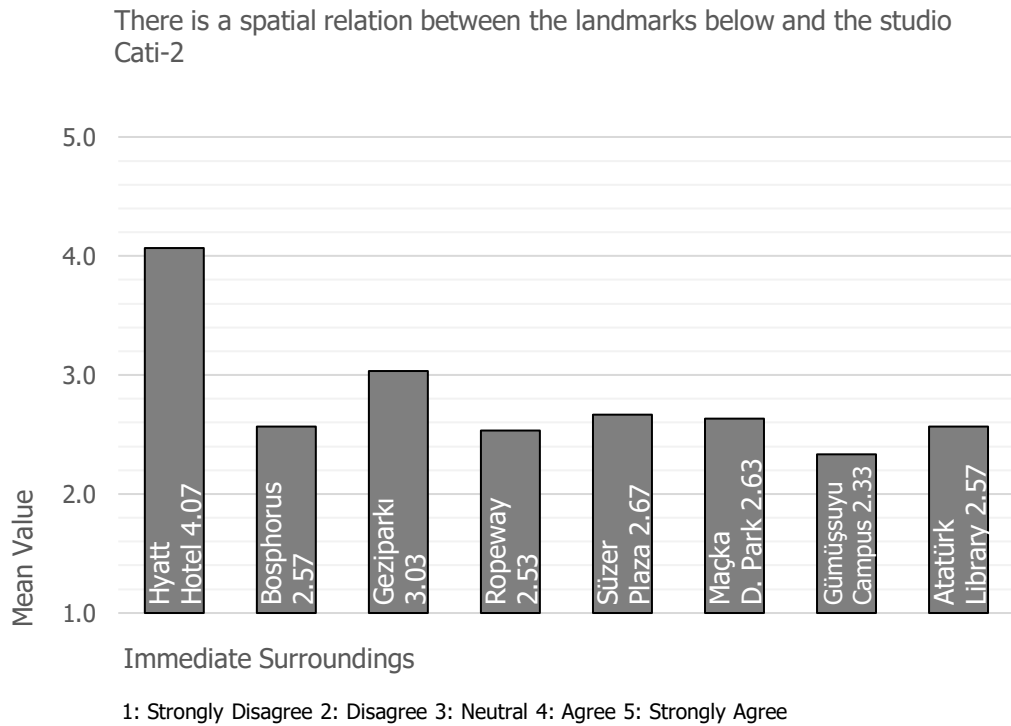


Figure 4.28 : Participants' ability to correlate the studio Çatı-2 with the predetermined outer landmarks.

Like the common prognosis in the literature review above, visuo-spatial perception skills, which let people translate retinotopic to spatiotopic information to recognize similar spaces from each other, also can take a significant role for linking the inner spaces with the outer spaces. As it is mentioned above in results, transparency levels are as following, the studio 3400, the studio Çatı 2, the stationery and Registrars' Office respectively. The participants indicate that there was a strong spatial relation between the studio 3400 and both Bosphorus and Süzer Plaza. Total opposite, the participants found out no strong spatial relation between any outer landmarks and Registrars' Office, which has no eye contact with the predetermined outer landmarks or anywhere outside of Taskisla. A few participants remarked the spatial relation between Registrars' Office and the outer landmarks. This data says, to link inner spaces with outer ones, transparency can take a significant role.

5. CONCLUSION

Perceptual and cognitive processes are shaped by peripheral stimuli; in addition, architectural space characteristics and form are also parts of these stimuli. Indoor wayfinding behavior occurs within a specific place and architectural features of the space orientate wayfinding behavior due to the behavior is under effects of perceptual and cognitive processes. That architectural features are the characteristics of a building such as color, form, differentiation, signs or layout configuration.

When a person enters a place, the characteristics of that place begin to be stored in memory. Once the person is again in that place, the acquired and stored data of that place are dissolved or recalled. Thus, the user remembers the spatial locus of the space and that assists the person in performing wayfinding by pre-determined images, cognitive schemas and maps of the respective directions. In other words, pre-acquired images and cognitive schematics give the person tips on navigating within that space. If and only people differentiate the images and cognitive schematics from each other, wayfinding would be accomplished. In particular, the understanding of the circulation system and the organization of the space has great importance in terms of wayfinding. According to many studies done, learning the space and wayfinding starts with differentiation first; plus, differentiation starts with connecting pre-acquired images and cognitive schematics with related images, which are landmarks.

