INFLUENCE OF SPATIAL ORGANIZATION AND SIGNAGE SYSTEMS ON WAYFINDING IN HOSPITALS: THE CASE OF TOBB ETU HOSPITAL

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED
SCIENCES OF
ÇANKAYA UNIVERSITY

BY
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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF
MASTER OF SCIENCE
IN
INTERIOR ARCHITECTURE
DEPARTMENT

FEBRUARY 2019

Title of the Thesis: **Influence of Spatial Organization and Signage Systems on Wayfinding in Hospitals: The Case of TOBB ETU HOSPITAL**

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ABSTRACT

INFLUENCE OF SPATIAL ORGANIZATION AND SIGNAGE SYSTEMS ON WAYFINDING IN HOSPITALS: THE CASE OF TOBB ETU HOSPITAL

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FEBRUARY 2019, 156 pages

The aim of this study is to reveal the effects of spatial organization and sign systems on wayfinding performance in hospitals. It is aimed to determine how these elements affect the experience of wayfinding of users with various qualifications in hospital. In this context, a field study was conducted in TOBB (Turkish Union of Chambers and Commodity Exchanges) ETU (University of Economy & Technology) Hospital in Ankara Söğütözü district.

Accordingly, accessing performance of the users and the period starting from the entrance to the polyclinic of otorhinolaryngology, mostly used in 2018 as a round trip have been examined. In this study, directional signs regarding the current situation in TOBB ETU Hospital were used as data collection and an on-site determination study was conducted based on the findings of Bechtel and Churchman (2002) about wayfinding strategy. Within this scope, the study was carried out in three stages. In the first stage, the indoor space organization of the hospital was analyzed through hospital floor plans.

In the second stage, the data of sign systems that Lynch (1960) had categorized were used and all the details including the type, size, colors, hanging heights of the current sign systems in the hospital were examined.

In the final stage, the study has been deepened with a survey by observing O'Neill's (1991) wayfinding behavior standards. Questionnaires including structured questions has constituted the framework of the survey. Moreover, the walking distance of the survey participants to the target polyclinic as a round trip and the way they followed have been measured as the types of actions and evaluated accordingly.

The relationship between these notions, time and the differences in the personal characteristics that cause diversity in people's behaviors were tried to be proved using SPSS correlation analysis program. The routes followed by the participants were recorded in the user maps and notes were taken regarding the participants' behavior, pausing period and their attention to the sign systems. It has been noted that the spatial organization / plan of the hospital and the sign systems, signage and direction information in the hospital are effective in terms of easy wayfinding of the participants on their routes as the results of the analysis.

According to these findings, the hypothesis that "The indoor space organization and sign systems are effective in wayfinding experiences of hospital users" has been confirmed. In addition, it was revealed how this experience has been differentiated for users having different backgrounds. The variables such as age, gender, and familiarity status have not played a very significant role for the success of wayfinding in this hospital whereas the educational status has affected the values.

In this thesis, the researcher has produced guidelines for architects or designers in wayfinding that should be taken into account during the designing phase. The study has also developed recommendations to further in the field of wayfinding.

Keywords: Wayfinding Performance, Spatial Organization, Wayfinding in Hospital, Signage, Hospital.

ÖZ

HASTANELERDE MEKANSAL ORGANİZASYONUN VE İŞARET SİSTEMLERİNİN YÖN BULMA ÜZERİNE ETKİSİ: TOBB ETU HASTANESİ SAHA ÇALIŞMASI

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ŞUBAT 2019, 156 sayfa

Bu çalışmanın amacı, mekansal organizasyon ve işaretleme sistemlerinin hastanelerde yön bulma performansı üzerine etkilerini ortaya çıkarmaktır. Bu unsurların hastanedeki farklı niteliklere sahip kullanıcılarının yön bulma deneyimine nasıl etki ettiğinin belirlenmesi hedeflenmiştir.

Bu bağlamda Ankara Söğütözü semtinde bulunan TOBB ETU Hastanesinde bir saha çalışması yapılmıştır. Bu kapsamda hastanenin 2018 yılı içerisinde en çok kullanılan Kulak- Burun- Boğaz (KBB) polikliniğine kullanıcılarının girişten itibaren gidiş ve dönüş şeklinde ulaşma performansı ve süresi değerlendirilmiştir. Çalışmada bilgi toplama yöntemi olarak, TOBB ETU Hastanesindeki mevcut duruma ilişkin yönlendirme levhaları Betchtel ve Churchman'ın (2002) yön bulma stratejisine ilişkin saptamaları baz alınarak yerinde tespit çalışması yapılmıştır.

Bu kapsamda, çalışma üç aşamalı olarak gerçekleştirilmiştir. İlk aşamada, hastanenin iç mekân organizasyonu hastane kat planları üzerinden analiz edilmiştir. İkinci aşamada ise, Lynch'in (1960), kategorize ettiği işaretleme sistemlerinin verilerinden yararlanılmış ve hastanenin mevcutta bulunan işaretleme sistemlerinin türleri, boyutları, rengi, asıldığı yükseklik gibi tüm detaylarıyla incelenmiştir.

Son aşamada ise, O'Neill'in (1991) yön bulma davranış ölçütlerine göre gözlemlenerek yapılan anket çalışması ile derinleştirilmiştir. Ayrıca anket katılımcılarının hedef polikliniğe gidiş ve dönüş süresince kat ettikleri yol, izledikleri rota, gerçekleştirdikleri eylem biçimleri olarak ölçülmüş ve değerlendirilmiştir.

İnsanların davranışlarındaki çeşitliliğe neden olan kişisel özelliklerindeki farklılaşmaların bu kavramlarla ve zamanla olan ilişkileri SPSS bağıntı analizi programı ile ispatlanmaya çalışılmıştır. Katılımcıların izledikleri rota kullanıcı haritalarına kayıt edilmiş, kullanıcıların davranışları, duraklama süreleri ve işaretleme sistemlerine ilgileri hakkında notlar alınmıştır.

Analiz sonuçları olarak hastanenin mekânsal organizasyonu/planı ve hastanedeki işaret sistemleri, tabelaları ve yön bilgilerinin yön bulmada yeterliğinin, katılımcıların rotaları üzerinde gidiş yönlerini kolaylıkla bulma da etkili olduğu görülmektedir.

Bu bulgulara göre, hastane kullanıcılarının yön bulma deneyimlerinde iç mekân organizasyonunun ve işaretleme sistemlerinin bir etkisi olduğu'' hipotezi doğrulanmaktadır. Ayrıca farklı backgroundlara sahip kullanıcılar için bu deneyimin nasıl farklılaştığı ortaya çıkarılmıştır. Bu hastanedeki yön bulma başarısında yaş, cinsiyet ve aşinalık durumu gibi değişkenler çok önemli bir rol almamaktadır fakat eğitim durumu değerleri etkilemiştir.

Bu tez araştırma konusu ile araştırmacı, yön bulma kolaylığını sağlayan birtakım unsurları mimarın yada tasarımcının henüz tasarım aşamasında iken dikkate alması ve buna göre iç mekanı projelendirmesi konusunda mesajlar vermiştir. Çalışmanın, wayfinding üzerine araştırma yapacak olan diğer araştırmacılara hangi konularda yardımcı olabileceğinden bahsedilmiştir.

Anahtar Kelimeler: Yön Bulma Performansı, Mekansal Organizasyon, Hastanelerde Yön Bulma, İşaretleme Sistemleri, Hastane.

ACKNOWLEDGEMENTS

I would like to thank Assoc. Prof. Dr. Ezgi Kahraman for her invaluable supervision, guidance and encouragement throughout the preparation of this thesis.

I express appreciation to Asst. Prof. Dr. Ufuk Demirbaş for their big suggestions throughout the development of the thesis.

I would like to thank Assoc. Prof. Dr. Çiğdem Gökhan for her guidance helpful suggestions.

I would like to thank Assoc. Prof. Dr. Nur Ayalp for her suggestions and contributions.

I am grateful to all faculty members and staff of Çankaya University Department of Interior Architecture and Graduate school of Natural and Applied Sciences.

I would like to thank Res. Assist. Nazan Kara for her supports and helps.

I would like to thank Dr. Leila Akbarishahabi for her supports and helps.

I would like to thank my best friends, Nil Aksöz and İdil Esen Duran for their support, encouragements, patience and helps.

I am mostly grateful to my family. I am grateful to my mother Zuhal Ilpan and my father Necdet Ilpan for their invaluable support and their endless love, encouragements and patience.

I would like to thank my husband Berk Buyruk for his endless love and big support throughout my thesis.

Finally, I am mostly grateful to my sons Efe Buyruk and Ege Buyruk for to provide the power of making an academic career to me.

For My Lovely Sons Efe And Ege…

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LIST OF ABBREVIATIONS

YAH	You-Are-Here Map
STM	Short Term Memory
LTM	Long Term Markup Memory
ICD	Interconnection Density
NCS	Natural Color System

CHAPTER 1

INTRODUCTION

Wayfinding is an everyday concept that could be explained as simple as moving from one place to another. However, losing one's way and failure in locating a certain destination is usually a frustrating experience. In such cases, most people feel that their individual safety is reduced. Failure in wayfinding may cause fear and distress. Getting lost and the inability of the individual to get help directly when needed may result in many different negative emotional behaviors (Sönmez and Önder, 2015).

Movements of the users in the space itself are among the basic design concerns of spatial architecture. According to these concerns, it is necessary to think about what happens in the space with the elements it encompasses. The space is stable when it is considered in its simplest form and the movement is provided by the people. Based on this disposition, the question of how much time we spend moving in a given space, in which direction and which choices we make come into question (Hasgül, 2011).

The goal of wayfinding design is to provide the information required for users to correctly make and execute decisions within the environment (Passini, 1984). People require information to make an accurate decision on a route, so that they can find their way to a desired destination. With the help of environmental design elements such as layout, landmarks, signage and color, people can reach wherever they would like to go to. In large-scale-built environments, wayfinding becomes a significant design issue, because it can be difficult to find the way and go from one a place to another. In this situation, visual accessibility, architectural differentiation, building plan configuration are known to affect the wayfinding decision (Doğu, 2001). Wayfinding research in literature is carried out in a variety of complex buildings such as municipal buildings (see Best, 1970), hospitals (see Başkaya, 2004), shopping malls (see Doğu & Erkip, 2000), airports (see Seidel, 1982; Churchill, Dada; de Barros & Wirasinghe, 2009), public libraries (see Beecher, 2004; Mandel, 2013).

Hospitals are more complex and difficult buildings than shopping malls, hotels and other public buildings. In all these facilities, people go into the buildings to tend to some specific needs. Signs are the tools that help in wayfinding in such buildings.

According to O'neill (1991), signage is used to enhance wayfinding efficiency especially in settings with complex floor plan configuration, and in places where wayfinding is a serious problem, such as subways, hospitals and large governmental buildings. Current research in hospitals and various health institutions reveals that not just patients but also the doctors who are active in their work disclose that they have lost their way occasionally.

Architects and designers have a great responsibility in this regard. In the design stage of a hospital, direction planning, signage systems, maps and other auxiliary elements should be determined. Otherwise, serious consequences such as missing patients may occur (Sönmez and Önder, 2015). The observation of such positive/negative results in wayfinding can be spatially considered by making it a phenomenon that should not be rejected in the design stage (Arthur and Passini, 2002).

1.1. Aim of the Study

It is possible to divide the design process of spatial organization into two basic stages. The first one of the stages is to determine the needs of the individual the design is aimed to reach. At this stage, the needs are determined and the purpose is decided on. In the second stage, the question of what should be done to meet these needs arises. These two stages in design are related to the need of the user for wayfinding in the spatial organization, and it is considered in what needs to be done to serve for this need. It is a relatively easy experience to get to know the environment, to get acquainted and to find ways in small-sized buildings. However, when the issue is to find one's way in the shortest time and with the least amount of energy, this need becomes increasingly complex in large-scale public spaces. Wayfinding experience in design of the spatial organization is seen as a step that should be handled with due diligence, because it may have negative consequences which may affect the health of the user especially in hospitals, and may extend to the loss of life in emergencies. The psychology of the people, that is, the mood of the moment, has an effect on all of their abilities and daily behaviors, as well as their experience in finding ways in a space. This is especially important when we consider the hospital environment. However, the

patients or relatives who have physical or mental health problems may find it more difficult to find their ways in the daily life flow under these physiological conditions. Due to the aforementioned reasons, wayfinding has a different importance, because it is related to human health in the spatial organization of the hospital based on other complex structures. For this reason, the orientation of wayfinding in the hospitals is discussed in this study. In this context, the major research question of this thesis is "how spatial organization and signage systems affect the wayfinding experiences of the hospital users". The minor research question is "how does this experience differentiate among users with different backgrounds". In order to find answers to these questions, the main factors affecting the wayfinding experience ofpeople will be discussed, and the effects of spatial organization and signage systems on orientation experience will be revealed. For this purpose, a case study conducted at the TOBB ETU Hospital, the hospital's experiences of accessing the Otorhinolaryngology (ear – nose – throat) outpatient clinic, which is the most frequently used polyclinic of the hospital according to the figures of the year 2018, was investigated.

According to Bechtel and Churchman (2002), on-site determination studies were conducted based on differentiations in determinations related to the strategy of wayfinding (following the target and moving towards it after seeing it, following a path for finding the target, using a number of spatial elements, using a mental image or cognitive maps). In this context, the study was carried out in two stages.

In the first stage, the spatial organization of the hospital was analyzed through hospital floor plans. In this analysis, Lynch’s (1960) approach was used to examine the data of the categorized signage systems and the details of the existing signage system, such as the size, color, and height of the hanging system.

In the second stage, O' Neill’s (1991) approach was conducted while making observations according to the behavioral criteria in wayfinding. The study was expanded with a survey conducted on hospital users. The survey was accompanied by user maps that showed the way to the otorhinolaryngology outpatient clinic while revealing directions within the hospital experience. Responses of 50 hospital users to the structured questionnaires, sample maps of the users and the investigations on hospital floor plans constitute the raw data of this study. Through questionnaires, it was aimed for the users to discover the close environment, to stop and to read the signs, and to determine whether the information boards and signage systems facilitated their

movements and provided adequate guidance for ease of wayfinding. In addition to the analyses, the results of the survey were analyzed by descriptive statistics; namely, by T-Test and Anova analysis. The effects of the spatial organization of the hospital and the signage systems on wayfinding performance of the hospital users were identified. Especially the orientation signs, directional signs and 'you are here' maps were found out to be effective in wayfinding of the users in the hospital. This study proves that it is necessary to take into account the design scheme and the signage systems of important hospitals.

1.2.Structure of the Thesis

This thesis consists of 5 chapters. The first chapter is the introduction and the aim of the study, and the scope, methods and techniques used in the study are explainned in this section. In the second chapter, a literature review of the subject is presented. Concepts are defined under the titles of 'space', 'spatial perception' and 'orientation'. The dimensions of factors affecting wayfinding and signage systems are presented. In this section, the individual differences and basic design elements affecting the orientation are examined in detail. Briefly, the concepts and methods related to wayfinding are tried to be introduced in this section. In addition, this chapter summarizes the previous researches on wayfinding in spatial organization and the results obtained, and the criteria for the orientation design. In the third chapter, the hospital concept, the classification of the hospital and the departments of hospital spaces are examined in detail under the title of 'wayfinding in hospitals'.

After explaining what factors are important in a hospital design, the experience of wayfinding and orientation in hospitals, and the main factors affecting this experience are discussed. In the fourth chapter, case studies and their findings are given. In this chapter, the contextual setting of TOBB ETU Hospital, where the study was carried out, is given; information on the spatial organization and design setting were presented, and the information gathering and analysis processes of the study are discussed. The questionnaires used in the data collection process and user maps and the participants of the study all provided data for descriptive statistics; namely T-Test, Anova analysis and spatial analysis. In the last chapter, the results of the study are interpreted and discussed with reference to previous studies, and then, suggestions were developed for these studies.

CHAPTER 2

LITERATURE SURVEY ON WAYFINDING

2.1. Basic Concepts in Wayfinding

2.1.1. The Concept of Wayfinding

Everybody has a need to find their way to a new location. Wayfinding is the ability to describe a location and reach the destination or navigate in spatial environment whether it is a familiar or an unfamiliar one (Passini, 1984). The term wayfinding was first used by the urban planner Kevin Lynch in his seminal book 'The Image of the City' to identify people's orientation and patterns in a city. He defined wayfinding as a consistent use and organization of definite sensorial marks from the external environment (Lynch, 1960).

Wayfinding and orientation help people to find their ways and reach to the destinations that they aim for. We use wayfinding in every moment of our daily lives. We need guidance to find a classroom in a school building, or we need orientation to go to bathrooms in places where we are strangers. People are lost without orientation and wayfinding cues. Wayfinding is a dynamic affair. It involves movement through space and a continuous involvement in reading, interpreting and representing space (Passini, 1984). It even affects our personal mood. When we are not able to find our way, we feel stressed and anxious. Being lost can certainly provoke fear. Sometimes; though, people seek orientation challenges for excitement and pleasure. Wayfinding is closely linked with experiencing space in a physical mental and emotional sense (Passini, 1984). Confusion is the negative feeling which puts us in a position where we are not able to decide and feel helpless.

''Wayfinding is the ability to learn and remember a route through the environment (Blades, 1991; cited in Kitchin, 1994) with the overall goal being able to relocate from one place to another in large-scale space (Gluck, 1991; cited in Kitchin,1994). Spatial orientation refers to the process by which a person knows where he is (Garling and Golledge, 1989; cited in Peponis et al., 1990). Both wayfinding and orientation use high level cognitive processes. Wayfinding is the term that refers to a rather narrow

concern: that is, how well people can find their way to their destination without delay or undue anxiety (Peponis et al., 1990).'' (cited in Doğu,1997, p.7)

According to the definition of Peponis et al. (1990), wayfinding is the ability to reach a destination in a short time without experiencing fear and stress. Traveling condition is one of the most stressful wayfinding processes, because time is a crucial matter. Contributing to the users' ability to make them find their routes faster and catch their flights on time without experiencing stress and annoyance is an important design problem (p.55).

Wayfinding is the cognitive element of navigation. Navigation is the aggregate task of wayfinding. It must inherently have the cognitive element. An essential part of wayfinding is the development and the use of a cognitive map, also referred to as a mental map, which is a mental representation of an environment (Darken & Peterson, 2001).

Lynch suggested key concepts for wayfinding and understanding the city by forming mental maps that consisted of paths, edges, landmarks, nodes and districts. While paths are identified as ''the channels along which the observer customarily moves'' at the city scale, it is equal to corridors, promenades, and walk paths on galleries at the building scale (Passini, 1984).

Edges are identified as 'the boundaries between two areas at the city scale, walls appear to be building equivalents" (Cited in Demirbaş, 2001). Landmarks are identified as physical reference points, places or features that may be conspicuous as the widely known or recognized landmarks in the area (Cited in Demirbaş, 2001). Nodes, at the city scale, are described as points of intense activity where, as in the buildings, circulation intersections, halls and indoor squares are the equivalent points. Lastly, districts are defined as medium to large, representative sections of the city at the city scale, changes in function and floor are equal at the building scale (Cited in Demirbaş, 2001). In 1981, four groups of environmental variables were examined by Weisman in order to identify wayfinding including visual access to familiar places or signage systems of interior or exterior sides of a building, the degree of architectural differentiation between different areas of building, the use of signs and room numbers to provide information on identification or directions and the building's configuration. In 1984, Romedi Passini, who is an environmental psychologist, broadened the

definition of wayfinding by including signage, graphic communication, logical space planning, audible communication and tactile elements.

Arthur and Passini (1984) described that wayfinding consists of three specific and interrelated processes. The first one is decision making and the development of a plan of action; the second one is decision execution that transforms the plan into appropriate behaviour at the right space, and the last one is information processing understood in its generic sense as comprising of environmental perception and cognition which in turn are responsible for the information basis of the decision related process.

Passini is one of the first researchers to examine the process of spatial organization. According to Passini, orientation, which is an important concept for creating effective environments, is closely related to the efficiency or inefficiency of the built environment. In the study named 'Wayfinding in Architecture', he rejected traditional hypotheses by assuming that effective orientation depends only on a properly structured cognitive map (Passini, 1984). According to Passini, it is possible to observe correct orientations even in pedestrians whose environmental cognitive maps are totally distorted or not present at all (Passini, 1984).

Environmental information is the architectural and graphic expression of information necessary to solve wayfinding problems (Passini et al., 1998). Both decision-making and decision execution are based on environmental information. Information has to be identified in the setting and has to be understood and used in the decision-related processes. For a thorough understanding of the processes we go through during wayfinding, it is essential to understand the cognitive and environmental factors that influence it (Passini et al., 1998).

Wayfinding was the term introduced to describe the process of reaching a destination, whether in a familiar or unfamiliar environment, and it is best defined as spatial problem solving. Within this framework, wayfinding comprises three specific but interrelated processes:

1) Decision making and the development of a plan action.

2) Decision execution, which transforms the plan into appropriate behaviour at the right place in space.

3) Information processing understood in its generic sense as comprising environmental perception and cognition, which, in turn, are responsible for the information basis of the two related processes (Arthur and Passini, 1992:25).

Successful wayfinding design should allow people to;

- situate their location within a setting,
- determine their destination,
- develop a route plan which takes them from their location to their destination,
- execute the plan and arrange any required changes (Kumoğlu, 2013).

2.1.2. Spatial Orientation and Spatial Cognition

Spatial orientation can be defined as our natural ability to adapt our body orientation in relation to the environment which surrounds us (Passini, 1984). According to Passini, the definition of spatial orientation is the ability of a person to determine where he/she is, and determining what to do in order to reach a place (1984). To find our ways more seamlessly, we need more than a sixth sense. Our brain develops cognitive maps. We need organization and directions to find our ways.

People interact within the environment to get to the destination they would like to go. During this action, they gain spatial cognition about their own movements and about spatial relations with the environment (Montello, Hegarty, Richardson & Weller, 2004).How people acquire, store, organize and recall information about location, distances and arrangements in buildings, streets and great outdoors is called spatial cognition (Gifford, 2002).

Much of our environmental perception and knowledge derive from external information from the environment; this is just as true for the required actions. Thus, the durable theme of spatial cognition plays a central role in the study of person-environment compatibility (Kaplan, 1983).

“Spatial cognition” is the term introduced to explore the cognitive processes we undertake during our activities such as navigation. The study of spatial cognition, particularly while addressing the representations of macro-spaces, has always been closely associated with spatial orientation and wayfinding. In respect to spatial cognition, it is possible to identify three different types of environmental knowledge: landmark, route, and survey knowledge (Demirbaş, 2001).

The representation that people have of their surrounding environment, also called an image or a cognitive map, is the psychological concept that underlies the notion of 'spatial orientation' (Doğu, 1997, p:10). People perceive their surroundings mostly by the help of seeing. Eyes are strong supporters of the perception of the external environment. The characteristics help to catch our attention. There are two types of effects in attention (Connor, 2004). The first one is the bottom-up effect which can be explained as catching attention while no attention is being paid. For example, when one is in an empty room and suddenly a bird flies away, it draws one's attention. This situation is called the bottom-up effect. On the contrary, top-down effect is readily existing, that is, for example, when one is in a crowded room and searching for a specific someone, one intentionally pays attention to everything until one finds who he/she is looking for. This effect is called the top-down effect, and way defining deals with this effect and aims to succeed in performing it. For example, in a building, one pays attention to every sign and way navigation while one's eyes are scanning and glancing to find a specific exit sign. The aim of the wayfinding and architectures is to make those signs easily noticeable (Connor, 2004).

Actually, wayfinding can be considered as a very complex information processing task in the brain. People have two types of memory. The first one is the short-term memory (STM) and the second one is the long-term memory (LTM) (Arthur and Passini, 1992). Wayfinding is interested in STM. STM is the memory where we can keep the information which we get from the external space for max/min 7 seconds before the information processing continues and transfers the information to the LTM. That max/min 7 second of time is what wayfinding is interested in (Arthur and Passini, 1992). Arthur and Passini's studies (1992) claimed that the limited capacity of the STM can only keep three items at a time of a glance (cited in Doğu, 1997). It has been suggested that if more than 3 items are presented, they should be grouped in packages to help the person get the message in a few glances. It is important to understand the difference between perception and cognition. Arthur and Passini (1992) explained these notions such that whereas perception is the process of achieving information through the senses; cognition is defined as understanding and being able to manipulate information. Spatial cognition is also affected by many factors, which are; personality, intelligence, self-efficacy, culture, education, emotion, time pressure, risk, interest, testosterone level and level of economic development (Gifford, 2000). Besides, signs

and numbering systems, visibility of the destination, differentiation and configuration influence spatial cognition and wayfinding (Weisman, 1981). In order to understand spatial cognition, we should describe three types of environmental knowledge, which are landmark, route and survey knowledge (Parush & Berman, 2004).

2.1.2.1. Landmark Knowledge

Schlender, Peter and Wienhöfer (2000) stated that landmark knowledge is derived from the knowledge of noticeable objects in an environment. "It involves apparent objects to orient easily in a new environment (Edwards, Thompson & Barfield, 2000, p.13)." It does not involve spatial information; it plays an important role in route knowledge by specifying decision points (Sancaktar, 2006). It also facilitates remembering information (Edward et al., 2000).

Properties such as the texture, shape and orientation of certain objects are stored in declarative knowledge structures, allowing us to access this knowledge (Bliss et. al, 1997). For example, when arriving at a new college campus, students may learn how to identify the library, administrative buildings and important classroom buildings.

As our experience in the new environment expands, we may learn how to identify these landmarks from new perspectives, essentially building our ability to mentally rotate them to visualise how we expect them to look from different viewpoints. However, their initial formation is linked to the perspective with which we are most familiar (Demirbaş, 2001, p:6).

2.1.2.2. Route Knowledge

According to Duran (2016), route knowledge is also called "procedural knowledge". It is defined as an inner appearance of the procedures needed for finding one's way from place to place (Montello et al., 2004, p.270). It is related to one's capability to navigate from one location to another.

It includes information about the order of landmarks and minimal information about the appropriate action (Montello, 1998). Route knowledge has greater impact on wayfinding performance compared to survey knowledge (Hölscher, Merlinger, Vrachliotis, Brösame & Knauff, 2007). Since navigation is usually purposeful, it may be asserted that route knowledge is probably more valuable than landmark knowledge,

because it helps people accomplish desired tasks. Key features of route knowledge representations are:

1) they are learned in the context of accomplishing specific tasks (i.e. getting from the library to the classroom),

2) they are represented from the egocentric perspective (left and right turns are learned with respect to the body's orientation and direction of travel),

3) they are perspective-dependent, meaning that they are most useful when employed from the same viewing perspective as they were learned (usually from the ground-plane for the pedestrian travel). Finally, based on the task of finding alternative ways to destinations, we rely on informal algebraic and geometric computations based upon the directional changes and distances that describe the known ways (Demirbaş, 2001, p:7)

2.1.2.3 Survey Knowledge

Survey knowledge is gained when routes and landmarks are combined into a cognitive map. Van Dijk, op Den Akker, Nijholt and Zwiers (2003) identified survey knowledge as the ability to conceptualize the space as a whole. Survey representations facilitate spatial influences that can be useful during wayfinding through large spaces (Infield, 1991). Survey knowledge is not equivalent to wayfinding performance, and a clear superiority of familiar people with respect to survey knowledge could be established (Hölscher et al., 2007). The ability to use survey knowledge is referred to as the sense of direction (Duran, 2016, p:21-22).

Sense of direction is relevant to wayfinding. People who have a good sense of direction find out and attend to details in a new environment, and remember new routes better than people who have a poor sense of direction (Padgitt & Hund, 2012). On the other hand, people who have a poor sense of direction are more likely to lose their way and worry about getting lost (Sholl, Acacio, Marker & Leon, 2000, Duran, 2016, p:21-22).

2.2. Dimensions of Wayfinding

The following sections analyse cognitive mapping and legibility as the indicators of individual and physical factors in wayfinding, respectively.

2.2.1. Cognitive Maps

‘‘Cognitive maps are the structures that hold information a person has about the environment’’ (Kaplan, 1982, p:55). Cognitive maps are the visual representations of a place in our minds. They help us decide where to go or which direction we should follow. They usually develop in the environments that we are accustomed to. For example, we can think about our own houses when we close our eyes. This thought and the plan of the house that we have in our minds is a simple cognitive map. Surely, those maps are not always exactly accurate. That is why we need visual and concrete presentations of them while we are strangers at a place. ‘You are here’ maps are the closest concrete materials to our cognitive maps. They reflect how we exactly try to conduct the plans and directions in our brains (Kaplan, 1982).

‘‘The human environment is highly diverse, rich and uncertain; the amount of the potential information is overwhelming. At the same time, the human is faced with limited time to decide, and limited capacity for holding information’’ (Kaplan, 1982, p.55).

Think about that you are left in a city and you need to get around and travel. What you would do is that if you do not have any map in your hands, you try to visualize the plan and the map by the help of the locations of the streets and buildings (Stea, 1982).

Moore (1976) stated that ‘‘cognitive mapping is the processes whereby people acquire, code, store, recall and decode information about the relative location and attributes of the physical environment’’ (qtd.in Lang, 1987, p.135).

Cognitive maps are the key points of wayfinding. They help us realize where we are and make us feel comfortable about our ways, but, of course, they need supporters like concrete maps and signage systems. Because they are merely schemas that we have in our brains.

> ‘‘There are some quite persuasive reasons for geographers to study cognitive mapping not least its basic appeal to understand how and why people behave in space as they do. Other applications include the planning of environments that are easy to remember, improving the teaching of wayfinding and orientation skills, and general classroom geographically based exercises such as map reading, improving geographic material such as You-Are-Here maps, so they are more easily understood, and improving the databases and interfaces of geographical information systems (Kitchin, 1994a, p. 47).’’

Kitchin (1994a) distinguishes the variables that can affect cognitive mapping ability into nine main groups:

1. environmental deterministic sources (unalterable, e.g. General physical topography);

2. environmental deterministic sources (alterable, e.g. Number of turns and intersections along a route);

3. environmental interaction sources (e.g. Familiarity, mode of travel, travel time);

4. social circumstances and interaction sources (e.g. Education, socioeconomic status, media, experience in map use);

5. perceptual filters, perceptual context and anticipatory schemata (e.g. Senses, current emotional state, expectancy);

6. characteristics of the mapper (determined, e.g. Age, gender);

7. characteristics of the mapper (undetermined, e.g. Beliefs, needs, emotions, personality, self-confidence);

8. cognitive style (i.e. How a subject approaches a problem of wayfinding);

9. form, function, structure, and contents of the information in the brain (Demirbaş,2001, pp.15-16).

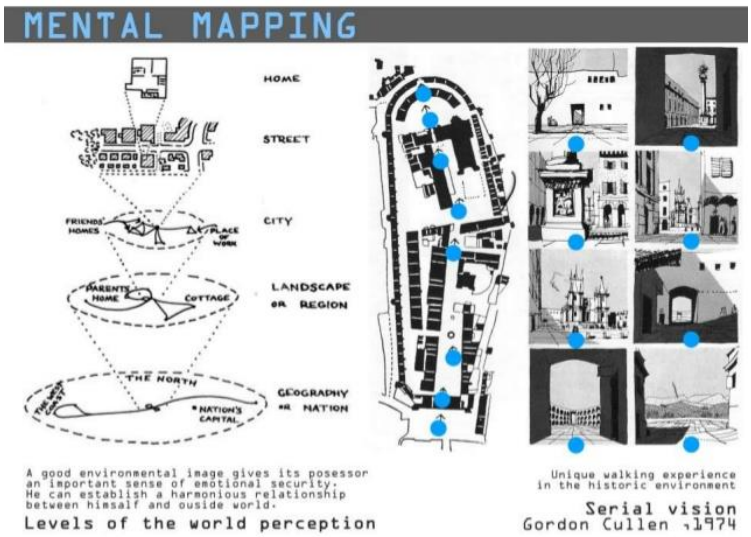


Figure 2.1. Kevin Lynch's Mental Maps
(https://www.slideshare.net/AliciaValdiviaAlexeeva/kevin-lynch-mental-maps)

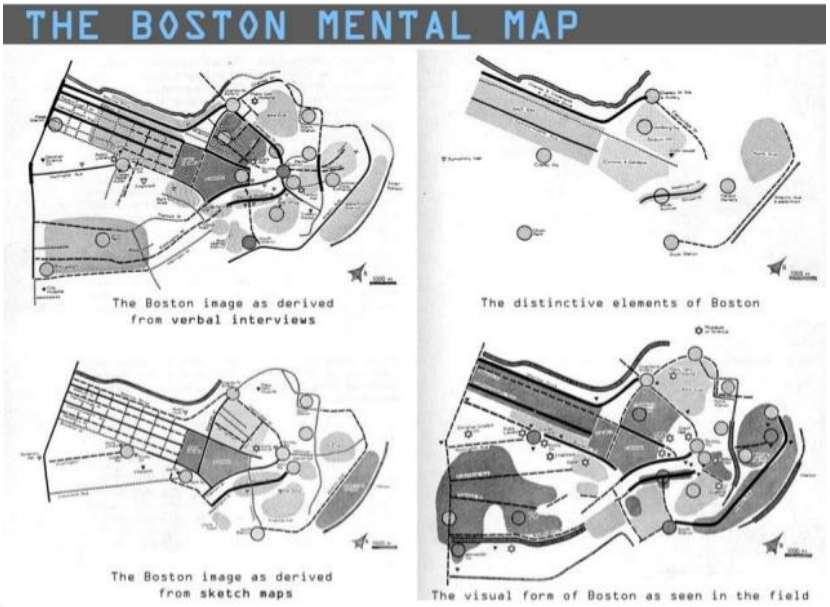


Figure 2.2. Kevin Lynch's Boston Mental Map
(https://www.slideshare.net/AliciaValdiviaAlexeeva/kevin-lynch-mental-maps)

2.2.2. Legibility

Legibility is "the ease with which its [the city's] parts can be recognised and can be organised into a coherent pattern" (Lynch, 1960, pp. 2-3). Information-processing capabilities of an individual can be identified as it relates to architectural elements and space. Difficulties may arise when a person is taking in information from the environment, trying to comprehend/decipher, then processing the acquired information.

Way finders trying to reach their destinations are often confronted with complex, ambiguous or irrelevant information within buildings that are too large to be perceived in their entirety. Although the architecture itself, i.e. spatial configuration of a structure, may contain the information to generate a "wayfinding" system, certain spaces lend themselves better to extracting and comprehending the relevant information. This quality is referred to as "legibility". A place that facilitates obtaining and understanding of environmental information has a high legibility factor (Demirbaş, 2001, pp.16).

Legibility, which means the apparent clarity of the environment, is one of the important concepts of environmental psychology, and is crucial in environmental setting (Lynch, 1960).

Legible environment “not only offers security, but also heightens the potential depth and intensity of human experience” (p.5). Legibility means the degree to which a building or groups of buildings facilitate the ability of users to find their way around (Abu Ghazzeh, 1996).

Herzog & Leverich (2003) defined the term as “the ease of finding one’s way around in a setting, the ease in figuring out where one is at any given moment, or of finding one’s way back to any given point in the setting” (p.461).

If the current view in a setting appears well-structured, then it is legible. However, inappropriate architectural design might make a setting complex, which might cause wayfinding problems (Helvacıoğlu, 2007).

According to Architect Esin Hasgül (2001); legibility is the ability to easily understand where and how a phenomenon is. A readable spatial architecture means that the locations of spaces and places can be easily understood by the users.

This is more than a complex architectural design; simple and lean infrastructure architectural designs can show themselves. The design of the spatial infrastructure of a building can help guide the users. If the spaces of the circulation spaces and the functions of the building can be understood by the user entering the building, the building's own design is a preliminary step in assisting the orientation design. In this context, the building's own structure can be removed from the feeling of disappearance, and the spaces inside the building can be easily found before the additional information about the orientation design. This situation can be seen visually as the spaces and circulation areas are noticeable; it can be provided with similar spatial experiences that the user has seen in previous buildings (Hasgül, 2011).

Circulation spaces are important areas that must be designed before the positioning of other spaces, which also shape the spatial organization within the building. A well-designed circulation system allows the user to understand the building (Arthur and Passini, 1992).

If the user can detect the location of the circulation elements such as stairs and elevators in the building, this makes it easier to realize the vertical activities within the building and to find ways between the floors of the building. In this context, locations of circulation spaces should either be visually noticed to the user or be explained with a symbol (Hasgül, 2011).

2.2.3. Building / Floor Plan Complexity

Complexity is a phenomenon that consists of many things in which there are many elements of the same kind. As can be seen from the definition, the fact that something is very intense makes it difficult to perceive it rather than making it more understandable. For this reason, unconventional forms in architecture can lead to an unusual architectural understanding, building designs and problems of perception and orientation. Different corridor structures, staircases and spatial constructs make it possible for the user to experience the space in order to perceive the user. At this point, if it is desired to provide ease of guidance to the user, it is necessary to see the fact that simple-built buildings are places where the user is tired to seek fewer ways (Hasgül, 2011).

Lynch (1960) reasoned that cognitive maps of cities function primarily as orientation aids, and reflect basic elements of the physical city form. His own research suggested five key features that comprise cognitive maps of urban settings, namely; paths, nodes, landmarks, districts, and edges.

"Paths" at the city scale are defined as "the channels along which the observer customarily, occasionally, or potentially moves" by Lynch (1960, p. 47). Spatial organization includes corridors, promenades, walks on galleries, etc. as equivalent to paths at the building scale (Passini, 1984a). Specific to buildings was vertical circulation: stairs, escalators, and elevators.

"Landmark'' is an object within a relation with a subject. Communicating landmarks is a process that is the basic relation between the subject and an object, and results in a completed orientation. Comments about the usage of signage systems can be categorized as being used in making wayfinding decisions in recognition as something familiar on way identification and in remarking on passing (Lawton, Charleston, & Zieles, 1996).

While it is possible to mention many structures as symbol structures in urban scale, it is possible to define this concept as the use of icon objects in the spatial organization. When the user goes to the point he/she wants to reach within the space, he/she makes his/her movement happen with some information from the environment. Another information system for this ease can be identified as symbol objects (Lynch, 1960).

‘‘Nodes’’ are “the strategic spots in a city into which an observer can enter, and which are the intensive foci to and from which he/she is travelling” (Lynch, 1960, p. 47). In the spatial organization, the equivalent points at the building scale are important circulation intersections, as halls and indoor squares can be evaluated as nodes (Lynch,1960).

“Edges” are “the linear elements which are not used or considered as paths by the observer. They are boundaries, edges may be barriers” (Lynch, 1960, p. 47). In the spatial organization, walls are considered to be the building equivalents as they have the impermeability of edges. Doors represent points where the barriers are broken and can take on the character of a landmark or a path.

“Districts” are described as “medium to large sections of the city, conceived of as having a two-dimensional extend which are recognisable as having some common identifying character” (Lynch, 1960, p. 47). These five elements of cognitive maps are very important in urban plan settings. If these five basic titles are extracted from the environment, the planner should take care to emphasise them in his/her spatial conceptions. In doing so, he/she would increase the quality of legibility and imageability of a place (Passini, 1984a).

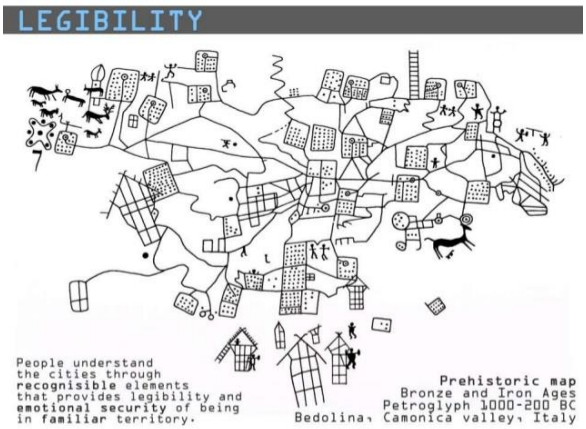


Figure 2.3. A Prehistoric Legibility Map (https://www.slideshare.net/AliciaValdiviaAlexeeva/kevin-lynch-mental-maps)

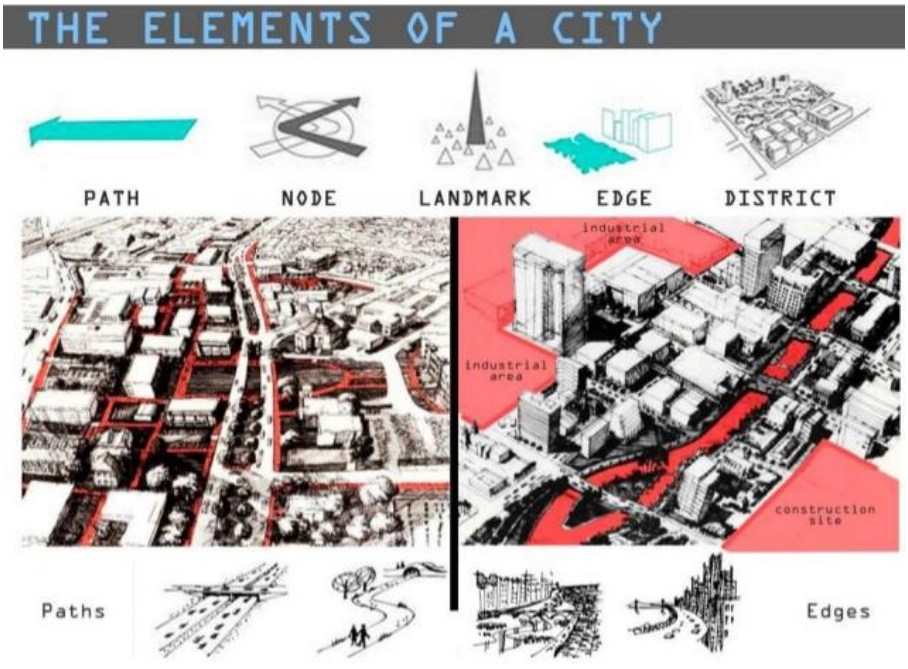


Figure 2.4. Path and Edge Elements of a City Map

(https://www.slideshare.net/AliciaValdiviaAlexeeva/kevin-lynch-mental-maps)

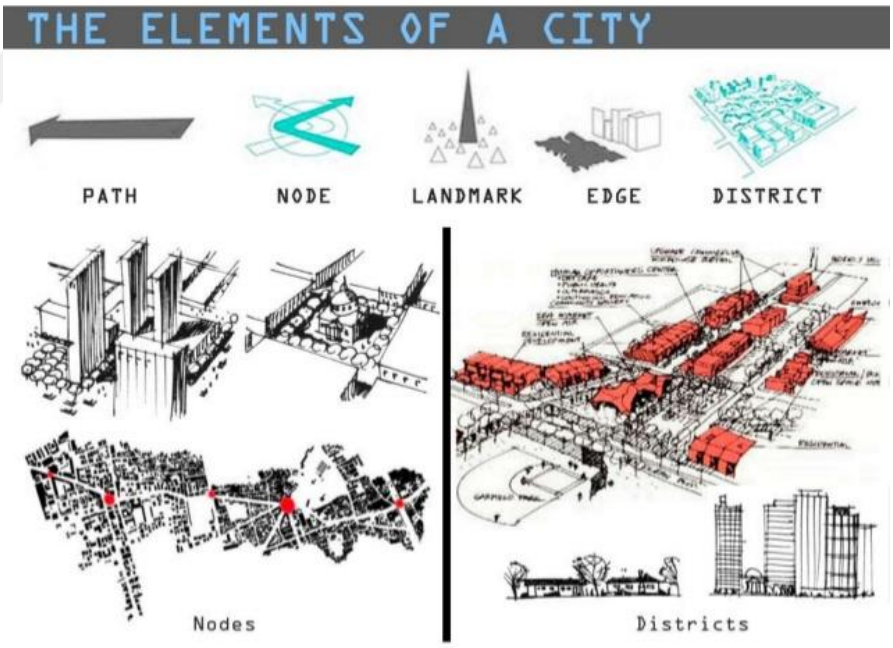


Figure 2.5. Node and District Elements of a City Map

(https://www.slideshare.net/AliciaValdiviaAlexeeva/kevin-lynch-mental-maps)

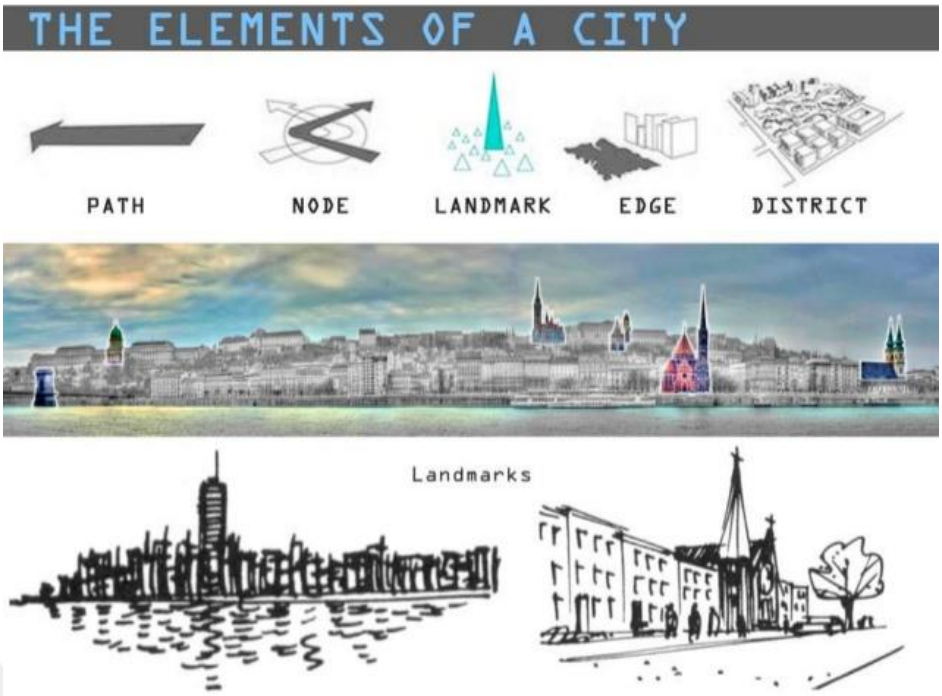


Figure 2.6. Landmark Elements of a City Map

(https://www.slideshare.net/AliciaValdiviaAlexeeva/kevin-lynch-mental-maps)

It is possible to see the clues for wayfinding in interior space in some examples at urban scale. In this context, we can address some of the elements we used for wayfinding in cities for the indoors as well. We see that these elements encountered in the city should be provided with similar requirements on the interior scale due to the increase in public spaces, the fact that life is in a faster flow and the concept of time has been gaining more importance. In places such as shopping malls, hospitals, schools, subway stations, airports and hotels, where the people's wayfinding have become a need, this need should be met with the guidance systems (Hasgül, 2011).