There is not enough research around the interrelation between indoor wayfinding behavior and landmarks, which are located outside of the setting. Most of the research investigates the indoor wayfinding and indoor landmarks; remaining research investigate that relation within the scope of city scale. Although there is not enough research about the effects of immediate surroundings of a building on indoor wayfinding behavior; studies in the literature, which investigate the relation between wayfinding behavior and landmarks which are located already in that setting, were inspirational as to evaluate outer landmarks in the context of indoor wayfinding behavior on this topic. In consideration of the hypothesis, this study is distinguished

from its kind and it fills the gap in the literature about the contribution of immediate surroundings of symmetric buildings to indoor wayfinding behavior.

The contribution of immediate surroundings of symmetric buildings to wayfinding behavior has been investigated at İstanbul Technical University, Taskisla Campus. As it is mentioned above in the literature review chapter, landmarks take significant role on wayfinding behavior (e.g. Lingwood et al., 2015; Hirtle, 2001; Lynch, 1960; Caduff and Timpf, 2006; Omer and Golblatt, 2007). Outer landmarks, which are located in immediate surroundings of a building, were expected to affect indoor wayfinding behavior in a positive way. Overall results of the tasks and the questionnaires verified the contribution of outer landmarks to wayfinding behavior.

It was found that there is significant relation between pointing out task and getting outer landmarks as reference points. As it can be seen at the results and discussion section, there is a direct proportion between accuracy of pointing out tasks and getting outer landmarks as reference points (see 4.2.2 section). The accuracy of the pointing out tasks increases when participants take up outer landmarks as reference points. Also, transparency takes a crucial role when it comes to taking outer landmarks as reference points. It was found that pointing out spaces that have visual accessibility to immediate surroundings of the building is easier than pointing out spaces that have no visual accessibility to immediate surroundings of the building. The results verify that visual accessibility between indoor spaces and immediate surroundings of the building affects taking outer landmarks as reference points and taking outer landmarks as reference points affects the accuracy of pointing out somewhere in a symmetric setting that consists of similar architectural elements.

In addition, it was studied out that people in symmetric buildings that consists of similar architectural elements acting collectivistic. They take common outer landmarks as reference points besides of landmarks, which are located in the building. Moreover, the choices that people make while wayfinding can be made by distance between people and the outer landmarks, integration and tendency of the outer landmarks. Much as transparency is important for taking outer landmarks as reference points, a few participants indicate that they take outer landmarks as reference points even though they do not see the outer landmarks.

The results of the study show that, people, who use a building for a while, can correlate indoor spaces with the outer landmarks. The geometry of a symmetric building that consists of similar architectural elements keeps the accuracy of the correlation between indoor spaces and the outer landmarks in a limited frequency. However, transparency breaks taboos and makes accuracy of the correlation in a large number of frequency where we can mention visual accessibility between indoor and outdoor spaces.

Today wayfinding is not an issue just for academy but also professional work era. There are several firm that their professional is wayfinding. One of them introduces itself as “We enhance architecture, interior and site design through branding, graphics, signage and technology to create clear and cohesive environments. Our wayfinding and environmental design professionals develop strategies that help orient people and simplify navigation in complex facilities” (Url – 11, 2016).

In addition, architecture is not alone with investigating wayfinding, there are more disciplines, which are investigating and developing wayfinding. Technology studies are most common ones. These days, most of the people can reach and use mobile phone to find their ways in the cities and across the countries via GPS. In addition to that, mobile phone applications were being developed for indoor wayfinding.

For future research and experiments, both symmetric and asymmetric illegible buildings can be taken account, thus research would be more generalizable. In addition, it is recommended that, limitations should be extended to validate findings to a great number of different type built environments.

The results of the study and discussions should be considered within the context of providing legible and inclusive built environments. In addition, results show that efficient and proper spatial arrangement of a setting can make that setting legible and inclusive for people from all ages and abilities; in this legible and inclusive settings, wayfinding would be easier and it saves time and energy. It can be recommended that, arranging similar functions together and distinguishing them from each other is significant to have more legible built environments. Also reinforcing visual accessibility between indoor spaces and outer spaces causes getting more outer landmarks as reference points that makes wayfinding easier. The outcomes of this study can be beneficial to architects who are not only dealing with spatial arrangement and form but also universal and inclusive design.



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APPENDICES

APPENDIX A:



APPENDIX A:

Task 1-A: Pointing out task
Please, point out the studio 3400 by your finger.
☐ Accurate ☐ Inaccurate

Figure A.1 : The first pointing out task.

Question 1-A
What is the thought that makes you point out that direction?

Figure A.2 : The open-ended question related to the first pointing out task.

Task 1-B: Wayfinding task with think-loud protocol
Please, go to the studio 3400 and think loud while you are performing the task.

Figure A.3 : The first wayfinding task.

Question 1-B
How did you find the destination?

Figure A.4 : The open-ended question related to the first wayfinding task.

Task 2-A: Pointing out task
Please, point out the registrar's office by your finger.
☐ Accurate ☐ Inaccurate

Figure A.5 : The second pointing out task.

Question 2-A
What is the thought that makes you point out that direction?

Figure A.6 : The open-ended question related to the second pointing out task.

Task 2-B: Wayfinding task with think-loud protocol
Please, go to the registrar's office and think loud while you are performing the task.

Figure A.7 : The second wayfinding task.

Question 2-B
How did you find the destination?

Figure A.8 : The open-ended question related to the second wayfinding task.

Task 3-A: Pointing out task
Please, point out the stationary shop by your finger.
☐ Accurate ☐ Inaccurate

Figure A.9 : The third pointing out task.

Question 3-A
What is the thought that makes you point out that direction?

Figure A.10 : The open-ended question related to the third pointing out task.

Task 3-B: Wayfinding task with think-loud protocol
Please, go to the stationary shop and think loud while you are performing the task.

Figure A.11 : The third wayfinding task.

Question 3-B
How did you find the destination?

Figure A.12 : The open-ended question related to the third wayfinding task.

Task 4-A: Pointing out task
Please, point out the studio Çatı-2 by your finger.
__ Accurate __ Inaccurate

Figure A.13 : The fourth pointing out task.

Question 4-A
What is the thought that makes you point out that direction?

Figure A.14 : The open-ended question related to the fourth pointing out task.

Task 4-B: Wayfinding task with think-loud protocol
Please, go to the studio Çatı-2 and think loud while you are performing the task.

Figure A.15 : The fourth wayfinding task.

Question 4-B
How did you find the destination?

Figure A.16 : The open-ended question related to the fourth wayfinding task.

1. There is a spatial relation between the landmarks below and the studio 3400.					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Hyyatt Otel	☐	☐	☐	☐	☐
Bosphorus	☐	☐	☐	☐	☐
Gezi Park	☐	☐	☐	☐	☐
The ropeway	☐	☐	☐	☐	☐
Süzer Plaza	☐	☐	☐	☐	☐
Maçka Democracy Park	☐	☐	☐	☐	☐
Gümüşsuyu Campus	☐	☐	☐	☐	☐
Atatürk Library	☐	☐	☐	☐	☐

Figure A.17 : The first Likert scale question.

2. There is a spatial relation between the landmarks below and the registrar's office.					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Hyyatt Otel	☐	☐	☐	☐	☐
Bosphorus	☐	☐	☐	☐	☐
Gezi Park	☐	☐	☐	☐	☐
The ropeway	☐	☐	☐	☐	☐
Süzer Plaza	☐	☐	☐	☐	☐
Maçka Democracy Park	☐	☐	☐	☐	☐
Gümüşsuyu Campus	☐	☐	☐	☐	☐
Atatürk Library	☐	☐	☐	☐	☐

Figure A.18 : The second Likert scale question.

3. There is a spatial relation between the landmarks below and the stationary shop.					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Hyyatt Otel	☐	☐	☐	☐	☐
Bosphorus	☐	☐	☐	☐	☐
Gezi Park	☐	☐	☐	☐	☐
The ropeway	☐	☐	☐	☐	☐
Süzer Plaza	☐	☐	☐	☐	☐
Maçka Democracy Park	☐	☐	☐	☐	☐
Gümüşsuyu Campus	☐	☐	☐	☐	☐
Atatürk Library	☐	☐	☐	☐	☐

Figure A.19 : The third Likert scale question.

4. There is a spatial relation between the landmarks below and the studio “Çatı – 2”.					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Hyyatt Otel	☐	☐	☐	☐	☐
Bosphorus	☐	☐	☐	☐	☐
Gezi Park	☐	☐	☐	☐	☐
The ropeway	☐	☐	☐	☐	☐
Süzer Plaza	☐	☐	☐	☐	☐
Maçka Democracy Park	☐	☐	☐	☐	☐
Gümüşsuyu Campus	☐	☐	☐	☐	☐
Atatürk Library	☐	☐	☐	☐	☐

Figure A.20 : The fourth Likert scale question.

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