As we try to go to a place in the city by looking at a map, following the bus station locations and their routes, calculating where to start and end our journey, we should first recognize the entrance door when we come to a hospital, then find answers to the questions such as on which floor is the department that we would like to visit, through which circulation element we can reach that floor. Otherwise, we might face problems such as the feeling of getting lost in indoor space, stress and waste of time, and we might be late for where we are heading to (Hasgül, 2011).

When we address the space scale, the subject of directivity can be as simple as moving from one room to another and even moving in one single room. We can examine the factors affecting our internal movements in two main topics: The first one is the need itself and the second one is fullfilling the need. When you enter the kitchen, first of all, you need to know where the jug is placed if you need to drink water. Therefore, you should be in need of your previous experiences. If you know where the jug is, the stage of your fulfillment of need will be easier. The map that your previous experiences have created in your mind makes you unconsciously and rapidly move towards the jug. Unless you know or remember where the jug is, this time the need is still clear, but you have to perceive the place and make a search for the jug in order to fulfill the need. Although it looks like a small period of time in this example, you will waste some time. There is a period of thinking about the place of jug and perceiving where it is placed in the kitchen. What is to be done here is to minimize this process and to facilitate the perception of the location of the jug with the design criteria for spatial perception, such as the fact that the kitchen is not in a complex structure, but rather in perceptible colors and textures. For this reason, the interior directivity design becomes necessary: It aims to provide convenience to the person about what to be done regarding the need itself and the fulfillment of the need (Hasgül, 2011).

2.3. Factors Affecting Wayfinding

Passini is one of the first researchers to explore the process of locating indoors. According to Passini, orientation, which is an important concept for creating effective environments, is closely related to the efficiency or inefficiency of the built environment (Passini, 1984a; Passini 1984b). There are four basic factors in finding ways: knowing the location, knowing where to go, knowing the best way to reach the destination, and following up, understanding where to go and returning (Peponis et al., 1990; Passini,1992). People use their previous experiences and environmental data to fulfill these four factors in determining directions. Arthur and Passini (1992) argue that the users need three types of information in an environment in which they are not experienced or are not sufficiently familiar with. These are:

1. In order to be able to make a decision, it is necessary to give information about the settlement, environmental organization about where the organization of the space is, where they are and where they will go (Plan diagram);

2. Namely, the information that will help to guide decisions to the destination (directional signs and signages);

3. They need information that helps them complete the decision-making and implementation process, and they need information that identifies the intended goal (you-are-here maps).

We can identify two distinct dimensions of wayfinding. The first dimension is of a functional nature; it corresponds to the reaching destinations within acceptable limits of time and energy. The aim of wayfinding design in this respect is to provide the environmental information necessary for decision-making and decision execution, while respecting users' ability to deal with basic perceptual and cognitive tasks (cited in Demirbaş, 2001, p.22).

The second dimension is of an evaluative nature; it corresponds to the experience gained during wayfinding. We evaluate most things we do, and we like or dislike certain activities and situations, finding them more or less satisfying in retrospect (Passini, 1984a).

In addition, many studies argue that the layout of the floor plan has important effects on wayfinding and perceived legibility. Weisman stated that the simplicity in the plan form was the prerequisite of the value of effective wayfinding behaviors (Weisman, 1984). In their study, Başkaya et al. revealed that the problem of understanding the form of the space was increased with the complexity of the floor plan, and that the wayfinding performance was weakened (Başkaya et al., 2004).

O'Neill (1990) tried to define the concept of legibility with objective values; the plan form was developed for the complexity of the form and used an objective criterion based on the topological relations between the decision points. This criterion, which focuses on the connection intensity between the decision points, is called Interconnection Density (ICD); the intersection of intersectable paths between spaces. This value is calculated by counting the direct connections of each of the decision points with other decision points and then the number of connections at each decision point is proportioned (O'Neill, 1990). In another study performed by O'Neill, the effects of this newly defined criterion on topological complexity Density (ICD) - cognitive map formation and wayfinding experiences were identified, and he has stated that the increase in topological plan complexity (ICD) adversely affects the cognitive

map accuracy and increases errors in wayfinding behaviors. The results of the study show that topological plan complexity has no direct effect on behavior, and it has been shown that the environment has an indirect effect on the formation and development of cognitive maps. It can be said that the floor plan complexity is a theoretical measure that predicts individuals' understanding of the space and their potential wayfinding performance before the use of places. The power of this criterion stems from the ability of the physical environment to expose the effects of the physical environment on cognitive maps and wayfinding performance through two-dimensional plans (O'Neill, 1990 a).

Distinguishing spaces is considered to be one of the environmental variables that affect the wayfinding behaviors. The differentiation of the form and the volumetric characteristics of the space, as well as the signs, colors, lighting and detail solutions, are also obtained. In addition, the physical and socio-cultural characteristics such as age, gender, occupation, individual physiology, environmental familiarity affect the spatial movement of individuals (Önder and Sönmez, 2015, p.361). The fact that it cannot find its way in the space and that it is lost creates fear and anxiety; therefore, it should be kept in mind that it causes time and productivity losses. Therefore, in the intellectual stages of design, the concept of orientation must be given due consideration; architecture should take its place as a criterion. In conclusion, basic factors affecting wayfinding in the literature studies are summarized in a table (See Table 2.1 and 2.2).

Table 2.1. Basic Factors Affecting Wayfinding Experience

FORM RELATED PROPERTIES	• Interconnection Density (ICD), Simple Plan Form, Circulation Systems • Topological relations, Easy Accessibility to Entrance of Buildings • Visual Access to Remote Points, Integration Value of Spaces
SIGN SYSTEMS	• Marks, Pictograms, Signages, Maps, Schematic Graphics, Landmarks • Digital Boards (location, size, form, color, index/language, characteristic property, distance of legibility, signage lighting)
DESIGN FACTORS	• Color, Lighting, Material, Texture, Form, Shape • Smell, Sound, Density, Legibility, Complexity, Signs

Table 2.2. Dimensions, Indicators and Methods of Examination

<table>
<tr><th>DIMENSIONS</th><th>INDICATORS</th><th colspan="2">METHODS</th></tr>
<tr><td rowspan="2">Background Indicators</td><td rowspan="2">. Age and Sex
. Educational status
. Occupational Status
. Background Knowledge
. Ethnicity, Preferences
. Personal Habits</td><td>DATA COLLECTION METHODS</td><td>DATA ANALYSES METHODS</td></tr>
<tr><td>Questionnaires
User Maps
Route Maps
Cognitive Maps</td><td>Graphics
Statics Tables
Descriptive Statistics</td></tr>
<tr><td>Psychological Indicators</td><td>. Personal Background
. Family
. Individual physiology
. Familiarity
. Frequency of Circulation</td><td colspan="2" rowspan="4">SELECTED AUTHORS
. Arthur, P. & Passini
. Lynch, K.
. O'neill, M. J.
. Allen, G. L.
. Golledge, R.G
. Gifford, R.
. Pollet, D. & Haskell, P.
. Seidel, A.
. Peponis, J., Zimring, C. & Choi, Y. K.
. Montello, D. R
. Miller, C. & Lewis, D.
. Giuliani, R. W.
. Galea, L. A. & Kimura
. Cornell, E. H., Sorenson
. Churchill, A., Dada</td></tr>
<tr><td>Architectural Indicators</td><td>. Visual Accessibility
. Building Configuration
. Architectural Complexity
. Color and Material
. Form, Lighting</td></tr>
<tr><td>Signage- based Indicators</td><td>. Types of Signage
. Numbers of Signage
. Location of Signage
. Size of Signage
. Content of Signage
. Fonts of Signage Systems</td></tr>
</table>

2.3.1. Layout

Layout of a setting could be defined by its spatial content, form, organization and circulation system (Doğu & Erkip, 2000). If a building makes easy navigation possible, it can be acknowledged as a design success. Therefore, a building has to be architecturally legible, which means the apparent clarity of the environment is one of the important concepts of environment, one of the important concepts of environmental psychology and is important in environmental setting (Lynch, 1960).

Providing a legible spatial structure which consists of three issues, namely; form, configuration and circulation system, is an important factor in wayfinding performances, because people do not understand the overall plan (Helvacıoğlu, 2007). The overall plan configuration of a building, and particularly the ease and accuracy with which one can build a mental image of it, may have some considerable impact on a wayfinding behaviour, whereas buildings with simple orthogonal grids and angles are less problematic than irregular ones (Helvacıoğlu, 2007).

Başkaya, Wilson and Özcan (2004) suggested that a regular but asymmetrical floor plan was easier to remember than regular but symmetrical layouts, and simple layout and higher physical differentiation gave better spatial knowledge than complex layout and lower physical orientation (Çubukçu & Nasar, 2005).

In order to allow people to pay particular attention to the aim of visiting, a simple plan may help orientation. When buildings become larger, complexity increases, and it becomes difficult to perceive the settings. In order to perceive, distinctiveness gives the identity and it is a major requirement of wayfinding that should be used. According to Arthur and Passini (1992), distinctiveness can be acquired by providing visual impact.

A number of studies proposed that the complexity of a floor plan configuration is the primary source of influence on wayfinding performance. Weisman (1981) found that the most serious disorientation problems occur in buildings judged to be complex and difficult to be described by user groups.

O'Neill (1992) suggests that the complexity of a floor plan form influences negatively, and people have significantly greater problems with understanding spatial layout, and reduced wayfinding performance. O'Neill made an experiment to assess the influence of increased floor plan complexity, and found that people tend to experience greater difficulty in terms of performance as measured by the amount of time it took to reach the destination, and accuracy in map sketches decreased.

The circulation system is the important element of a building that helps to develop a mental map. Especially in large scale-built environments, the architectural expression of the circulation system makes a building easier to understand. A well-designed

circulation system provides users with an easier understanding of a building (Arthur & Passini, 1992).

Circulation systems should be identifiable and obvious to understand easily, and important adjacent activities should be exposed the circulation systems (Pollet & Haskel, 1979).

2.3.2. Landmarks

Landmarks are important for cognitive mapping. People tend to remember landmarks more than any other element in an environment, and the differentiation of places can be easily done through landmarks. Sorrow and Hirtle (1991) describe landmarks as significant elements in people's formation of a cognitive map of physical environments. Landmarks serve multiple purposes in wayfinding as an organizing concept. In their study, Sorrow and Hirtle (1991) propose three landmark categories: visual landmarks which are objects with visual characteristics, cognitive landmarks, and structural landmarks.

Landmarks allow people to annotate the environment in some way to personalize the spatial cues. They are directional and basic, and they provide orientation and information to the navigator which have reassurance cues along a route to know that they are on the right way. (Sorrow & Hirtle, 1999). Landmarks are used as reference points with their features and distinctiveness. Their importance arise from the fact that they assist the user in navigating and understanding spaces (Sorrow & Hirtle, 1999).

In addition, Raubal and Winter (2002) have reportedly depicted the use of mental representation of space. People can follow a route by recognizing features as anchors for spatial relations and landmarks as they help to remember the sequence of the route, even when people do not have a good knowledge of the spatial layout.

According to Vinson (1999), landmarks support the development of route knowledge, which is essential to navigation.

According to Sims (1991), even difficult routes have a wealth of information present in their details such that lifts, stairs, corridors, doorways, floor finishing are all landmarks used to determine the way to a given destination.

In order to differentiate various landmarks in an environment, there are many significant attributes of identification available such as color, texture, signing, size and shape (Learmont, Newcombe, Huttenlocher, 2001).

Landmarks are a type of point-references (Lynch, 1960). It gives a strong identity to various parts of built environments. “A landmark is an object that marks a locality, acts as a mental landmark in the wayfinding process and breaks a complex task into manageable parts” (Giuliani, 2001, p. 45).

Landmarks have to be unique in a building in order for these not to lose their effectiveness; they can be lighting fixtures, materials, kiosks or art pieces. Location is very important for markers. For example, landmarks that are located at intersections are highly exposed. Landmarks should be perceived from as many directions as possible, and they should not physically interrupt the way of travel (Pollett & Haskell, 1979).

Landmarks are essential parts of wayfinding cues, and are seen as points of reference. Therefore, sensitivity to landmark quality is a critical factor for wayfinding as people use landmarks as reference points in necessary times. Landmarks are the most prominent cues in any environment (Darken & Peterson, 2002). They act as key elements to enhance the ability to orient oneself and to navigate in an environment. Their importance is because of aiding the user in navigating and understanding spaces (Sorrows & Hirtle, 1999).

2.3.3. Maps

Maps are powerful tools for navigation. They do not only provide information about the environment, but also influence the ability of users. Maps give information to understand where people are in the building. Interior maps should be located at key and focus nodes in a circulation system and on each floor level with room numbers (Pollett & Haskell, 1979).

Visual properties of a drawing to represent geographical information of the environment are included in maps (Helvacıoğlu, 2007). Hunt and Waller (1999) suggested that the maps are used for three purposes; guides for exploration, substitutes for exploration and basis for direction.

Poorly prepared maps can cause confusion and frustration. Therefore, You Are Here maps (YAH) should be prepared appropriately. According to Levine (1982), labels on maps should use consistent terminology, memorable architectural elements such as landmarks should be incorporated into the map design and the YAH arrow should point the directions and the spot the viewer is facing while looking at the map; while the perspective view YAH maps are more preferred than the plan-view maps.

2.3.4. Circulations Systems

‘‘Architectural circulation system makes for a building that is much easier to understand’’ (Doğu, 1997, p.47). Circulation systems, in other words - traffic - is the internal organization of a building. Circulation is all about organization and appropriate gathering of information in a specific area. People use information such as signs and maps to decide where to go and what to find. Circulation is a big deal, because configuration of locations are the key points of wayfinding (Doğu, 1997).

Doğu (1997) suggests that main circulation systems of a building can be perceived from outside, therefore constructions such as underground buildings and subways do not have this opportunity. For example, the subway network in New York is known to be huge and very complicated, but by the help of suitable circulation and appropriately used signs and maps, even a child would be able to find his or her way easily. The most important thing about circulation is that it should involve logic to a certain extent. To consider a circulation as successful, it should have a logic that even strangers who have never been in that place before should understand its structure and should be able to find their way. Circulation Systems help us get to know the building; for example, locations where there is mobility give us cues where the entrance and exits are located. Elevators, escalators and stairs are the most important structures of a building. They provide access and transportation in the facilities. Therefore, they should be expressed, perceived easily and should be visible (Doğu, 1997).

The circulation system is one of the key elements of a building that helps to develop a mental map. A well-designed circulation system provides users with an easier understanding of the building (Arthur & Passini, 1992). Circulation system of the building should be identifiable and obvious for easy understanding from the initial

contact, and important adjacent activities should be exposed to the circulation system (Pollett & Haskell, 1979).

Vertical circulation elements such as stairs, elevators, and ramps should be perceptible for maintaining easy communication to the users (Giuliani, 2001). Giuliani (2001) stated that the entries and circulation spaces are the first contact places of people in a building. Thus, a sense of openness for improving the acquisition of knowledge about the building layout and social organization should be provided (Helvacıoğlu, 2007).

2.4. Signage Systems

‘‘Signs communicate environmental information, they tell the viewer what is where and when they refer to an event, signs may also specify when and how likely it is to occur’’ (Passini, 1984, p.90). Signs are the most important factors of information systems in wayfinding.

According to O’Neill (1991), signages are used to enhance wayfinding efficiency especially in settings with complex floor plan configurations in which wayfinding is a chronic problem; such as subways, hospitals, and large governmental buildings. Richter & Klippel (2002) claim that the information provided by a sign is the faster process of receiving information. However, signage systems can be problematic as they just show the directions rather than the routes, and a new sign is needed at every decision point.

According to Passini, signs are used for identification of a place or an object. They are important because, instead of literally reaching to the destination, once the signs are perceived, the destination can be considered as reached. Signs are like the tour guides in a touristic tour, where people are all strangers. Signs have the aim of leading people to their destinations. In that condition, if the destination is far away or even the destination itself cannot be reached, reassurance signs should be used (Passini, 1984).

For example, when a sign shows you to go directly to reach the pharmacy and when you come to a must-turn point, you would probably feel doubt about if you are in the right way. To prevent this doubt, reassurance should be used.

Faulty signs can cause wayfinding problems in unfamiliar environments. Some signs lack visibility, because the lettering is not legible when viewed from a distance; some

contain inaccurate, ambiguous and unfamiliar messages and some contain reflective surfaces and inappropriate color combinations (Muhlhausen, 2006).

There are several important roles in functional information systems such as location, content, illumination and color of signs. Firstly, the location must be visible at transitional areas and at intersections; there should not be more than five messages and five lines of text in a single sign; character height, stroke width, font type, surface characteristics should be considered; artificial and natural illumination should be designed to prevent glare on signage; color schemes used should be described easily by names as blue, orange, etc. (Pollett & Haskell, 1979).

When designing environmental signage, it is important to consider the contrast between the color factor of the typography and the background for ease of reading and also the impact of color on interpretation and understanding of the content (McLean, 1993). In addition, importance must be given to the user about their cultural index, the lighting about its levels and the signage materials to prevent reflection (Martinson & Bukoski, 2005).

Signage content should be designed and considered in the first design process, because the remembrances of signs decrease when the number of contained words increases (Bourdeau & Chebat, 2003).

Lengthy sentences and long horizontal lines should be avoided in the signs. A standard formula for line length is 40 to 50 characters per line. More than 50 characters start to distract visitors' attentions, disturb the eye, tend to lose its place and cause vision to jump from line to line (McLean, 1993). Signs also make people feel comfortable about the environment they are in; people would like to have control of the places they are in. For example, if a person is suffering from claustrophobia disorder seeing the exit sign in a big shopping mall in every 50 meters would make him/her comfortable.

"As communicators, graphic information must contain appropriate content and be understandable, and as graphic elements, they must have an appropriate design format and be legible" (McLean, 1993, p.106).

According to O'Neill (1991), people using textual signage made the fewest number of wrong turns, whereas people using graphic signage made significantly more wrong turns and people using no signage made the greatest number of wrong turns.

There are various signs provided for the individuals for reducing the risk of disorientation and for helping them understand their environments (Bourdeau & Chebat, 2003).

Signs provide access to the information content of buildings. Pollett & Haskell (1979) stated that identification signs, directional signs and descriptive signs are the fundamental types of signs. Giuliani (2001) added more types of signs including destination identification, situation and object identification and orientation signs (Helvacıoğlu,2007, p.24).

2.4.1. Signage Types and Their Functions

There are several helpful types of signage. These are provided to individuals for reducing the risk of disorientation and for helping them understanding the environment (Bourdeau & Chebat, 2003).

Signs on the exterior or interior of the buildings have three functions which directly correspond to the functional information types, namely; orientation, direction and identification signs. Pictograms and you are here maps are other important factors which are useful signage types in wayfinding (Arthur & Passini, 1992).

2.4.1.1. Orientation Signs

‘‘They give users an overview of what 'shape' the building has, where they are, and where the destination lies, as well as other relevant information about the general setting (Arthur and Passini, 1992, p.143).’’ Maps, floor plans, exploded views and models, all with you are here maps, clearly identifying corridors, destination zones and building directories rank as examples of this signage type (see Figure:2.1).

Figure 2.7. An example of Orientation Signs, 2018 (https://minnickgd.wordpress.com/tag/signage/)

2.4.1.2. Directional Signs

These are signs where information is displayed to find destinations, located on several strategic points in the built environment. ‘‘They are the common process description. They give information about a destination to lead people along a determined route (Arthur & Passini, 1992, p. 143).’’ Most of the directional signs include arrows and elevator button panels (Giuliani, 2001, p. 50). In addition, Arthur and Passini have given floor directories in elevator lobbies as an example of directional signs (see Figure 2). They are used for showing people which way they need to go (Miller & Lewis, 1999). Arrows that are placed too far from the signs reduce the effectiveness of directional signs.

Figure 2.8. An Example of Directional Signs, November 2018 (https://www.howardindustries.com/products/interior-directional-signs)

2.4.1.3. Identification Signs

These are the signs on which information about individual locations is displayed; such as buildings, locations and public facilities. Passini (1984) stated that identification signs are the most significant explanation state of locations. They provide information about the destination. They involve building signage, floor numbers and room identifiers provided at the destination (see Figure 3). These signs are used only when the destination is reached. That is; these kinds of signs tell people where they are and where they have arrived at their destination (Miller & Lewis, 1999).

Figure 2.9. An Example of Identification Signs, November 2018 (https://www.capitalsignsny.com/portfolio-items/ada-identification-signs)

2.4.1.4. Pictograms

The dictionary definition of pictograms is a picture or symbol standing for a word or a group of words. Abdullah and Hübner (2007) suggest that pictograms are iconic signs which represent facts, not through words or sounds, but through visual meanings. Pictograms are used for easier communication. There are many examples of their use of dialects, but they have never become the standard language (Ota, 1987).

Those in frame shapes started being used as way cues and helping information, because they can easily catch attention and they can be easily interpreted. One major issue with pictograms is that they should be prepared in a fashion close to interpretations other than its message. Pictograms are used as visual language elements. They are like supplementary words. They are important in the aspect of wayfinding instead of words, because they can be understood by people of all ages.

In facilities, people often use restrooms. Everybody can notice a pictogram of a restroom sign and find their way easily to feel relieved.

Figure 2.10. Restroom Pictograms and Baby Room Pictogram, November 2018. (http://blog.parallaxedesign.com)

It is always more appropriate to use a common language than different applications in the pictograms. Therefore, it is necessary to look at pictogram designs applied to ISO Standards. As the wayfinding in place becomes more prominent in large-scale public spaces, the standards of pictograms in public spaces are within the scope of the subject. ISO 7001 includes pictograms within this scope as "Graphical symbols used in public information signs" (see Figure 2.11).

Figure 2.11. Pictogram Exampels Used in Public Spaces -ISO 7001 (www.wayfindinguk.worldpress.com)

It is seen in the literature that pictograms are found both indoors and outdoors. The pictograms used indoors become more necessary due to the fact that there is more information in public places and it is more difficult to access them. For example, let us take pictograms that could be applied within a hospital: We see that the 'H' letter, a unique international pictogram of hospitals, is perceived as a hospital everywhere. In addition, pictograms symbolizing departments such as dentistry, otorhinolaryngology, urology and dermatology can be used. If we examine an office, it is possible to express the sections such as meeting room or manager room with symbols. Anyone can understand that the restrooms in a shopping mall are expressed by symbols of a girl and a boy. Each of the symbols at the airport, such as arrows, airplane symbols, is presented to the user as standard pictogram designs. As it can be understood from the examples, the usage of pictograms is not just a graphical design choice; it is also an important requirement for the users. While the need of users in a hospital is to find the department for their illness, it may also be searching for the restroom in a shopping mall. Therefore, pictograms are graphical expressions that meet the need for wayfinding within the spaces.

2.4.1.5. You-are-Here Maps (YAH)

You-are-here maps (YAH) are more beneficial than regular maps, because they indicate users their locations within the environment and surrounding areas (Marquez, Oman and Liu, 2004).

According to Mublhausen (2006), YAH maps should be placed accurately and in appropriate number, because lengths of the routes and the number of turns have an important role to decide the place of these maps. These are needed at the entrances and should be perceived from a distance and easily accessible (Richter & Klippel, 2002). Poorly prepared maps can cause confusion and frustration. Therefore, YAH maps should be prepared appropriately.

According to Levine (1982), the labels on the maps should use consistent terminology, memorable architectural elements such as landmarks should be incorporated into the map design and the YAH arrow should point the directions and the spot the viewer is facing while looking at the map; while the perspective view YAH maps are more preferred than the plan-view maps.

Passini (1984) stated that the sketch maps discussed bring out the important role of the organization principle in the construction of a cognitive map at the building scale. Passini (1984) also added that to establish such an organization principle is a means to make use of that information, and to retain what is needed.

While creating a YAH map, there are rules that should be considered, namely; completeness, visual clarity and semantic clarity (Klippel, 2006). Completeness refers to that every turn and every little and important detail should be obtained on the map in order to prevent a misunderstanding especially in an emergency situation. Maps should be visually clear which means that they should be easily understandable, and every sign and every notice should be readable. Schematic clarity is another important thing to be careful about. The meaning of every sign and every notice should be clearly represented (Klippel, 2006).

A YAH map needs to be placed along paths and positioned near decision points. Lengths of the routes and the number of necessary turns play a crucial role in the number of YAH maps to be placed. A YAH map is needed at the entrances as visitors orient themselves at these points and decide their destinations. These maps should be positioned in an asymmetrical part of the environment for easy identification on the map, should be perceived from a distance and be easily accessible (Richter & Klippel, 2002).

Figure 2.12. You-Are-Here Maps, 2018
(https://www.travelwayfinding.com/sales/you-are-here-maps)

Figure 2.13. 3D You-Are-Here Maps, 2018
(https://www.travelwayfinding.com/sales/you-are-here-maps)

2.4.2. Regulation of Signs

2.4.2.1. Content of Signs:

The content of the signage should be considered, because of the remembrance of signs. When the number of words increases, the level of remembrance of signs decreases (Bourdeau & Chebat, 2003). Long horizontal signs should not be used. Mclean (1993) claims that 40-50 characters start to distract visitor attention, disturb the eye and tend to result in losing one's way leading to the place.

Signs should not contain more than five messages and five lines of text in a single character height, stroke width font type; and surface characteristics should be considered (Pollett & Haskell, 1979). Also, Janet and Mayron (1993) stated that the text styles of signage must be sans serif or sample serif, and letters must be between 1.5cm and 5cm in height (see Figure 2.8).

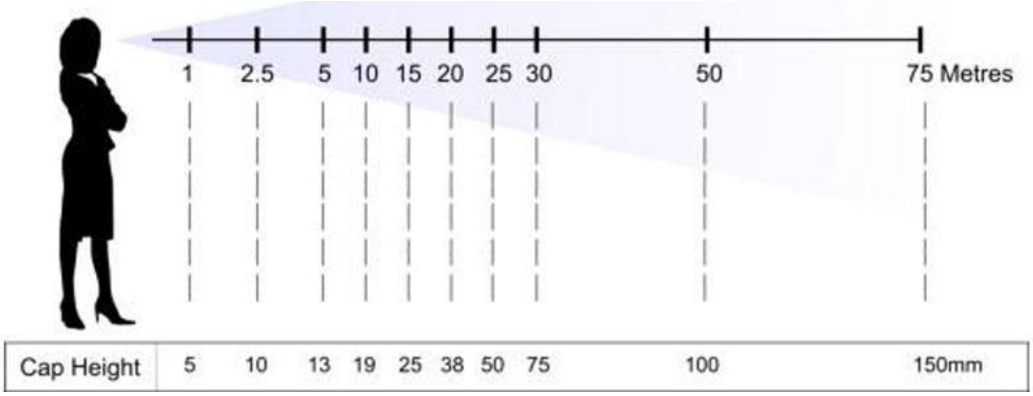


Figure 2.14. Text Height Levels in signage
(http://donsnotes.com/products/plaques-signs.html)

2.4.2.2. Location of Signs:

Arthur and Passini (1992) summarized the construction of a sign in three ways: self-supporting on a post or a slab; wall-mounted on flat vertical surface and suspended from a soffit or ceiling. Transitional and intersection areas are appropriate for the location of signs in terms of visibility (Pollet & Haskell, 1979).

According to Arthur and Passini (1992), decision points show themselves as corridor intersections, because this provides maximum visibility of the information for people coming from all directions, especially in complex buildings like hospitals or university buildings. The signage visibility rests upon the distance between the pedestrian and the signage; longer viewing distances prevent intersections between the signage and the pedestrian (Wang, Lo, Lui, & Kuang, 2014; Nassar, 2011).

The visible distance of signage is related to its height, size (Garvey, Pietrucha, & Meeker, 1997), color (Wong & Lo, 2007) and viewing angle (Xie et al., 2007), and is influenced by pedestrian age (Chrysler et al., 2001), vision level (Scott, Atkins, Bentzen, & Barlow, 2012) and obstacles (Zhang et al., 2016) (see Figure 2.10). Rousek (2011) states that eye level signs could attract the attention of users more frequently.

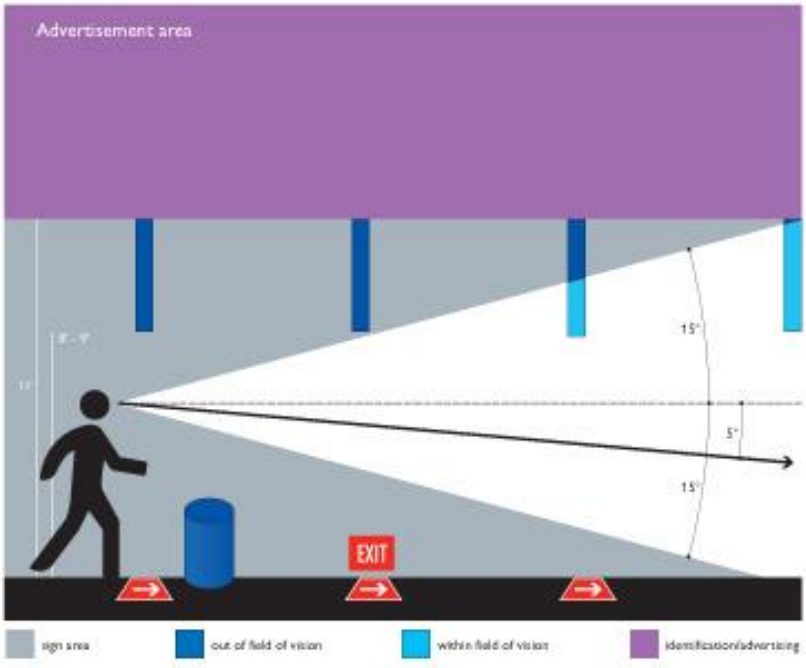


Figure 2.15. Field of Vision Information Graphic
(https://www.coroflot.com/ivank/Wayfinding-n-Signage)

Graphic information in horizontal position should be located 1200 mm above the floor, due to the cone of vision of pedestrians, children, adults and people with wheelchair (Arthur & Passini, 1992). Also, it is stated that the display of large pictographs has been placed 2200 mm above door height and extending ceiling height 3000 mm in order to utilize for display (Arthur & Passini, 1992) (see Figure 2.11).

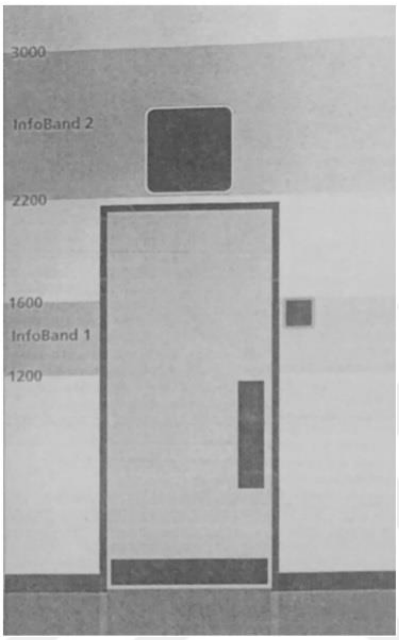


Figure 2.16. The Placement of Signs
(Derived from Way-finding: People, Signs and Architecture)

2.4.2.3. Finishing of Signs:

Design of signage should be consistent in typography, type height, icons, grid design, color and material choice. The signs need to be straight-forwardly designed and in a consistent order to wayfinding scheme, and always use the same order of displaying the information. It must be remembered to prepare samples of the different sign types and check them in the built environment to ensure that it becomes a best-practice design. Arthur & Passini described in their book 'Wayfinding' from 1992 a reliable method to calculate the contrast difference between two colors. The formula is based on the light reflectancy (LR) readings in percentages for each of the two colors involved. By subtracting the darker color from the lighter color, divided by the difference by the lighter, and multiplying by 100, we get brightness differential.

When the brightness differential is 70 percent or higher, legibility is assured. When it is less than this value, legibility cannot be assured and those colors should not be used in that combination. The finishing of signage must be made in such manner that letters should have an eggshell, matte or another non-glare finish material. In addition, letters of texts should have a minimum of seventy percent reflectance contrast with their background, and can be either light character on dark background or dark characters on a light background (Janet & Myron, 1993) (see figures 2.11, 2.12, 2.13).

Figure 2.17. Dark Backround with Light Text
(https://www.designworkplan.com/read/airport-signage-photo-inspiration)

Figure 2.18. Light Background with Dark Text
(https://www.designworkplan.com/read/airport-signage-photo-inspiration)

Figure 2.19. Examples of Signage surfaces in an Airport (https://www.designworkplan.com/read/airport-signage-photo-inspiration)

When the signs are stated in the design of the orientation, all kinds of graphical expressions for wayfinding in a space can be understood. Certain signs that evoke specific concepts may provide information to the user by means of usage in the space. The important thing is that the information to be delivered can reach the user correctly. Location, content, lighting and color elements on signs play a significant role in the useful and informative presentation of information systems (Helvacıoğlu, 2007). The elements affecting the use of signs are also directly related to the perception of the user. The location, content, lighting and color elements on the signs can be briefly explained as follows:

Location; It is the place where the sign is located in the space. The selection of places to locate the signs is an important factor in orientation. The position of the sign should be at a certain distance for the user's physiological perception. In addition to the physiological perception of the sign, it should be in a position that users can keep in their minds. This position is determined as the decision-making points in the space. It is possible to define the decision-making points in the space as the pausing points such as intersections of the corridors and turning points. At these points, the user needs to be directed by the signs.

Content; it is about what the sign is intended to express. The person thinks about the function s/he is looking for in his/her mind while s/he is directed to the point s/he is

going to. For this reason, when this function is correlated with an image in mind, it helps him/her in wayfinding. Therefore, the fact that the sign has a semantic content is a necessary factor for the mental perception and remembering of the person.

Lighting; Since it holds an important place in visual perception, it is an essential element for the sign to be recognized. Inadequate lighting may destroy the entire effect of the perfect graphical sign, which is designed according to all the parameters in the space, by causing failure in perception. A good sign also requires a good lighting along with it.

Color; It is a subject that is handled in the perception and perception psychology, and it is also used in signs in terms of awareness. The color on the signs should be selected by considering the perceptual size of the color and which color effects how. Benefiting from the effects as red indicates alarm, yellow is stimulative, and blue is relaxing, the signs can draw attention perceptually. According to Arthur and Passini, the signs to be used in indoor wayfinding are expected to have the following characteristics:

- Signs for the orientation should be visually accessible on related circulation routes.
- Signs should be different from their background.
- Particularly in complex environments, signs should have a coherent design to be more easily perceivable and should be in predictable coherent positions.
- Directional signs must be separated from the other signs in place.
- Texts on the signs should be readable from a distance, especially in decision making points.
- Information on the signs should be given as divisions in a certain structure.
- Signs for identity and orientation should be easily distinguishable from each other.
- Signs should be completely clear in order to be perceived only by their definitions.
- General and familiar expressions should be used (Arthur and Passini, 1992).

It is possible to classify the sign types according to their positions in the structural elements of the space. Signs can be positioned in three types of surfaces: walls, ceilings and upholstery. While wayfinding at indoors, the surface on which the sign is to be

located on the walls allows the user to look visually at an angle directly forward. We see that the signs are on the walls in many examples. However, the fact that signs are on the ceiling especially in crowded places can be an advantage. In such buildings, the perception of the signs on the walls may be weakened as it can be very crowded at certain times. It is a more appropriate design to place signs on the ceiling in crowded buildings such as subway stations and stadiums. The use of signs on upholstery in these buildings will cause signs to disappear in the crowd. The use of signs in ceilings, walls and upholstery is entirely in the hands of the designer. Upon his/her request, the designer can place the signs on the upholstery considering the people would look ahead, or to the wall as people's line of vision can be straight forward or to the ceiling because of the crowdiness. Since signs are a graphical expression in wayfinding, their location should be designed so that the user can see and use them efficiently within the place (Hasgül, 2011).

A correct signage design can convey the information correctly to the user as long as it sticks to the usage purpose of the signage. For this reason, the usage purpose of the signages changes the design of the signage from their location within the building to the colors applied on the signage. It is possible to examine the design of a signage under the following headlines (Chiara et al., 1991) :

- Alphabet selection
- Letter, word and space in between
- Arrow selection
- Clarity of the information
- Position of the information on the signage
- Size of the information on the signage
- Color selection

Alphabet Selection: The font to be selected should be easily perceived and conform to standards. The best perceived text types are "Fonts" which are solid and normal. Fonts such as Arial, Helvetica Medium, Clarendon are a few examples to these text types (Chiara et al., 1991).

Figure 2.20. Examples of Arial Bold Alphabet Font (http://dimensionalletters.com/formed_plastic/formed-plastic-arial-bold.html)

Letter, Word and Space in Between: In case the text and graphical expressions on the signage are next to each other, the space left between them should have a certain standard. The same standard goes for the space between letters and words in the text. The fact that the information on the signage has a certain homogeneity makes it easier to perceive the background (Chiara et al., 1991).

Figure 2.21. Space Relationship of Signages (Chiara and et al., 1991).

Arrow Selection: The use of the arrow in size and shape in accordance with the standards is important in perception. Since arrows are signs that determine the direction, they are used in direction signs as well as they determine directions as a single symbol. Arrows are the main signs that determine the direction of the information given on the plate with a text and a pictogram (Hasgül, 2011).

Figure 2.22. Arrow Selection (Chiara et al., 1991).

Clarity of Information: Another important point in the signage design is that the information given on the signage is completely clear. The message should be given to the user in the shortest and clearest manner. Unneccessary and long information can be hard in perceiving.

Figure 2.23. Exit Signage
(https://purepng.com/photo/28458/symbols-exit-sign-green)

Position of the Information on the Signage: Position of the information on the signage can be changed with various designs. It is recommended that the text is preferably in the middle, if the text is given solely. If both a text and a pictogram are used, the text should be on the left and the pictogram should be on the right. The position of the arrow on signage is where the direction is; meaning, if the direction is to the left, the arrow points to the left side; if it is straight forward, the arrow points to the top; if it points to the right, then the arrow shows the right side (Hasgül, 2011, p.116).

Size of the Information on the Signage: Size of the information on the signage varies among designs. It is recommended to meet the standards. However, it is important that the users can access the information they need. The size of the information on the signage is also related to the size of the signage. According to the size of the signage, the information must be at a certain rate on the signage. Another aspect is that its size should be readable from a distance. For example, a Helvetica font size of approximately 3 m long can be readable from 12 meters away. Therefore, we can also note that there is a proportion that a text of 6 cm long can be readable from 24 meters distance, and a text of 12 cm long can be readable from 48 meters away (Chiara et al., 1991).

Figure 2.24. Size of the information on signage (Chiara et al., 1991).

Color Selection: Color selection is another important element in the design of the signage. The color selection is in the hands of the designer, but should be taken into account for specific standards or relations on signs for safety and control (Chiara et al., 1991).

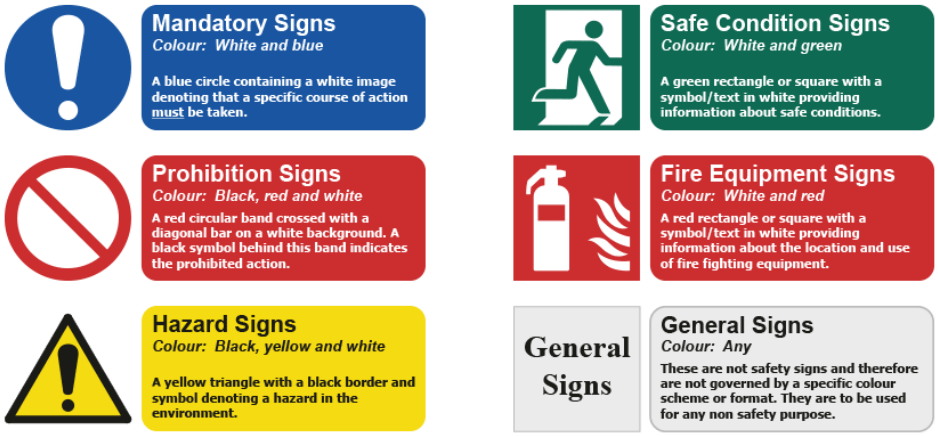


Figure 2.25. Colors of international graphical symbols (https://www.arco.co.uk/SignsCategories)

2.4.3. Reasons of Problems in Signs

Arthur and Passini (1992) explain why people have trouble with signages. The reasons of problems in signages are explained below:

Ambiguity: Even if a message might be clear for the person who originally put the sign up, it may be unclear; thus, it causes ambiguity.

Conflict: Two signs close to each other also create difficulties. This situation is faced when new signs are installed, and the old ones are not removed; so, it creates conflict.

Deficiency: It creates a problem with little information. Signs should contain information that people need at places.

Confusion: When there is more data than needed provided at given decision points, confusion is encountered. If signs are well illuminated, they are much more efficient; therefore, signs should be place opposite to windows.

Illegibility: Messages that are illegible are too small to be seen from the reading distance of sign, even if there may be nothing wrong with the message. Signs should give the right information. Finally, people should give full orientation to the wayfinding tasks, because if it is not provided, they might miss important information, signs, landmarks and architectural features.

2.5. Individual Differences Affecting Wayfinding

Individual differences also influence wayfinding. Various aspects of individual differences such as familiarity, gender and age have been examined through previous studies.

2.5.1. Familiarity

Familiarity is one of the crucial factors affecting the wayfinding process. This influences the improvement of sense of direction and wayfinding abilities. Familiarity seems to play a more important role in explaining wayfinding difficulties compared to those encountered in less complex environments (Li & Klippel, 2013). Franz and Wiener (2005) stated that the movement decisions include regular patterns that are caused not only by shape and configuration of the environment, but also by visual characteristics of points when looking for a specific place, especially in unfamiliar environments. Familiarity also affects the wayfinding performance.

O'Neill (1992) affirmed that, as familiarity with an environment increases, performance in wayfinding improves and the degree of complexity of the layout becomes less important.

Familiarity also affects the spatial orientation. People who are familiar with the environment used more information stored in their long-term memory, asked for less help for wayfinding and used fewer maps, but people who are unfamiliar used external sources more like maps, signs and other people (Chebat, Chebat & Therrien, 2005).

According to Hölscher (2007), people who are familiar with the building rely on their knowledge, and they walked on a completely planned route; also, they navigate faster than unfamiliar people taking the same route and besides, people with their knowledge did not gather as much information from their environment as unfamiliar people who are obliged to search and look at signs (Duran, 2016).

2.5.2. Gender Differences

Gender is a very important fact that affects the use of architectural and graphical design elements and affects the wayfinding process. Gender differences were found on some measures of wayfinding behaviors by Lawton et al. (1996). They reported that men were significantly more accurate than women in indicating the direction of a given

destination. However, there were no gender differences reported in wayfinding patterns. In addition, women expressed greater uncertainty about wayfinding tasks because of not being sure about the direction.

Cornell, Sorenson & Mio (2003) reported that males tend to express more confidence in their spatial and geographic abilities when compared to females. In addition, performances of the women were poor in wayfinding tasks and they were slower than men in the estimation of directions. They reported that men were significantly more accurate than women in indicating the direction of the destination. Cornell, Sorenson and Mio (2003) suggested that males tend to express more confidence in spatial abilities when compared with females. Besides, performances of women were poor in wayfinding tasks and they were slower than men in the estimation of directions. According to Schmitz (1999), men were more talented in recalling the wayfinding directions and descriptions in maps than women, but they were weaker in the use of signage systems in comparison to women (Allen, 1999). In addition, the time spent has some differentiation between females and males for finding their way and female participants found less wayfinding points than male participants did.

2.5.3. Age Differences

Age is the other important factor that influences architectural and graphical elements. It is reported in Osmann & Wiedenbauer's (2004) study that there was no significant difference between adults, young children (second graders) and older children (sixth graders) in using and getting help from colors when finding their way through unfamiliar surroundings. However, map correctness scores were significantly higher for adults than younger people as well as for the older children. In addition, Cubukcu and Nasar (2005) stated that the age factor produced a significant effect on navigation errors. That is; as the age increased, performance declined. Galea and Kimura (1993) found that younger people scored higher than adults did, not only on landmark selection, but also on scene recognition, distance ranking, map placement and route execution tasks. Older women had more difficulty than older men and younger adults did in general in selection of the best landmarks from the route. Kirasic (2000) found that younger adults (18-28 years old) outperformed older adults (60-85 years old) on scene recognition, map placement and route execution tasks (Helvacıoğlu, 2007).

2.6. Design Elements that Affect Wayfinding

2.6.1. Color Design in Wayfinding

Color is one of the most important design tools which affects all parts of our life. Dalke et al., (2005) defined color as "an inherent property of all materials and surfaces including everything from light and paint to art, from aesthetics to functionality and as an inseparable element of design" (p.343). Color is the most dominant design element, and ironically, the most relative aspect of design. The perception of color involves physiological and psychological responses of humans. Object, light, eye and brain are involved in a complex process of sensation and perception. Colors attract our attention, help us make sense of our environment, and affect our behavior. Colors play a cultural role, an informational role, and even a survival role.

Scientists, artists, and color theorists have developed variations of the color wheel. The first wheel appeared in 1611 and was developed by a Finnish astronomer Aron Sigfrid Forsius, and this was soon followed by Newton's color wheel in 1704. The primary objectives of these systems are to give order to the variables of colors and to concretely represent them, because "words are incomplete expressions as colors" (Munsell, 1981). Munsell developed a three-dimensional color tree. Hue, lightness (value) and saturation (chroma) are the three perceptual attributes of color. These are the dimensions to define the 'sensation' of a color. The chromatic aspect abstracted as 'hue' and defined as the perceptual attribute that is associated with the elementary color names. Hue allows us to recognize basic colors such as blue, green, yellow, etc. The light intensity abstracted as 'lightness' corresponds to how much light appears to be reflected from a surface in relation to nearby surfaces.

There are different color ordering systems in the world that are developed; such as the CIA Lab System, the Munsell System, the Ostwald System, and Natural Color System (NCS). NCS, the Natural Colour System, is a logical colour system which builds on how a human being sees colors. The NCS notation gives an unambiguous definition of a colour and any surface colour can be described. It can facilitate a person's colour specification, documentation and colour design. It is simple to decide and combine choices of colour with the help of the NCS system (Berit Bergström, 2014). A colour system does not necessarily give pretty colour combinations; however, it does provide

a tool for experimenting with different colour harmonies. One can develop one's own colour concept by observing what the colours look like and how they relate visually to each other. We will work hands-on with various colour exercises which will develop your capability and sensibility of seeing colours (Berit Bergström, 2014).

In humans, the color sense is highly developed and people can easily perceive different colors. Colors can be divided into three different sizes, namely; red-green, yellow-blue, and black-and-white, because all other colors are obtained from a mixture of these three basic colors. The colors are considered as the factors which provide varieties for the visual perceptions of people. The designer can strengthen the wayfinding abilities of the users by using colors. It is possible to ensure that the design is effective with the use of colors (Unver, 2006). There are various color perception theories that explain how we perceive colors by using the basic color concept. The point that is desired to be underlined here is one of these theories known as the opponent-process theory. According to this theory, which was put forth back in 1870, there are three antagonizing processes in the general process of color perception. One process is related to the intensity of color (black and white), the other is in red and green, and in yellow and blue. Each process works in two ways. At another stage of the process, another color is detected in another color.

Colors such as red-green or yellow-blue connected to the single process are not detected at the same time. However, red-yellow, blue-green blue-red, blue-red, yellow-green sensations can be perceived (Cüceloğlu, 2005).

The color factor in interior design has a number of psychological effects that allow people to make sensory inferences from space. For each color, there are common effects on the subject. According to the color used, a space can be large or small, close or far, cold or warm. Red and red colors often create a warm and close feeling in humans, while blue and blue colors evoke a cold and distance sensation. These psychological effects of colors have been proven by researches. In addition, the combination of colors contrasting each other increases the intensity of these colors, and can draw the effect in the area (Ünver, 2006).

According to Helvacıoğlu (2007), successful wayfinding abilities of users depend on the availability of environmental information.

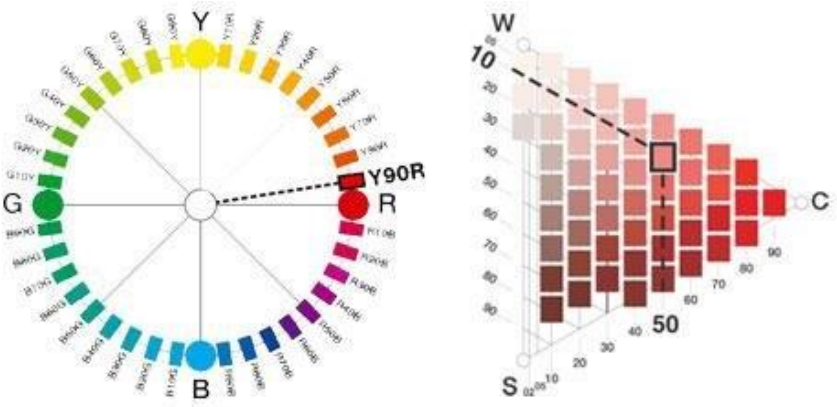


Figure 2.26. A view showing the NCS Color Circle and triangle (https://www.researchgate.net/figure/Two-dimensional-projections-of-the-NCS)

Colors can be used as visual cues to help individuals focus on a particular area of the built structure. Colors can be applied as a wayfinding tool for not only spatial organization, but also for exterior spaces in the environments. Because of its easy manipulation in a variety of design materials, color is an ideal design element for creating environments that support users' wayfinding abilities (Read, 2003).

For instance, Greenroyd et al. (2017) stated that one strategy to aid wayfinding involves 'zoning' the sections of the hospital, by assigning each department their own color, and then painting the confines of that department in that color. This can have an added benefit of making areas attractive and can be used to send patients down paths of the designer's choosing. However, this conflicts with other studies which suggest colors should be kept in neutral or calming tones, such as blue or green, to decrease stress in patients and reduce the chance of delirious episodes caused by abstract colour schemes. (A tool for signage placement recommendation in hospitals based on wayfinding metrics Fraser L Greenroyd1, 2, Rebecca Hayward2, Andrew Price1, Peter Demian1 and Shrikant Sharma2).

Psychological responses to color; It can be divided into three groups as brightness and opacity, lightness and darkness and sensitivity to temperature and coldness (Başoğlu, 2007). When color is used in space, this color affects the color perception. Warm, dark and bright colors are perceived as coming sooner than cold, light and matte colors (Göler, 2009). At the same time, the more the color is perceived, the more the movement is proportional to the element. For example, warm and bright colors are needed in living spaces with movement elements such as schools and subway stations.

We see that a cold and dull color is used more frequently in places such as a bedroom or a spa center for relaxation (Göler, 2009).

In order to choose which color to use, the effects of colors on human beings in general should be considered. According to psychology, there exist for major colors: These are yellow, red, blue and green. Artists interpret green as a lexicon in terms of eye perception; however, it is a color in itself (Göler, 2009). The effects of these basic colors on human psychology are explained as follows:

- **Yellow**: Stimulant at the place of use, creates a cheerful, striking effect. It refers to expansion and communication. Yellow is a color that arouses joy, relaxes and enhances intelligence.
- **Red:** It creates a stimulating effect on the place of use. It has a friendly effect when mixed with white. Red means energy and power. Red has activating, provocative, sometimes disruptive effects. Expresses excitement, struggle and vitality.
- **Blue:** When used in dark tones or intensely, it creates a depressing, gloomy effect, and when used in light tones or when mixed with white, a soothing and reassuring effect is introduced. It symbolizes protection. Blue is a color that strengthens the belief, increases the ability to think, gives peace and joy.
- **Green:** It creates a calm, peaceful, sensitive, soft effect in the place it is used. It expresses joy and tranquility. It has a religious and mystical meaning along with its relaxing, hopeful and gratifying effect (Çetindağ, 2007).

"The use of color in the orientation designs also has a content that needs to be addressed from this point. For example, if a design will be made for children to find way in a school, one of the important requirements to consider is the color and the perception that this color adds to the space. The age ranges of children should be determined and the color of children in this range should be considered as more sensitive. Many questions should be sought, such as the purpose for which color is to be chosen and in what form it will appear (Hasgül, 2011).

2.6.2. Lighting Design in Wayfinding

After mentioning the effect of color on space and its effect on orientation, it is necessary to mention the concept of lighting which is an important element in directing people in the space. Lighting is a form of energy perceived by the sense of vision and radiated by radiation propagated in all directions in the spaces, and which scatters around the source and makes the surrounding objects visible (Göler, 2009).

Light is the name given to electromagnetic waves emitted in linear waves (Hidayetoglu, 2010). Before speaking about the perception of light and light in space, it is necessary to explain the basic concepts of light:

Luminous flux: The light flux of a light source is the total amount of light it gives in each direction (Hidayetoglu, 2010).

Brightness Level: Brightness is the division of an infinitely small particle that surrounds a point of a surface by the area of this surface particle (Göler, 2009).

Glow: The glow is related to the light size of a light source that affects the eye. The role of glare in visual perception is very important. Everything seen is a variety of colorless surfaces with different flashes (Hidayetoglu, 2010).

Glare: It is the effect of light coming from the wrong direction in the normal field of vision (Gordon, 2003).

Light color temperature: It is called "thermal radiation" when the objects become illuminated. Instead of the actual temperature of an object, the temperature emitted by a black object in that temperature is called the color temperature (Hidayetoglu, 2010). Physically, light is associated with a number of physical phenomena, such as light coming to the eye and breaking the lens. It is the psychological effect of light which is the most important for the psychology of perception and perception in space. The use of light in a different way has a different effect on the human being.

The psychological impact of light is examined in six chapters (Hidayetoglu, 2010):

- Light - shadow effect
- Effect of light filtered through holes
- Split light effect
- Distributed light effect
- Moving light effect
- Dramatic light effect

When it comes to locating and using light in the space, it should be said that the most commonly used lighting is artificial lighting. First of all, artificial illumination must be properly designed and the perception of space must be fully ensured. If there is a problem in the space quality depending on the light, the person would have problems about visual comfort, which is the most important perception of wayfinding.

This is one of the main problems in wayfinding. One must be able to visually dominate the space he/she is within. The first element that provides visual comfort in the spatial organization is the light (Hasgül, 2011).

In the spatial organization, direction and light is another consideration; some effects of artificial lighting on human psychology are used in orientation designs. For example, some technological designs can be made within the space, and the direction of movement can be ensured by following the moving lights by using the moving light effect. It is possible to draw attention to some objects in the space by using the dramatic effect of light, and the perception of these objects can have an effect on orientation. As can be seen from these examples, it is possible to direct the user to move within the space with the psychological dimension of light.

Another element of lighting and orientation that can be made use of is using lighting elements as spatial elements in lighting. In this way, lighting fixtures are no longer the visual comfort of the space, but now they become objects, and the effects of directing these objects in the space can be utilized. If the relationship of light with space and human psychology is understood, many alternatives can be produced for orientation in the space as in these examples.

The form and design of the artificial lighting to be used relate to what kind of effect is desired in the space. The brightness of a space, its color and whether it is illuminated or not are linked to what function or functions it has to have (Tunç, 2007). If a very bright and illuminated area in the space is desired, a direct lighting system where where every point of the space receives light should be designed. If a more dramatic effect is desired, it is more logical to select indirect lighting, if only certain elements are required in the space.

2.6.3. Material and Texture Design in Wayfinding

In nature life, everything exists with a texture, because the structure of each static object and the movement of each dynamic body make up the texture of that object. In architecture, the concept of texture is revealed by the quality of the material, so that the texture is always the expression of a function, but it is the nature of the texture material in architecture.

According to Gürer, material participates in the space with its texture. In the limitation of the space, the physical properties of the material and the visual values of the subjective expression of the material are found, thanks to the texture of the material (Gürer, 1970). The effect that the tissue creates in the mind through vision is the visual texture of the objects, and these are the elements formed by motive, rank, line and intonation.

Tissue is a concept that allows the subject to make sensory inferences, because each tissue has a stimulus value that is tactile (Tüzcet, 1967).

Such tissues perceived by the sense of touch are called real tissues, such that they produce various emotions such as softness, hardness, coldness and temperature on humans (Tüzcet, 1967).

In the design of architectural spaces, it is possible to make various textures and variations in order to strengthen the stimulus and facilitate the perception. With the differentiation in the texture of the material, it is possible to create rhythms in the space or create different perceptions by highlighting different dominant characters. An object with a dense texture can be detected in a short distance, while a less dense object can be detected further away. It is possible to draw the attention of the user in the direction that he/she wants to go with use of a material of different character and an unusual texture, except the tissues that people often come across in nature (Tüzcet, 1967).

As a result, it is possible to facilitate the orientation of building materials and surfaces used by the designer and the orientation of these tissues in the space.

2.6.4. Form Design in Wayfinding

Form is one of the common concepts for all objects and subjects, because it is the response of a necessity, and a form is necessary for the concept of existence (Gurer, 1970).

According to Erkman (1973), the stimulant enters into various forms, because the energy that is present in various forms can affect our emotions through our sensory organs. The importance of the concept of form in architecture is the harmonization of function with the form of space.

The forms of the materials used, the forms of the structural elements and the form of the spatial whole must be fully in conformity with the needs of the subject moving in the structure. For this reason, architectural fiction should be evaluated with the form to be formed depending on the function and aesthetical perception (Ünver, 2006).

Form is one of the basic requirements of architecture. The three main elements that make up the whole of architecture are structure, function and form (Göler, 2009).

In architectural terms, form is a requirement on structural and spatial scale. The architect takes advantage of basic forms while designing a building. Spatial design include interior elements and materials in use of various forms in design. The most important element that a product designer uses in a product design is the form. For this reason, form is one of the most important factors that make up the design.

For architecture, the form is one of the most important basic design parameters, because it is the task of harmonizing a certain scope of thought with a certain form. In an architectural arrangement, the form is manifested in every scale, such that a form of a structural element, a material, a space, and a combination of architectural elements creates a form, and the form is a limiting and guiding element of the movement of men (Erkman, 1973).

There are no clear rules for the combination of color, texture and form, and these features of the objects are used to convey messages to people. These concepts provide the designer with the chance to make the desired accent as well as providing diversity in a space. The fact that the given message is strong or weak is due to differences in usage patterns and dominant characters. These elements, which can be used at every scale of the space – from the material to the element, are effective until the composition of the total composition (Ünver, 2006).

CHAPTER 3

WAYFINDING IN HOSPITALS

Hospitals are buildings with complex systems, founded on large areas, accommodating numerous spaces and using different naming and classifications distinct from the daily language. Hence, wayfinding is highly important for users to get needed services quickly and in a timely manner, without feeling any discomfort at hospitals (Kavaz and Zorlu, 2018). Hospitals are large and complex systemic structures in terms of the various units they contain (diagnosis and treatment units, personnel unit, management unit, technical units, etc.) as well as spatial organizations and structures. Such large complex structures can be perceived as complex for patients and visitors who come to the structure for the first time or who do not use the structure continuously. For this reason, hospitals should direct the user directly from the moment of entry to the structure and direct them to the direct exit after the completion of the work process at the target (Kavaz and Zorlu, 2018).

In hospital buildings where the user population is very diverse and varied, the user is under stress and anxiety about the hospital structure due to his or her discomfort. After entering the hospital, the patient may experience difficulties in reaching the hospital where he/she wants to go because of the limited corridors, limited visual access and foreign terminology. In this case, if one experiences problems such as running late or getting lost, the individual feels insecure because of the emotional pressure, stress and uneasiness he/she may experience (Güç, 2015; Marberry, 1997; Sönmez and Önder, 2015). For this reason, legibility and wayfinding are important in hospital buildings.

Hasol (1993) defines the hospital in the simplest way as 'a dormitory where patients are hospitalized'. According to TSE (2002), the health institutions in which the sick and wounded are also diagnosed and treated are the places where people give birth. Identifying the hospitals as the buildings that form the basis of the health system, Akıncıtürk (1985) considers hospitals as institutions which are responsible for diagnosis, treatment and protective services for the society.

Mutlu (1973) defines hospitals by considering the health personnel of hospitals who strive to treating diseases, preventing the spread of infectious diseases, taking measures to protect public health, conducting scientific researches to combat diseases, and organizing doctors and nurses.

Although there are various differences between hospitals in terms of size, operation and the services they provide, all of them have a common point in dealing with health problems of people, and they are divided into types according to their size, the organizations they belong to, and their involvement in the diagnosis and treatment of one or more diseases (Altan, 2003).

Hospitals according to size can be classified as: Smallest (up to 50 beds), Small (up to 150 beds), Normal (up to 500 beds), and Large (more than 1000 beds). According to the establishment types, the hospitals in our country can be grouped as SSK, University, Foundation, Municipality and Private Sector Hospitals. The number of beds and percentages of these institutions vary every year (Karataş, 1979).

By the types of diseases, hospitals are divided into general hospitals and private hospitals according to their involvement in the diagnosis and treatment of various diseases (Altan, 2003).

3.1. Hospital Design

It is an undeniable fact that it is necessary to be more sensitive, knowledgeable and careful when it comes to places which are directly related to human life. According to the architect Ece Ünver, hospital design depends on the orientation and binding nature of the spaces. Alongside the technical staff who knows the architectural structure and system, they design a very special structure for the user group. The patient does not have a chance to choose, change or improve the place he/she has to be within (Ünver, 2006).

In the hospital buildings where a large number of different places are located and because of technical requirements, people use different names and classifications from the language they use everyday, users have difficulty in perceiving the space and experience orientation problems as a result of not using their existing knowledge (Ünver, 2006).

When the literature on hospital design and the functioning of these structures are examined, although there are many researches about the general concept of hospital, its units and its users, it mostly consists of studies on the quality of care (Ulrich, 2004). The relationship between hospital design and patient-healing process is mostly associated with hospital stay and the use of analgesics (Ulrich, 1984). In some studies, it was found that factors such as natural landscape and sound level provided relief in pain control and surgical methods (Katcher et al., 1984; Frumkin, 2001) and ease in surgical methods, whereas contact with nature decreases the stress and hospitalization time (Ulrich, 1999; Ulrich, 2003). According to Neufert; hospital capacity, hospital type, land selection, wind direction, daylight, infrastructure, transportation situation are the factors to be considered in the project design stage of hospitals:

- **Hospital Capacity:** Hospital capacity is determined by the number of patient beds. According to the number of patient beds, hospital sizes vary between 50 and 1000 beds.
- **Hospital Type:** The fact that the hospital is a general hospital or a private branch hospital is one of the most important factors affecting hospital design.
- **Land Selection:** It should be done in a region where hospitals can be minimally affected by natural disasters and transportation facilities can be easily provided. Land structure, geological data, etc. should be taken into consideration in our country which is considered to be an earthquake zone.
- **Wind Direction:** Heat losses should be avoided considering the dominant wind direction in hospital design.
- **Daylight:** The hospital should be positioned according to the daylight by determining the places where daylight should be received or not.
- **Infrastructure:** Hospitals should work with maximum efficiency, taking into account factors such as the size and capacity of materials used in exceptional situations or in daily use situations, so as not to adversely affect patient flow.
- **Transportation:** Hospitals should be easily accessible for easy access to the hospital, and it is one of the most important factors for emergency patients and outpatients (Neufert, 2015).

The areas of hospital design can be listed under two headings as basic and support functions:

A. Basic Function Areas: Administration, Polyclinics, Emergency Services, Patient Care Rooms (services), Operating Theaters and Hospitals, Intensive Care units, Diagnostic Units, Treatment Units and Sterilization Units can be defined as the main function areas of hospitals (Neufert, 2015).

B. Support Function Areas: Circulation areas, waiting areas, recording units, technical services, cafeteria, counseling, security, morgue, waste center and laundry room can be defined as support function areas of hospitals (Neufert, 2015).

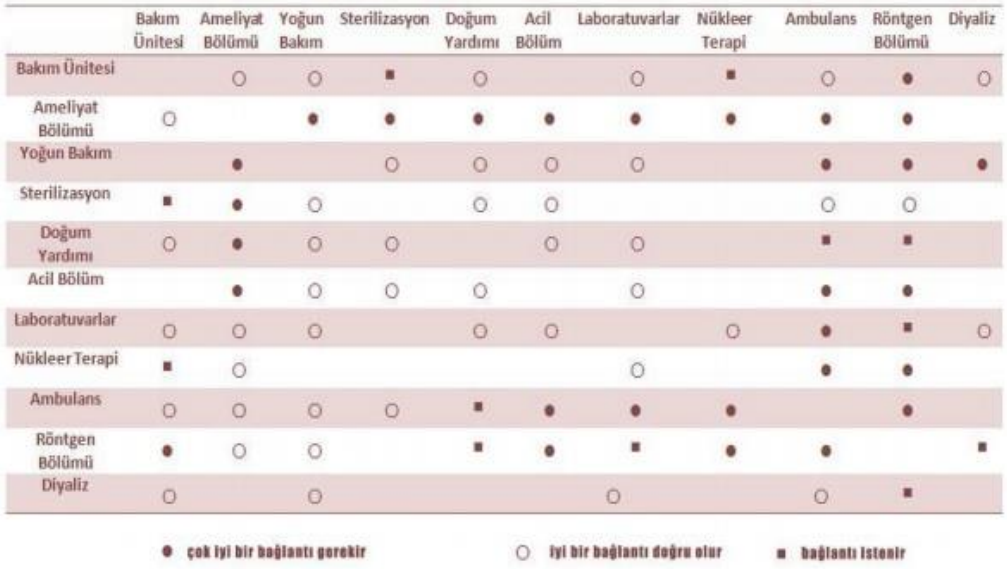


Figure 3.1. Functional Connection List in hospitals (Neufert,2015)

According to Aydın (2009), operating rooms in hospitals must have connections to central sterilization, intensive care units, diagnosis and treatment units, emergency department, blood center, morgue-autopsy department and pharmacy.

For polyclinics, it is also important that the diagnosis and treatment units are linked to the treatment units, while the administration should be connected to the patient admission service. It is also required that polyclinics are associated with pharmacies. Emergency services must have connections to intensive care units, diagnostic units, operating theaters, polyclinics, blood center and morgue-autopsy departments. Patient acceptance services should be connected with policlinics and patient care chambers. Central sterilization should have direct connection with operating rooms. (Aydın, 2009).

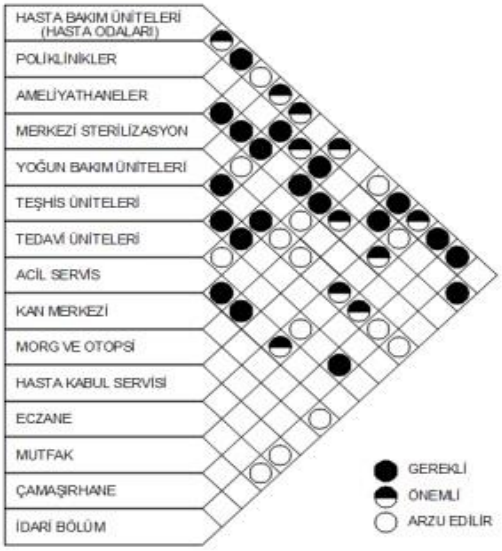


Figure 3.2. Proximity Matrix in Hospital Departments (Aydın,2009)

3.2. Departments of Hospital

During the design of hospitals, the architect acknowledges that some functional requirements are common to all users, so if they are common in all hospital structures, they can combine these with old information in their minds and enable them to move more comfortably within the space. It is possible to examine the topological knowledge of general hospitals under the main headings of clinics, polyclinics, diagnosis and treatment departments, operating theaters, emergency department, administrative and technical services departments (Özdemir, 1976). According to Özdemir, the hospital departments are as follows;

. Patient care units (Clinics) are the departments where all kinds of health, hygiene and accommodation conditions are provided for patients who will be treated in the hospital. Clinics are usually differentiated from other units. Generally, the places of the clinics in the spatial editing are located on the upper floors, while the mobility of the patients is taken into consideration in the distribution according to the floors.

. Outpatient department (Polyclinics) is the department which the patient directly comes to, and it is also the section that patients use for the examinations to be performed outside the unit where they are maintained. Polyclinics are usually very close to the ground floor, administrative departments and patient acceptance. Polyclinics have a mixed spatial organization with their intensive functions and circulation areas that serve them. The architectural solution should be by means of

defined geometries that minimize this confusion. Multilevel solutions are generally unavoidable, but vertical distribution of units should be carried out according to patient characteristics. While units such as orthopedics, gynaecology and cardiology, which receive patients possibly having trouble in walking, are located on the ground floor; units such as dentistry and opthalmology are located on upper floors.

. **Confirmation Units** include laboratories, radiological diagnosis, ultrasanography, ECG, EEG, EMG, computer tomography, angiography, magnetic resonance, cystoscopy, rectoscopy and endoscopy. Diagnostic units are parts used both by internal and external patients. For this reason, diagnostic units should be close to polyclinics, patient care units, operating room and emergency room.

. **Treatment Section** contains the appropriate and necessary treatment units of the diagnosed disease. It is arranged to serve to internal and external patients as a necessity. Treatment section contains physical therapy, rehabilitation, radiotherapy, nuclear medicine, hemodialysis units. As treatment units provide inpatient treatment to other patients, these also include patient bed sections.

. **Physical Therapy and Rehabilitation Units;** they are usually held together. Physiotheraphy contains traction, infra-lipstick, superficial heating, ultraviolet, laser and tens of the parts of the treatment treated with tools; massage treatment and bath treatment (hydrotherapy).

. **Operating Rooms** should be located in a place where the hospital should be completely separated from other parts of the hospital and should not be under traffic. For this reason, it should be on a separate floor or a separate block, isolated from the other sections and connected with all patient care floors.

3.3. Importance of Wayfinding System in Hospitals

Large-scale structures, such as hospitals, where sound, noise and crowds are intense, are tiring for the user and reduce the efficiency of perception. Therefore, there are some elements that should be considered in order to strengthen the perception in the use of visual signs in such structures. These are as follows: correct choice of the decision point, location of the sign, style and size of the sign, horizontal and vertical alignment of the sign, pronunciation and punctuation in the text, design of the arrow, contrast between the background and text, materials/symbols/colors used and maps.

All these visual pointers should be designed with simple, clear and consistent information, and in a way to be comprehended by foreign users as well (Kavaz and Zorlu, 2018).

In the literature on this subject, Carpman et al. (1984) has determined that the wayfinding performance increases with the signage systems in hospitals in the study of the decision-making point of the signages system (1984).

O'Neill explored the effectiveness of signs on the wayfinding performance in complex-planned structures and showed that the sign systems he dealt with in writing and with graphical expression content had different effects on orientation. It has been found that in buildings with low complexity, the signs themselves reduce the drawback by increasing their activity in complex structures, while creating hesitation and reservation by themselves (O'Neill, 1991).

The socialization of the individual is affected by the social structure of the place and reflects it to the life process; not only the physical structure of the space, but also creates the user diversity (Hillier, 1996). In this context, the importance of experience in multi-storey complex architectural structures, such as hospitals, is further increased and space experience becomes more complex. Because hospitals have a unique structure owing to not only crowded working groups and complex mechanical tools, but also with users and visitors who need assistance. In these structures, it is difficult for users to experience and perceive the spaces and the corridors that provide the connection between spaces, and to act with this awareness.

According to Lemprecht (1996), the efforts of health care providers to increase the duration of outpatient care in order to accelerate the healing process of the patients are an important indicator that the movement in the hospital will increase. This situation brought up the patient-centered hospital design concept and it was understood that the design language presented during the healing process of the patients was highly effective.

One of the elements supporting the evaluation of space user relations in the patient-centered hospital design approach is the wayfinding element in the context of accessibility (Turner, 2004).

The importance of wayfinding behavior in hospitals is understood when the users are not able to move freely within the space due to design-based reasons. Especially in hospitals, which have physical and psychological disturbances, such as hospitals, and which are designed within a special group of users whose needs and behaviors need to be dealt with more carefully, it is necessary to consider a number of concepts that facilitate wayfinding at the architect design stage (Ünver, 2006).

Facility planners are encouraged to use the master planning process to create effective wayfinding systems (Easter, J.G., 2007, p. 29–34); however, this advice is seldom heeded, despite the fact that wayfinding is one of the variables beyond clinical service that affect patients and staff (Gehshan , 2011, p. 11; Wolstenholme, D.; Cobb and others). This lack of recognition about the critical role of wayfinding systems has unfortunate outcomes, because an environment that fosters independent wayfinding will reduce costs; people who are unsure about where they are and how to reach a destination will interrupt the staff engaged in other activities (Devlin, 2010).

According to Architect Rahşan Ece Ünver, architectural fiction must be formed primarily as required for human behavior in the hospitals. While success is not needed in small-scale hospitals, even in the case of large and complex structures, there is a need for additional systems that provide ease of navigation as well as signage systems. During the design process, the architect should pay attention to the studies that show how the users perceive and behave in hospital structures. Starting from the external environment, in terms of all design parameters, from spatial alignment to spatial relations, the use of spatial excitation elements such as suitable form, texture, color and formation of signage systems can be examined (Ünver, 2006).

An early application of wayfinding in the healthcare arena came from the work of Carpman, Grant, and Simmons (1986), whose book titled “Design that Cares: Planning Health Facilities for Patients and Visitors” is a landmark volume that integrates environmental research and healthcare design. The authors argue that a “coordinated wayfinding system” is needed in healthcare facilities and that the ease of wayfinding will affect stress [11] (p. 19). Research from this book points out to several themes that have received continued attention, including the importance of nomenclature (i.e., how destinations are named), density (i.e., the number of signs), context, placement, and visibility (cited in Sloan Devlin).

To summarize the basic elements to be considered in the design of hospital buildings, the structures should be perceived easily, the functions should be solved together, the positioning of the common elements and spaces at easily accessible points, the use of special designed elements at the points where some attention is drawn to and visual perception should be strengthened by providing variety in the spaces with different functions through the use of elements such as color, lighting, form and texture.

3.4. Importance of Accessibility in Hospitals

Hospitals and health buildings are complex buildings, which are used by a wide variety of problematic people and patients. For this reason, health buildings and hospitals must provide for the physical demands and other needs of these people. Planning and designing hospital enviroments need intense and complex efforts. Hospitals must provide functional ability to reduce stress, encourage healing and recovery, and enhance safety and accessibility for users. In brief, hospitals and health buildings must include accessible environments for older people, children, women and disabled individuals (Gezer, 2014).

Accessible hospitals must have well-designed areas, physical configurations, equipments, furnishings and materials which are promoted by independent functions. Designs must be easily understandable by the help of signs, signboards and navigation tools. Also, it must be easily used by everyone regardless of age, ability and condition. Nowadays, in hospital and health buildings, planning approaches with “people-oriented designs” must be adopted. When designing new and existing health buildings, “accesibility” theme must be considered (Gezer, 2014).

Hospitals are large and complex systemic structures in terms of the various units they contain (diagnosis and treatment units, personnel unit, management unit, technical units, etc.) as well as spatial organizations and structures. Such large complex structures can be perceived as complex for patients and visitors who visit the structure for the first time or who do not use the structure continuously. For this reason, hospitals should direct the user directly from the moment of entry to the structure and direct them to the direct exit after the completion of the work process at the target (Kavaz and Zorlu, 2018).

Hospital buildings should be constructed in areas that are easily accessible in emergencies, but allow for a green area without air pollution, away from places such as highways, airports, railways and those with noise pollution. Access roads must be clear and safety should be ensured in the traffic control points. Parking lots should be in a condition that allow employees, relatives of the patients and service vehicles to proceed to the car park (Aydın, 2009). The size of the hospital in terms of m^2 area can be considered as a determining criterion for the number of parking lots. When the total size of the hospitals is taken as a basis, it is necessary to allocate at least 1 parking area for every 75 m^2. Parking lots should be arranged as open and closed areas, and ease of use and accessibility should be provided in emergency vehicle entrance and exit areas. In case there is not enough space for planning the number of vehicles, parking lots should be located around the health structure. The location of these areas, which are obliged to be included in the existing transportation system, should be determined in a way to allow for convenient vehicle entry and exit. In addition, a traffic flow that facilitates access to the health building should be provided, directional signs should be arranged, and the emergency exits and ambulance parking places of the hospital should also be considered (Aydın, p.14, 2009).

A suitable positioning for topographic data is very important for hospital buildings. The slope of the land allows for different entrances in the floor planning, but can also lead to circulation turbulence, if it is not planned properly. In addition, approach angles of the sunlight, direction characteristics, use of natural parts of the sections are important for the user as well as the physical environment conditions should be considered in the building with biological issues (Gezer, p.122, 2014).

The planning of the green area around the building is another issue to be considered in the organization of the environment. The landscape should be constructed according to the land and climate data, the trees should be selected in such a way that they do not prevent the approach of the sunlight and prevent the wind from windy areas. The green areas arranged in the garden and outdoors should be able to rest and control the natural area, but should be controllable. For the green areas, the number of patient beds is taken as a criterion, and 10 m^2 of garden area per bed is given as a suitable value (Aydın, p.14, 2009). In front of the building entrance doors, common areas such as telephone booths and ATMs should be considered in front of their use areas. In order to ensure that the entrance is comfortable and non-hazardous, it must be well-arranged

and properly illuminated. There should be no threshold on the entrance doors. If there is a matting, it should be placed in an indentation which is buried into the floor and at the same level with the floor (Aydın, p.14, 2009).

As a result, an environmental design that is close to human dimensions is very important for the structure to convey a feeling of safety and accessibility in the hospital environment. Factors such as entry points to the building and adequate outdoor lighting in the parking lot, appropriate consultation and security services are all essential elements to ensure safe environmental conditions. In hospital buildings, a physical environment must be created that is responsive to all these functions, friendly to nature and to every living person, and providing the patient with confidence and quality service with the latest technologies (see Figure 3.2).

Figure 3.3. Example of Main Entrance in Golden Jubilee National Hospital (https://www.holmesmiller.com/golden-jubilee-entrance)

3.5.Factors Affecting Wayfinding in Hospitals

Although there are many studies that analyze the factors affecting wayfinding in large-scale buildings, there is still a need to further analyze this issue in hospitals. From the standpoint of plan configuration and signage, wayfinding research on any large building or complex of buildings is applicable to healthcare environments (Devlin, 2014, p.4). Thus, this study focuses on plan configuration and signage systems in hospitals.

3.5.1. Plan Configuration in Hospital Wayfinding

Early on in the research on wayfinding, plan configuration was shown to be a correlate of wayfinding performance (O'Neill, 1991, p.23 and Weisman, 1981, p.13). Marquardt mentions that long corridors, repetitive elements and changes of direction within the circulation system negatively affect the orientation as structural aspects and the information clutter is mentioned as an environmental design feature as well (Marquardt, 2011, p.4).

The main purpose of this study is to determine wayfinding performance of hospitals in the hospital and the use of spatial excitation elements. In order to provide ease of orientation in a hospital, the first necessary condition is that the architectural design is properly constructed in terms of hospital design and use; therefore, the architect has to take into account some of the diagrams and patterns that exist in the memory of people at the design stage. Signage systems in hospitals are more important depending on the hospital's architectural construction and the size of the hospital after stimulation facilitates the perception and use (Ünver, 2006).

The simplicity and intelligibility in architectural plans are very important concepts in terms of the concept of orientation based on intelligibility in spatial fiction. It is open to public use where structures such as hospitals are located on a large scale and in a very different number of places; large, spacious, high level of illumination should be found in places (Ünver, 2006).

According to Ünver, locations of common elements such as elevators and stairs are also important in these places. Positioning problems of such circulating elements at easily detectable points and close to each other will significantly reduce their wayfinding abilities. Another important issue to be considered in the design phase is the spatial alignment characteristics in order to provide ease of orientation in the formation of architectural fiction. Positioning of the spaces with the same or similar functions will facilitate the movements of the users in the space.

According to Hale Gezer (2014), planning solutions that make the patient feel at home in the last period are preferred and the scales are accessible. Accessible planning in this context should contain the following factors;

- Providing the easiest access to functional use as soon as possible,

- Separation of internal and external patient circulation,
- Correlation of commonly used service units with entrances and outpatient services,
- Distribution of working areas in accordance with the flow of use,
- Connection between the service areas of administrative areas and inpatient units, patient attendants and patient care service areas,
- Proper air conditioning and hygiene in the social sharing areas of patients,
- Comfort in every environment.
- In addition, clean air intake and transmission should be kept under control, and external air intakes and exhaust outlets should be well-analyzed. Autopsy rooms, isolation rooms for airborne infections, ethylene oxide excretions, chemotherapy rooms/aspirators, outlets of fumes such as laboratory aspirators, ventilation (supply/return) should be arranged in terms of their locations (Gezer, 2014).

It cannot be excluded that social culture is of great importance in order to ensure minimum sterile conditions in the operation and use of such structures. For this reason, the understanding of business structures, patient behaviors, hospital visitor circulation, visitor behavior and habits of such structures in our country, especially the risks associated with the accompanying system, should be taken into consideration, and it should be stated that sterilization measures begin at the design phase of the architectural project prior to the implementation of the air-conditioned sterile air conditioning system. It is very important to select the appropriate devices and operating methods for a system with a very good control of the suitability of the architectural project to fit the sterile volume understanding (Kırbaş, 2012).

As a result, spatial organization in the hospital plan design, correct operation of the action and equipment and size of the space are gaining importance, since the users are experiencing health problems. The places which are designed systematically for providing for the needs of a hospital without making people lose time and get tired are arrangements that are needed for the operational functionality of the hospital.

According to Kavaz and Zorlu, the user's perception and wayfinding can be facilitated, if the plan configuration in a hospital with large area is designed in a system where

more systematic and visual access can be achieved from many points (Kavaz and Zorlu, 2017).

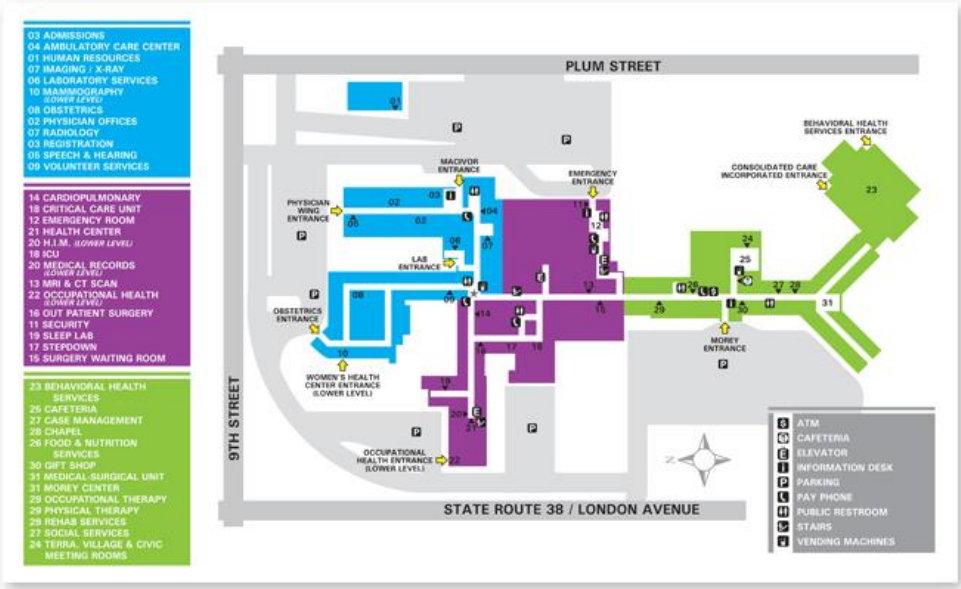


Figure 3.4. An example of Hospital Wayfinding Plans (http://hollback.com/projects/hospital)

Because hospitals are complex functional structures, hospital design requires good organization. This requires hospitals to be designed according to the rules of wayfinding. In hospital design, the most important factor for the patients not to have problems in wayfinding within the space is that the plans are clear and the design of the inter-departmental relations without question is important for the treatment process of the patients. If patients do not get lost in the outpatient clinic, this will prevent the loss of time, they will be provided early diagnosis and treatment (Çetintaş, 2016).

Hospitals are the feature of being the health center of the region with the circulation system and polyclinic working well (Mutlu, 1973). Easy access to doctor's rooms and registration banks, and their proximity to the waiting halls and their arrangement in such a way that they do not interrupt the patient flow will make it easier to navigate.

In hospitals, circulation and wayfinding can be evaluated in the following areas:

- Access to outpatient clinics,
- Access to the waiting areas,
- General Access.

General Access: The entrance area, which allows general access, should be arranged on the ground floor and close to the street (Mutlu, 1973).

Access to Clinics: Shorter access time from the outpatient clinic to patient registry banks and doctor's chambers is important for patient diagnosis and treatment. Therefore, the polyclinics should be designed in such a way that the patient registration unit and the doctor's rooms are directly connected to each other.

Access to Waiting Areas: The waiting areas should be within the policlinic and patient registration banks, and should be connected to the outpatient entrance hall and should be designed in such a way that they do not interfere with the circulation of space with the suitable waiting hall furniture (Mutlu, 1973).

Furthermore, the disabled citizens should not be forgotten in the signage systems in terms of convenience in the circulation and wayfinding systems of hospitals. It should be assessed in the policlinic and waiting areas, especially in the handicapped access to the main entrances by the criteria for elevation difference, ramps and elevators. There should be no differences in the height of the hospitals that restrict the access of disabled people. There should be a ramp or lift in the hospitals with elevation differences. There should also be noticeable surfaces for the visually impaired. In addition, speaking sign systems should be used (Çetintaş, 2016).

3.5.2. Psychological Affects of Wayfinding in Hospital

The psychology of the individual, the current state of mind, has an effect on finding one's way when one enters a space as it affects one's other abilities and daily behaviors. This is especially important when one considers the hospital. Because when a person is ill, he/she cannot think and act in a healthy and right way. When a person has health issues in terms of mental or physical health, he/she goes to the hospital and this may make it harder for him/her to find his/her way in the hospital. Therefore, wayfinding design in hospitals is more important than it is in other complex structures. Environmental psychology research shows that physical environment is a positive stimulus on human health. In other words, the environmental warning should be neither excessive, nor inadequate (Wohlwill, 1968; Berlyne, 1971).

While the relatives around the patient should maintain a high level of patient spirituality, the building in which it is located should also provide such an

environment. The architect should make the space aesthetic with the contrast of the occupied and vacant parts, the rhythm of the window rows and the harmony and contrast of the colors and the design of the elements such as light and shadow (Mutlu, 1973).

According to Ulrich, R. S., (2001), patient waiting halls in a hospital should be designed to ensure that the equipment is compatible with the choice of color and technological equipment. If the degree of warning is high due to noise, intense light, bright colors and other environmental factors, it is likely to cause stress. Low values can also cause negative feelings such as boredom and depression. The lack of positive stimuli may also lead to focusing on stressful thoughts that cause anxiety or stress. As a result, if the patient is both ill and stressed, it will be more difficult to find way in the hospital. In this case, the designer should take measures to minimize stress factors in the space.

3.6. Signage Systems in Hospital Wayfinding

According to Güler (2008), when it comes to the design of a signage system for wayfinding, it is seen that solutions based on information systems are produced first. What to do in order to wayfinding in a hospital can only be considered as the placement of signages in certain areas. However, wayfinding within the space includes both organizational and perceptual and informative scope. When it comes to routing the space user with information systems within the space, the information design that enters into another design area comes up. In this context, it is necessary to start with the signage system design and what contents it has.

Güler (2008) defines the design of signages as information design is the determination, planning and shaping of the content and the environment to be conveyed by the message in accordance with the determined requirements of the users. Baer and Vacarra (2010), giving the definition of STC, have shown that the information design is expressed as "turning the complex, unedited or unstructured data into valuable and meaningful information". The definitions show that the signage design is required to be presented to the users in a certain way rather than via complex signs. Within the increasingly complex life, many alternatives are offered to the user to access the information; however, it is important that the alternatives offered are easy,

understandable and specific. Therefore, the correct transmission of information results in the design of information systems. "We do not need more information; what we need is the capability of conveying the correct information to the right people in right time, in the most effective and most required way " (Baer and Vacarra, 2010).

According to Güler (2008); "Determining the content of the message and visualizing it according to the target audience", which is at the core of graphic design, is one of the aims of information design. The message mentioned here is the transmission of information to be provided to the user about his needs. Visualization is to convey the message visually to the user in the design of information. Most of the designs of graphic designers are also intended to inform the user. In other words, there are two nested designs in terms of purpose and design.

According to Hasgül (2011), in hospitals, the user in the room has the purpose of nurturing the patient and visiting the patient. In achieving these purposes, one needs to learn what to do to get the doctor and the patient together. If there is a need to take the patient to a patient room with any number, where the verbal communication is insufficient, he needs the help of some visual elements to determine the location of the room in the building. The topics that are included in the graphic design, such as the location, legibility and attention of the orientation signs within the hospital, are in fact the strongest elements that provide circulation in the hospital (Figure 3.3).

Figure 3.5. An Example of Wayfinding Graphic Sign Boards in Hospitals, 2018 (https://formdg.com/projects/texas-childrens-hospital-wayfinding-graphic-design)

Signage systems are all kinds of graphic objects that contain symbols or text inside the hospital and used for orientation. This object can be a directional sign or a symbol which is drawn on the wall. The use of signs in the space, some schematic expressions of the location in the space with the explanation of the path to be added to the location of information added to the location has an important place (Hasgül, 2011).

When we imagine a hospital without these routing maps, we can think that no one can find the way, and that the users of the place will tend to ask verbally to the people in the hospital. Such intensive use of oral communication may cause problems in the hospital as people cannot deal with their duties.

In buildings where such seconds are important, it is necessary to have a system and operation in the orientation and wayfinding. Otherwise, as shown in the example, the quality of spatial use reduces. For these reasons, it is important that the information is given to the location user in a way that directs the user to a specific system. Wayfinding systems and informational systems are nested within this scope.

For example, Kavaz and Zorlu (2017) has shown that, in the study of user behavior observations and survey results are evaluated together, the point in the hospital in question is not sufficient to help the user in wayfinding in Trabzon Demographic Training and Research Hospital.

In order to be able to make a decision, it is necessary to give correct information about the settlement, spatial organization of the space, where they are and where they will go (Plan diagram) and it was seen that the organization of the space, the information about where they are and where they are going to, the environmental information in the space and the point of choice of signages (Kavaz and Zorlu, 2017, p.203).

According to researches, information systems in spatial orientation and wayfinding design in hospitals are examined under five headings, namely; signage, pictograms, schematic expressions, maps and landmarks.

General information about these titles will be explained and how they are used in way finding and the information given in this section will be supported by examples.

3.6.1. Signage Types in Hospital Wayfinding

"Signs enable us to communicate with environmental information and these signs indicate to the viewer where they are, when and what happens. Passini signs are divided into three titles: directional signs, way decisive marks and signs of confidence. The directional signs determine a place, an object or event by a name, a symbol or a picture and a mark (arrow). Signs that are decisive define an object, a place, or a person rather than a direction. The signs suggesting trust are the impressions used to inform a viewer who does not know where he is on the motorway" (Ünver, 2006).

Helvacıoğlu (2007) makes another classification regarding the signs that can be used in the hospital building:

- Identification signs
- Directional signs
- Descriptive signs

Identification Signs; any object, phenomenon, or any function within a space that defines any function graphically. These signs provide an identity to some of the subjects in the space.

Directional Signs are the signs that the user can follow along the path while finding his/her way in the building. It is possible to express the most used example of these signs as the use of arrows.

Descriptive Signs; these are the signs that explain a particular phenomenon, especially at the decision-making points. Descriptive expressions are used in areas where the user of the space may hesitate or need to obtain detailed information.

We see that the signages used in the place are also used by some objects such as boards and plates. However, the titles of the signs are separated from this title, because it contains other information along with signs. The use of signs under this heading should be expressed as the use of any structural element within the space. Arrows are the most commonly used directional signs. The characters, color and size of some marks can be meaningful for a user who is directed to an arbitrary target within the building. Apart from the organizational and perceptual factors in the building, the user also needs some additional information. At this point, where visual communication and graphic come into play, signs appear as design elements in hospitals with their lasting effect on the mind (Figure 3.4, 3.5).

Figure 3.6. Landmark Board in Hospital Wayfinding, December 2018
(http://www.ecoresignagesystems.com/hospital-wayfinding)

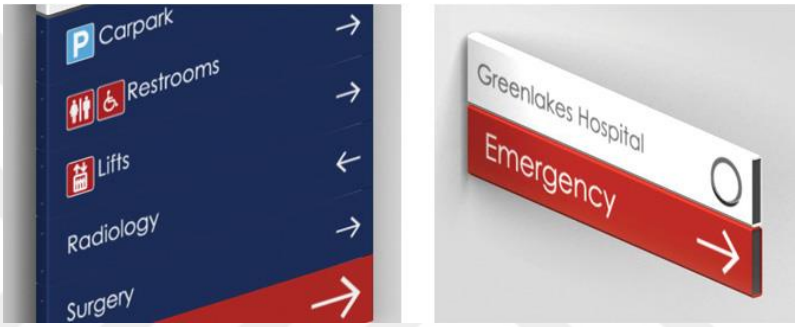


Figure 3.7. Examples of Landmark board in hospitals, December 2018
(http://www.ecoresignagesystems.com/hospital-wayfinding)

Pictograms; "H" letter, a unique international pictogram of hospitals, is perceived as a hospital everywhere in the world (Figure 3.7). In addition to this, pictograms symbolizing sections such as dentistry, otolaryngology, urology and dermatology can be used in hospitals (Figure 3.8).

Figure 3.8. Universal Hospital Pictogram
(https://www.ussignsandsafety.com/collections/guide-signs)

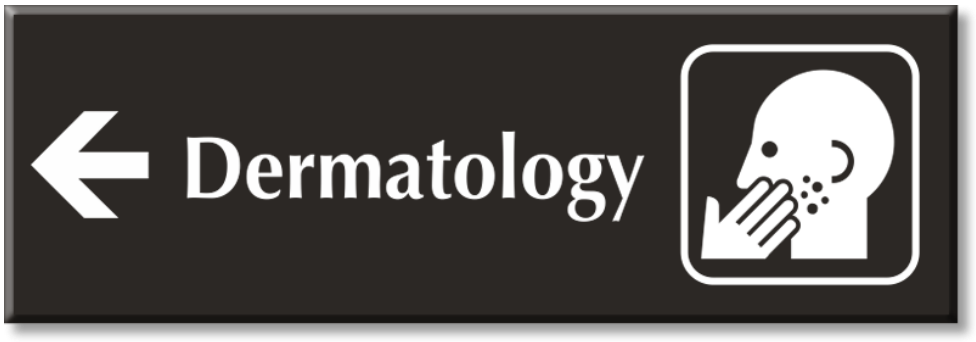


Figure 3.9. Hospital Department Pictogram
(https://www.mydoorsign.com/dermatology-right-engraved-wayfinding-sign/sku)

3.6.2. Signage Boards in Hospital Wayfinding

Hospitals are the most diverse areas in terms of signage design. Since there are color systems designed by each country uniquely to their desire, and used in the signages, signage designs vary according to these color systems. It is possible to say that all of the elements used in the signboard design such as font, font size, text color and background color are differentiated.

All kinds of graphical and written information is given to the user, and it is aimed to facilitate wayfinding in the hospitals.

When the users search for their way, they can reach the target point by following the information in these signs, and they can receive treatment without losing any time. With state-of-the-art features, advertising and digital sector companies digitize signs and deliver more realistic and fluent information to users.

Figure 3.10. Emergency Signage in a Hospital, December 2018
(https://www.otago.ac.nz/news/news/otago030366.html)

Figure 3.11. Digital Signage in a Hospital, December 2018
(https://www.polardisplay.com/cherry-services/digital-signage/)

3.6.3. Schematic Graphics and Maps in Hospital Wayfinding

Schematic graphics and maps must be expressions related to their locations. The locations where maps are to be located within the space should be the places that the person needs the most. The maps used in the spatial organization should be placed at the key points of the circulation systems with the room numbers on each floor (Helvacıoğlu, 2007). In this way, people encounter a map, which makes it easier to find way by looking at the expressions, in cases they cannot decide which way to go. The use of schematic graphics and maps in hospitals is important according to the size of the hospital and the number of floors. The disappearance in inter-polyclinic circulation can be prevented by 'you are here' maps at the current location. Schemas and maps that can be connected to the place of the person are the elements that save the person from this negative perception in the moments of being lost in the space. It is important that these elements are at the places where the person can reach at the decision-making points. Where the people lose their sense of direction, the maps enable them to understand where they are in the building, allowing them to continue from where they are (Figure 3.12 and 3.13).

Figure 3.12. Example of Maps in Hospitals, December,2018
(http://www.waymarking.com/waymarks/WMH5H9)

3.6.4. Landmarks in Hospital Wayfinding

Lynch explains the landmark concept under the headings of the urban scale: which is "These objects are reference points; however, the user does not enter into these objects, they are external phenomena". They are generally easily identifiable physical objects, namely; Building, beacon, mountain, etc. Their use is to distinguish a single element from many possibilities. Some are radial references that can be seen from other small objects and from many angles and distance" (Lynch, 1960).

While it is possible to mention many structures as symbolic structures in the urban scale, it is possible to define this concept as the use of icon objects in the spatial organization. When the user goes to the point he/she wants to reach within the space, he/she makes his/her movement happen with some information from the environment. Another information system for this ease can be identified as symbol objects (Hasgül, 2011). The icon object can act as a point of attention, if it has the correct visual character.

However; visibility, shape, color and facade surface of the object are determined as visual character criteria. Differentiating objects in space can be provided with design elements such as color, texture, size and shape (Helvacioglu, 2007). In hospitals, the signage systems can sometimes be designed as information desks and sometimes as a waiting unit, and they can be emphasized by integrated objects such as lighting and fixed furniture.

Figure 3.13. Examples of Landmarks in Hospital Wayfinding, December 2018 (https://tr.pinterest.com/pin/153403931042912167/)

CHAPTER 4

A CASE STUDY ON WAYFINDING IN A HOSPITAL: TOBB ETU HOSPITAL

The space is not only an object being observed with its experienced three-dimensional feature, it is the place where the movements of a complex entity, which has been tried to be solved for centuries, is realized. Therefore, it is very difficult to explain this situation and human condition by experimental observations (Snoff, 1991). It is necessary to determine what people think, feel or know, and to understand their relationship with space. According to Sanoff (1991), there are two methods for this review:

1. To ask people what they think and feel about the researched environment (survey),
2. Monitoring their behavior in the space (user map),

With in this framework, the aim of the study is as follows:

- To determine the relationship between spatial organization efficiency level and wayfinding performance,
- To determine the effect of signage systems with different characteristics on wayfinding performance,
- To demonstrate the level of complexity of the plan and signage systems between wayfinding,
- To determine the effect of familiarity with wayfinding performance,
- To determine the effect of design elements such as color, lighting, material and form on wayfinding performance in space,
- To see the effect of the level of perceptibility of signage systems on wayfinding performance,
- The effect of physical and psychological factors on wayfinding performance (age, gender, education, occupation, personal skills, awareness, familiarity, etc.)

For these purposes, the study was carried out in three steps. In the first step, the sign systems on the round trip to the target otorhinolaryngology polyclinic were determined and examined by using the strategies regarding the wayfinding behavior in the study of Bechtel and Churchman (2002).

In the second step, the users who were asked to go to the otorhinolaryngology polyclinic with the criteria that determined the wayfinding behavior of the users which were defined in the study developed by O'Neill (1991). The obtained data has been noted on floor plans, and the notes regarding the users have been written down on researcher note card. In the final step, a survey study has been carried out in order to learn the evaluations of current wayfinding systems and spatial organization and to determine the changes according to the user profiles.

4.1. Contextual Setting of TOBB ETU Hospital

TOBB ETU Hospital is a private hospital establishment of TOBB ETU health and education institution company located in Sogutozu town of Çankaya district of Ankara. TOBB ETU Hospital, which began serving in Ankara, Söğütözü on December 2004, is established on 25.000 m^2 closed area. The hospital gives qualified health service with its building, technology, compliance with international standards, large comfortable living spaces, care and physician staff experience (https://hastane.etu.edu.tr/page/kurumsal). The hospital departments include Emergency Department, Oral and Dental Health, Gynecology and Obstetrics, Gastroenterology, Pediatrics and Ophthalmology, as well as Anesthesia and Reanimation, Nutrition and Dietetics, Biochemistry, Dermatology, Endocrinology, Physical Therapy and Rehabilitation, General Surgery, Chest Diseases, Internal Diseases, Cardiovascular Surgery, Cardiology, Otoghinolaryngology Diseases, Microbiology, Neurology, Neurosurgery, Orthopedics, Traumatology, Plastic and Reconstructive Surgery and Urology polyclinics. In addition to these, there are special units such as Diagnosis and Treatment Unit of Large Intestinal Diseases, Diagnosis and Treatment Unit of Spine and Spinal Diseases, Liver, Anchorage Surgery Unit, Breast and Endocrine Surgery Unit. As of September 1, 2016, it was transferred to TOBB ETU University and currently serves as the Faculty of Medicine Hospital (https://hastane.etu.edu.tr/page/kurumsal).

Figure 4.1. General view of TOBB ETU Hospital, December,2018 (https://hastane.etu.edu.tr/page/kurumsal)

Figure 4.2. TOBB ETU Hospital Building Information, October, 2019 (http://www.mtkarchitects.com/uploads/yuklemeler/dp.pdf)

TOBB ETU Project was designed by Turhan Kayasu, the founder of MTK Architecture, between 1997-1998, and its construction was completed in 2005. The name of the hospital building, whose contractor is Mesa Mesken Sanayi, was changed to TOBB ETU Hospital in 2010 from Mesa Hospital.

Figure 4.3. TOBB ETU Hospital Project, October, 2019
(http://www.mtkarchitects.com/uploads/yuklemeler/dp.pdf)

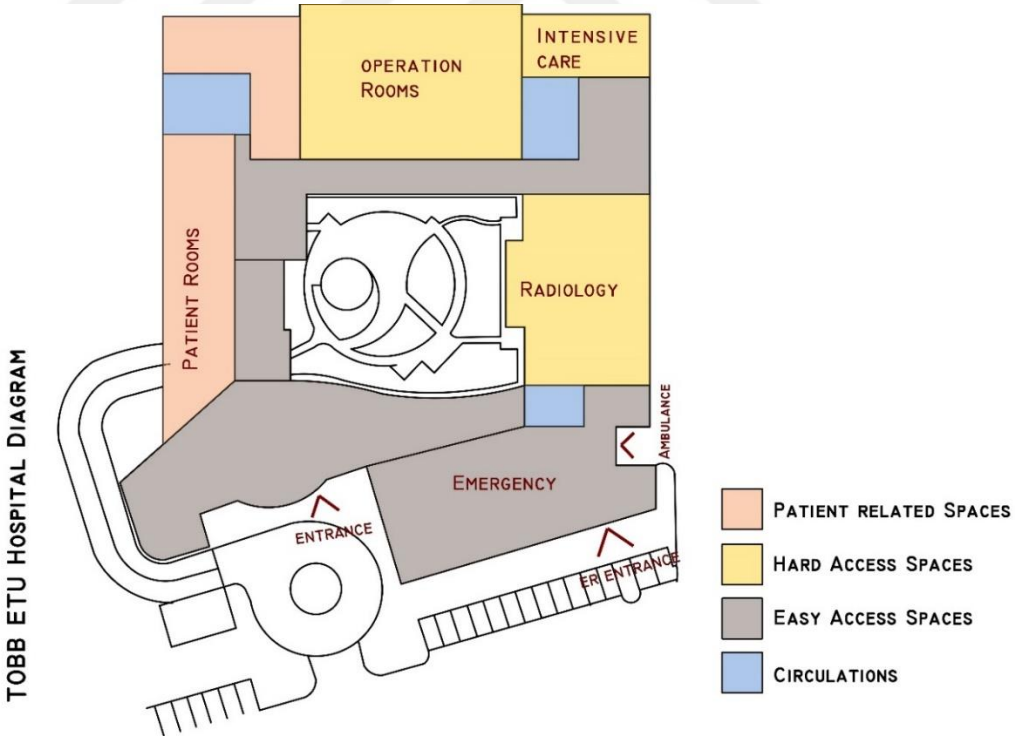


Figure 4.4. TOBB ETU Hospital Diagram Plan, December,2018
(http://www.mtkarchitects.com/uploads/yuklemeler/dp.pdf)

On the ground floor, main entrance and emergency entrance are located, and there are several departments and clinics such as Emergency, Operating Rooms, General Intensive Care, Cardiovascular Intensive Care, Radiology, Angiography, Cardiovascular Surgery, Patient Admission Discharge, Patient Relations, Visiting Doctors, Marketing Communication and Café. On the first floor; Patient Rooms, Outpatient Clinics, General Surgery, Otorhinolaryngology, Neurology, Neurosurgery, Orthopedics & Traumatology, Urology, Pediatrics, Dental Clinics, Gastroenterology, Coronary Intensitive Care, Restaurant & Administration Departments are located. On the second floor, patient rooms, outpatient clinics which are Oral and Dental health, Nutrition and Dietetics, checkup, pediatric surgery, Endocrinology and Metabolic Diseases, Physical Medicine and Rehabilitation, General Surgery, Thoragic Surgery, Chest Diseases, Obstetrics and Gynecology, Cardiology, Laboratory, Neonatal intensitive care, Hospital Administration, Library departments are situated. On the basement floor; Angiography, Cardiology, Laboratory, Pathology, Blood bank, Pharmacy, Information Technologies departments are located.

TOBB ETU Hospital is located in the Beştepe neighborhood of Yenimahalle district of Ankara. The TOBB ETU hospital located on Yaşam Street which is located on the western parts of Ankara. This hospital is close to the Sögütözü metro station and is easily accessible by private vehicle and public transport, and there is a car park at the front of the hospital for private cars. In the southeast direction of the hospital, there are “Akropol Hospital” and “Memorial Ankara Hospital” and in the southwest direction of the hospital, there is ‘‘Medicana International Ankara”. There are various restaurants and cafés around the hospital, and the “Armada Shopping Mall and Business Center’’ on the eastern side of the hospital. At the same time, in the northeast direction of the hospital, there are “Anadolu Hotels” and “Wyndham Ankara Hotel” and in the southeast direction of the hospital, there is “Mövenpick Hotel Ankara”; thus, clients coming from outside of Ankara have the opportunity to stay in a region close to the TOBB ETU hospital.

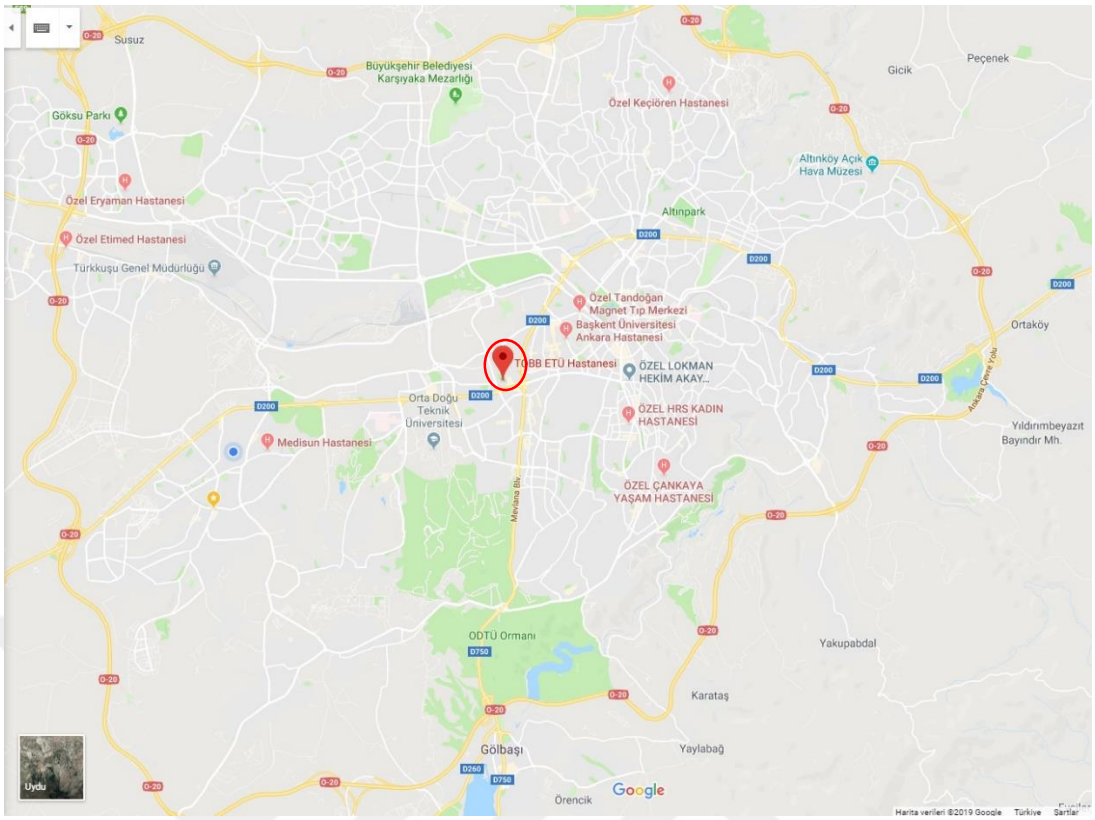


Figure 4.5. TOBB ETU Hospital Location Map, December,2018 (https://www.google.com.tr/maps/dir//Beştepe+Mahallesi,+TOBB+ETÜ+Hastanesi)

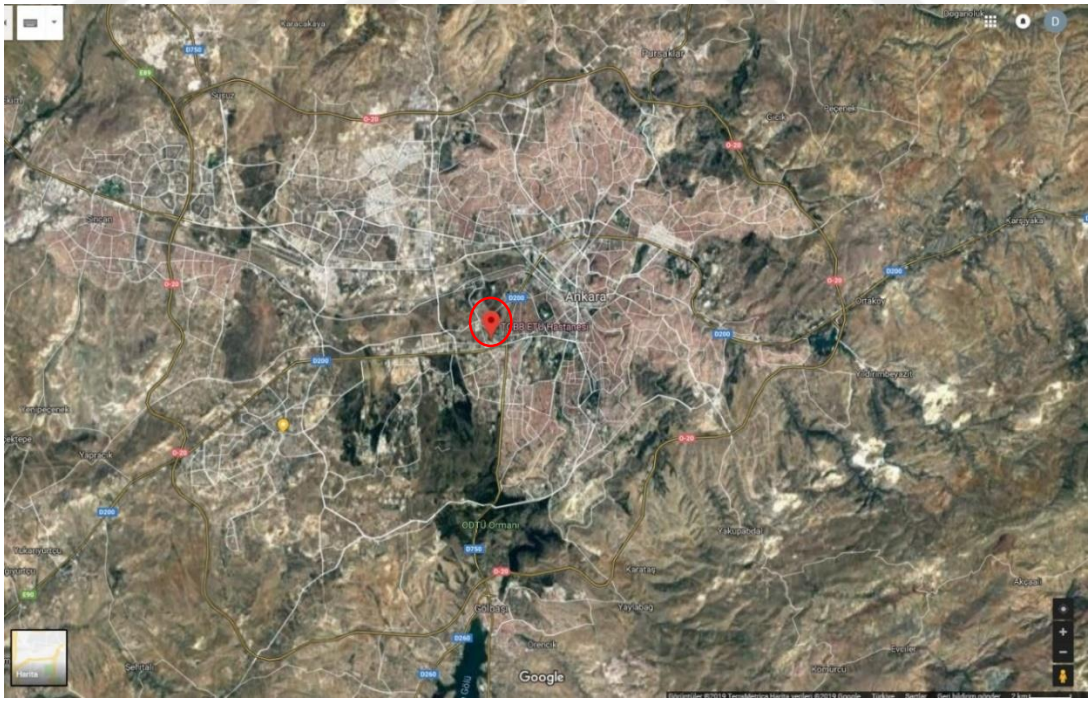


Figure 4.6. TOBB ETU Hospital Location Map, December,2018 (https://www.google.com.tr/maps/dir//Beştepe+Mahallesi,+TOBB+ETÜ+Hastanesi)

4.2. Analyses of Spatial Organization and Signage Systems of TOBB ETU Hospital

4.2.1. Spatial Organiation Systems of TOBB ETU Hospital

The spatial organization of TOBB ETU Hospital was divided into three as the main entrance to the outpatient clinic and the ambulance entrance. The otoghinolaryngology clinic is accessible from the main entrance and is located on the first floor. When we enter the space, the information desk, which is the first landmark, meets us. The information desk consists of a semi-circular shaped metal structure with a metal flange, and a tile wood veneer wall with the logo of the hospital meets the user (see Figure 4.4, 4.5, 4.6).

Figure 4.7. TOBB ETU Hospital Information Desk, from A point, January 2019

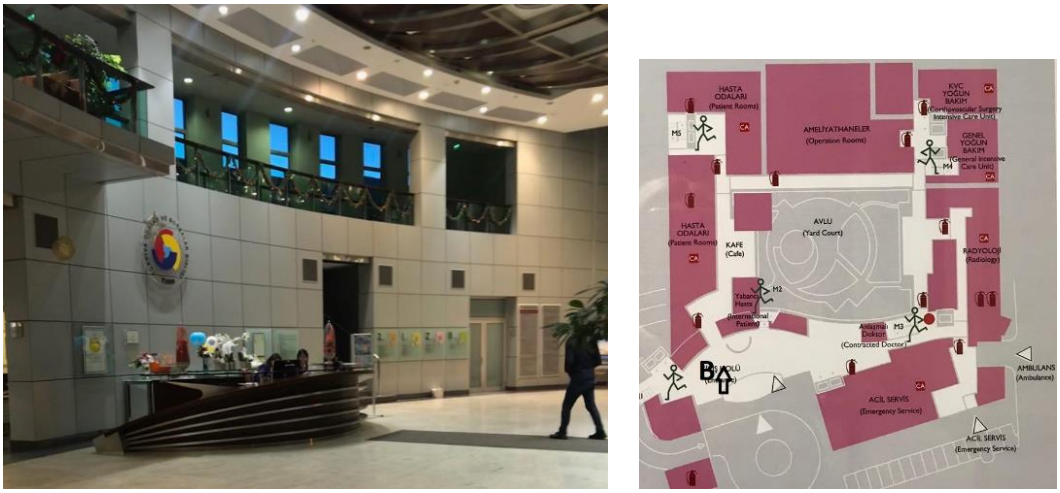


Figure 4.8. TOBB ETU Hospital Entrance, from B point, January 2019

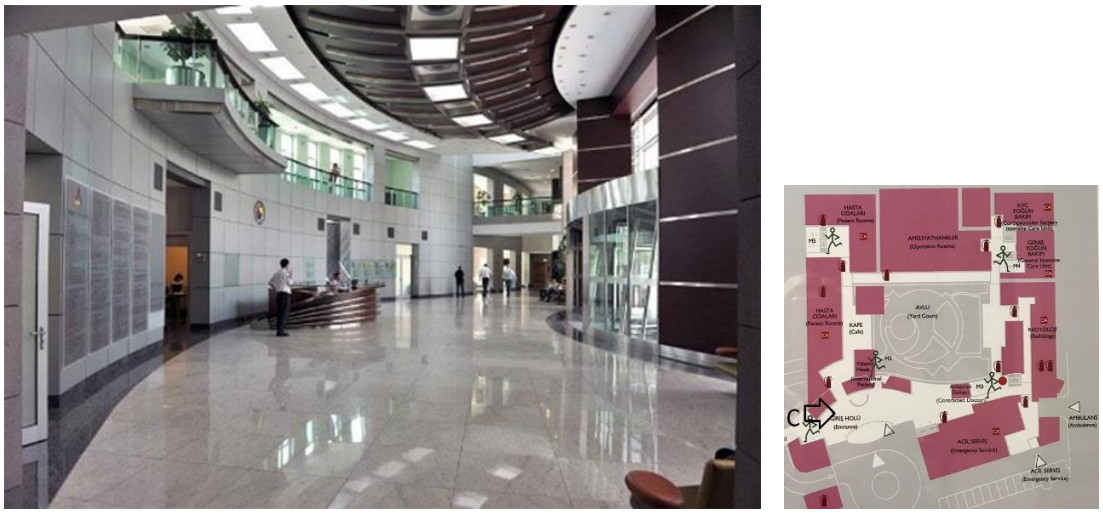


Figure 4.9. TOBB ETU Hospital Ground Floor View, from C point, January 2019

On the right hand side of the entrance counter, there are maps of the floor plans used for wayfinding in hospital , orientation sign boards with hospital-contracted institutions and a 1/1000-scale architectural model of the hospital. On the left side, there are tables showing the layout of all polyclinics by names and floors (see Figure 4.7).

Figure 4.10. Hospital Floor Maps and Model of the Hospital, January 2019, photoraphed by the author

Figure 4.11. Ground Floor Elevators of the hospital, January 2019, photographed by the author

There are two elevators used by patients coming from the ground floor heading to the target route; that is, the otorhinolaryngology polyclinic on the 1st floor. (see Figure 4.9). Upon arriving on the 1st floor by the elevator, a counter which consists of three polyclinics together with the otorhinolaryngology is found. Right next to this desk, there is the entrance of otorhinolaryngology polyclinic.

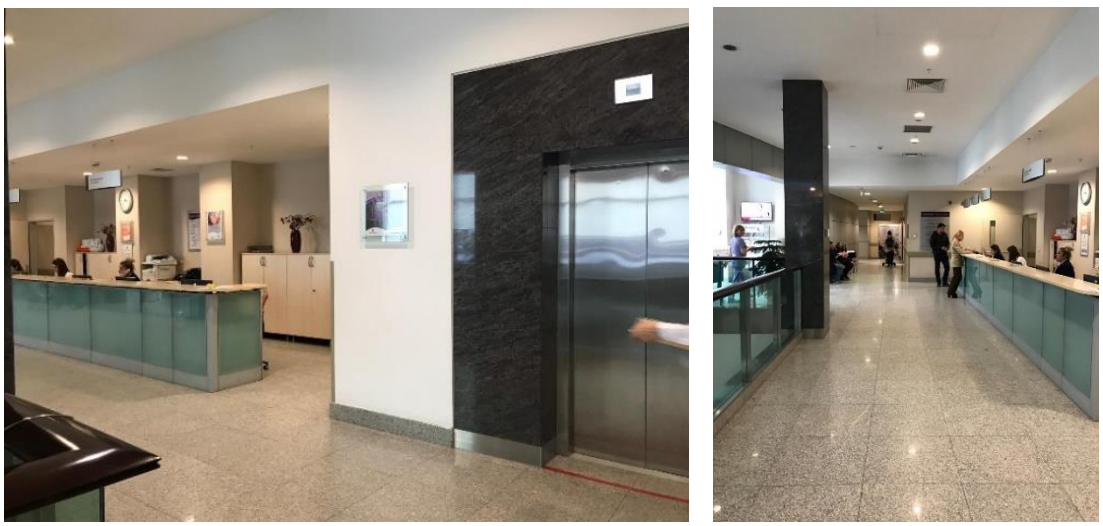


Figure 4.12. Information Desk in the Outpatient Clinic, January 2019, photographed by the author

4.2.2. Signage Systems of TOBB ETU Hospital

We can classify the signs in the hospital building in terms of their functions according to the purpose of this study. These are the wall-mounted orientation signs (see Figure 4.10, 4.11), wall-mounted (see Figure 4.12, 4.13) and ceiling suspended directional signs (see Figure 4.14) and identification signs located both on walls and above doors. When we examined these signs, they have dark background with light text and light background with dark text (Janet & Mayron, 1999). If we start examining the wayfinding signs in the hospital from the signage systems on the basement floor, four pieces of black foil are observed as letter-printed on glass, and the floor plans are observed as printed in different colors. The entrance floor is coded in pink, the first floor in yellow, the second floor in orange color and the basement floor in green. (see Figure 4.10 and Figure 4.11).

Figure 4.13. Orientation Signs of Floors at the entrance of building, January 2019

Figure 4.14. Orientation Signs of Floors mounted on the wall, January 2019

Signage type and quantity : Orientation signs including floor plans and sections.

Location: Located on the right side of the entrance desk on the basement floor.

Material: Black and colored foil adhesive lettering and symbol on frosted glass material.

Color: Plate: semi-transparent; font: black; symbol: orange-yellow-pink-green.

Mounting Type: Flat-mounted on the wall with aluminum screw.

Dimension: width: 83 cm, length: 83 cm.

When we examined these signs, they have dark background with light text and light background with dark text. When we examined the signs in terms of locations, areas with maximum visibility like intersections of halls, exits of stairs or elevators (Arthur & Passini, 1992) were chosen for placing the signs.

Figure 4.15. Ground Floor Directional Signs with 3 sections, January 2019

Signage type and quantity : Directional Signs - 2 pieces.

Location: Hanging on the wall near the lifts on the ground floor.

Material: Colorful foil adhesive text and symbol on aluminium plate material.

Color: plate: silver gray; text: claret red; symbol: silver gray.

Mounting Type: Mounted straight on the wall.

Dimensions: width: 90 cm, height: 62 cm.

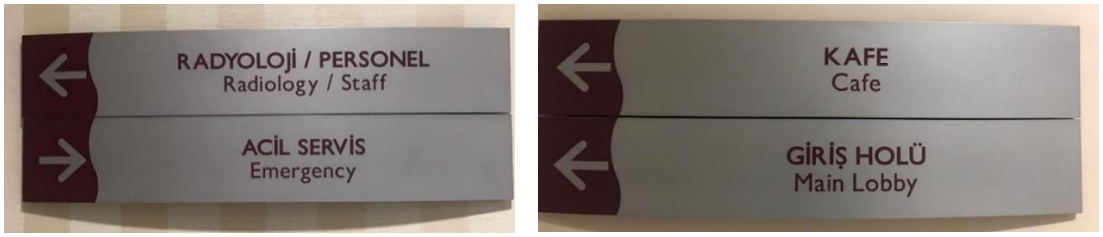


Figure 4.16. Ground Floor Directional Signs with 2 sections, January 2019

Signage type and quantity : Directional Signs - 2 pieces.

Location: On the Ground Floor

Material: Colorful foil adhesive text and symbol on aluminium plate material.

Color: plate: silver gray, text: claret red, symbol: silver gray

Mounting Type: Mounted straight on the wall.

Dimensions: width: 90 cm, length: 31 cm

When taking into consideration the cone of vision of people, the signs was put on the walls at the eye level, the mounting heights of the 95th and 5th percentile of men and women with respect to vertical location (Pollet & Haskell, 1979; Arthur & Passini, 1992; Zhang et al., 2016). Because of their location with maximum visibility, according to the results of the questionnaire, all of people utilized orientation signs. These directional signs with hanging suspended from the ceiling should be 220cm in height (Arthur & Passini, 1992), but in the hospital, the height of signs digressed the appropriate height and people's cone of vision.

Figure 4.17. Directional Signs with single section, January 2019, phorographed by the author

Signage Type and quantitiy: Directional Signs

Location: Radiology is on the ground floor and otorhinolaryngology is on the 1st floor.

Material: Colorful foil adhesive text and symbol on aluminium plate material.

Color: plate- silver gray, text: claret red, symbol: silver gray

Mounting type: Hanging on the ceiling with a rope.

Dimensions: width: 90 cm, length: 15.5 cm

Figure 4.18. Directional Signs with 4 (left) and 3 (right) sections, January 2019, photographed by the author

Signage type and quantity : Directional Signs - 2 pieces.

Location: Hanging on the wall next to the lifts on the 1st floor.

Material: Colorful foil adhesive text and symbol on aluminium plate material.

Color: plate: silver gray; text: claret red. symbol: silver gray

Mounting Type: Mounted straight on the wall.

Dimensions: The one with 4 divisions: width: 90 cm, length: 78 cm; 3 divisions : width: 90 cm, length: 62 cm

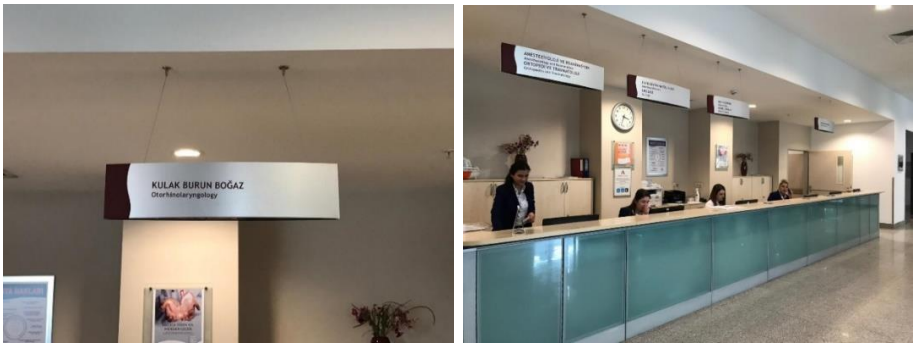


Figure 4.19. Identification Signs, single section, January 2019, photographed by the author

These are the signages that have the names of the polyclinic departments on them.

Signage type and quantity : Identification Signs - 4 pieces.

Location: Hanging on the ceiling with a rope at the top of the counter of the polyclinic on the 1st floor.

Material: Colorful foil adhesive text on aluminum plate material.

Color: plate: silver gray; text: claret red.

Mounting Type: Hanging on the ceiling with a rope.

Dimensions: Width: 90 cm, length: 22 cm

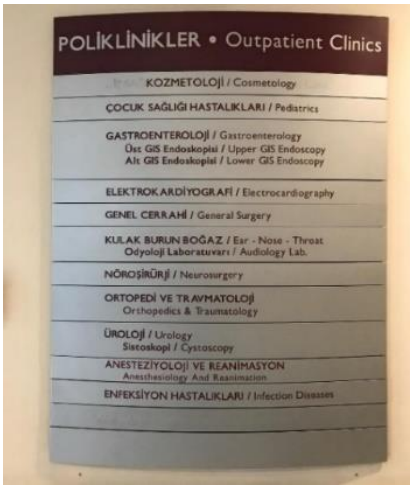


Figure 4.20. Identification Signs on the first floor, January 2019, photographed by the author

Signage type and quantity : Identification Sign - 1 piece.

Location: Mounted on the wall next to the polyclinic desk on the 1st floor.

Material: Colorful foil adhesive text on aluminum plate material.

Color: plate: silver gray; text: claret red.

Mounting Type: Mounted straight on the wall

Dimensions: Width: 90 cm, length: 115 cm

Figure 4.21. You-Are-Here Maps on the Ground Floor, January 2019, photographed by the author

Signage type and quantity : You-are-Here (YAH) Map - 2 pieces.

Location: YAH Map located wall- mounted near the elevators on the ground floor

Material: Color: plate: paper print; text:black, plan: pink colored

Mounting Type: Mounted straight on the wall

Dimensions: Width: 45 cm, length: 33 cm

Figure 4.22. You-Are-Here Maps on the First Floor, January 2019, photographed by the author

Signage type and quantity : You-are-Here (YAH) Map - 2 pieces.

Location: YAH Map located wall-mounted near the elevators on the first floor.

Material: paper print between two tempered glass.

Color: plate: paper print; text: black; plan: pink colored

Mounting Type: Mounted straight on the wall

Dimensions: Width: 45 cm, Height: 33 cm

Figure 4.23. Pictograms on the Ground Floor, January 2019, photographed by the author

Signage type and quantity : Pictogram (information about stairway).

Location: Mounted on the door which opens to the staircase, on the ground floor, 3 pieces.

Material: Colorful foil adhesive text and symbol on aluminum plate material.

Color: plate: silver gray; text: claret red; symbol: claret red. (The logo of the hospital is attached)

Mounting Type: Mounted on the wall.

Dimensions: width:15,5 cm, length: 15,5 cm

Figure 4.24. Pictograms on the Ground Floor, January 2019, photographed by the author

Signage type and quantity : Pictograms (information about the restroom area)

Location: Mounted on the door which opens to the restroom area.

Material: Colorful foil adhesive text and symbol on aluminum plate material.

Color: plate: silver gray; text: claret red; symbol: claret red. (The logo of the hospital is attached)

Mounting Type: It is mounted on the door of the WC.

Dimensions: width:15,5 cm, length: 15.5 cm.

Figure 4.25. Pictograms on the First Floor, January 2019, photographed by the author

Signage type and quantity : Pictograms (technical rooms) – 2 pieces.

Location: Mounted on the door.

Material: Colorful foil adhesive text and symbol on aluminum plate material.

Color: plate: silver gray; text: claret red; symbol: claret red.

Mounting Type: It is mounted on the door of the WC.

Dimensions: width:15,5 cm, length: 15.5 cm.

Figure 4.26. Pictograms on the Ground Floor, January 2019, photographed by the author

Signage type and quantity : Pictograms (information about the restroom area).

Location: Mounted on the wall which is the entrance to the restrooms.

Material: Colorful foil adhesive symbol on aluminum plate material.

Color: Plate: silver gray; symbol: claret red.

Mounting Type: It is wall-mounted at the entrance of the WC.

Dimensions: width:15,5 cm, length: 15.5 cm.

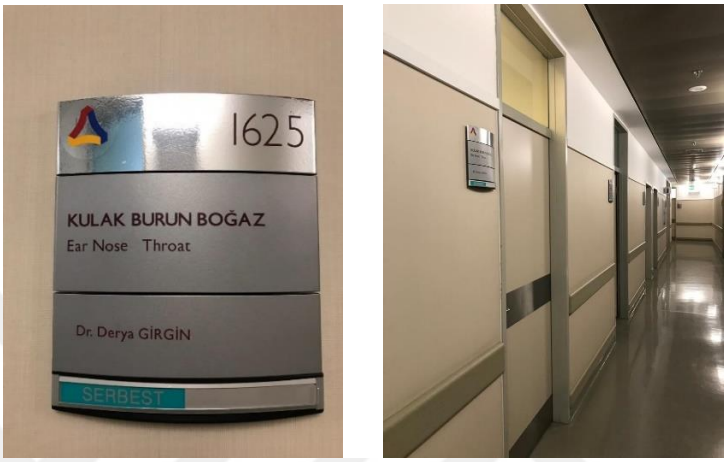


Figure 4.27. Pictograms on the First Floor, January 2019, photographed by the author

Signage type and quantity : Pictograms (information about the polyclinic)

Location: Mounted on the wall near the door of the doctor's room.

Material: Colorful foil adhesive text on aluminum plate material.

Color: Plate: silver gray; symbol: claret red.

Mounting Type: Wall-mounted.

Dimensions: width:22 cm, length: 25 cm.

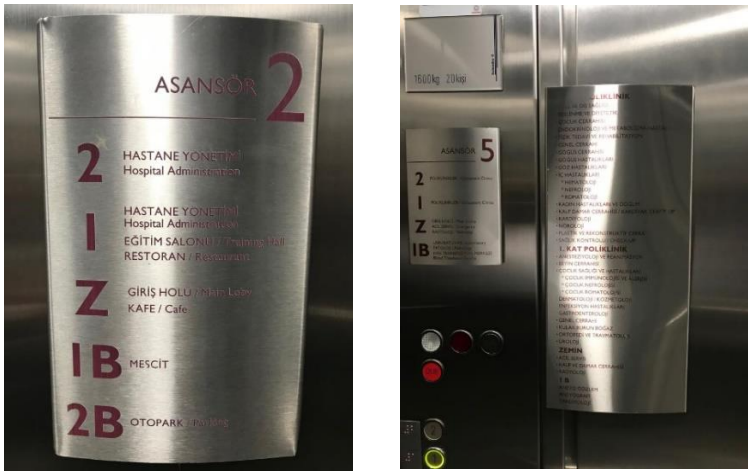


Figure 4.28. Information Signs in the elevators, January 2019, photographed by the author

Signage type and quantity : Information Signs – 2 pieces.

Location: On the elevator cabin wall.

Material: Colorful foil adhesive letters and numbers on aluminum plate material.

Color: Plate: silver gray; letter: claret red, number :claret red

Mounting Type: Mounted on the cabin wall of the elevator

Dimensions: on the left side- width:15,5 cm, length: 21.5 cm / on the right side- width:21,5, length:49 cm.

TOBB ETU Hospital's Analysis of Sign and Information Systems:

After examining the signage systems in TOBB ETU Hospital in detail, it has been seen that they are applied according to the standards in the literature studies stated in the previous pages (see page 39). Moreover, the signs to be used for wayfinding indoors accordig to Arthur and Passini (1992) were in compliance with the results of the survey. The following results have been revealed;

- Existing direction signs are visually accessible on the related circulation routes.
- Signs are differentiated from their backgrounds.
- Signage systems in the hospital have a consistent design and they are located in proper places.
- Direction signs are differentiated from the other signs in the place.
- Texts on the signs are readable from a distance especially on decision making points.
- Information on the signs is given in sections in a specific structure.
- Identity and directional signs can easily be separated from each other.
- Signs can be perceived in size, precisely and clearly readable.
- General and familiar expressions are used.

It is possible to examine the signage designs of the hospital as a concept according to the studies of Chiara et al. (1991) (see pages 40-42) under the following headlines:

- Alphabet selection : Alphabet selection on the signages can be perceived easily and written in Helveica Medium, which is a standart font.

- Letters, words and the spaces in between: The letters and words on the signages of the hospital are of a certain homogeneity, and their spaces can be perceived easily.
- Arrow Selection : The direction of the information given by the text and pictogram is coded correctly. The direction of the arrows leads the user to the correct place within the hospital.
- Clarity of the information : The information given on the signages in the hospital is shown to the user in the shortest and clearest manner. There is no irrelevance or ambiguity.
- Position of the information on the signage: The information on the hospital signages are centered on the plate. The position of the arrow on signages is where the direction is; In other words, if the direction is to the left, the arrow shows the left side; if it is straight forward, the arrow shows top; if it is to the right, then the arrow shows the right side.
- Size of the information on the signages: The size of the information on the signage is related to the size of the signage. The texts on the hospital signages of approximately 12 cm can clearly and easily be read from 50 meters away.

The position, content, lighting and color selection elements in signs play an important role in the useful and informative presentation of information systems (Helvacıoğlu, 2007). These elements can be explained briefly in hospital signage systems as follows:

Location: Locations of the signages are especially at decision-making points. It is possible to see the decision-making points, intersections of the corridors and turning points in the place at the pausing points. At the main entrance of the hospital, it is seen that the signages draw attention as a wayfinder in the lifts and staircase entrances as well.

Content: Contents of the sign systems in the hospital and what they want to tell are clearly stated. It does not confuse the user and is easy to read and understand.

Lighting: The lighting used in the hospital is a linear lighting illuminating the circulation areas in the space. This linearity of lighting can lead the users to a direction perceptually according to the lighting line. This concept of lighting has a perceptual content in terms of orientation.

Color selection : The color selection on the signages in the hospital is parallel to the hospital's plain interior design. Various color alternatives have not been used on the signages. Therefore, the color is not an effective element in terms of direction in the space. There is a color code given according to the floors only on the orientation signs on the ground floor (see Figure 4.11).

The coding of the floors are as follows; the ground floor is pink, the first floor is yellow, the second floor is orange and the basement floor is green. Other directional signs and pictograms are coded on gray- colored plate with claret red text or symbol. (see Figure 4.13- 4.18). Color selections in the hospital signages had no negative impact on the perception of the users.

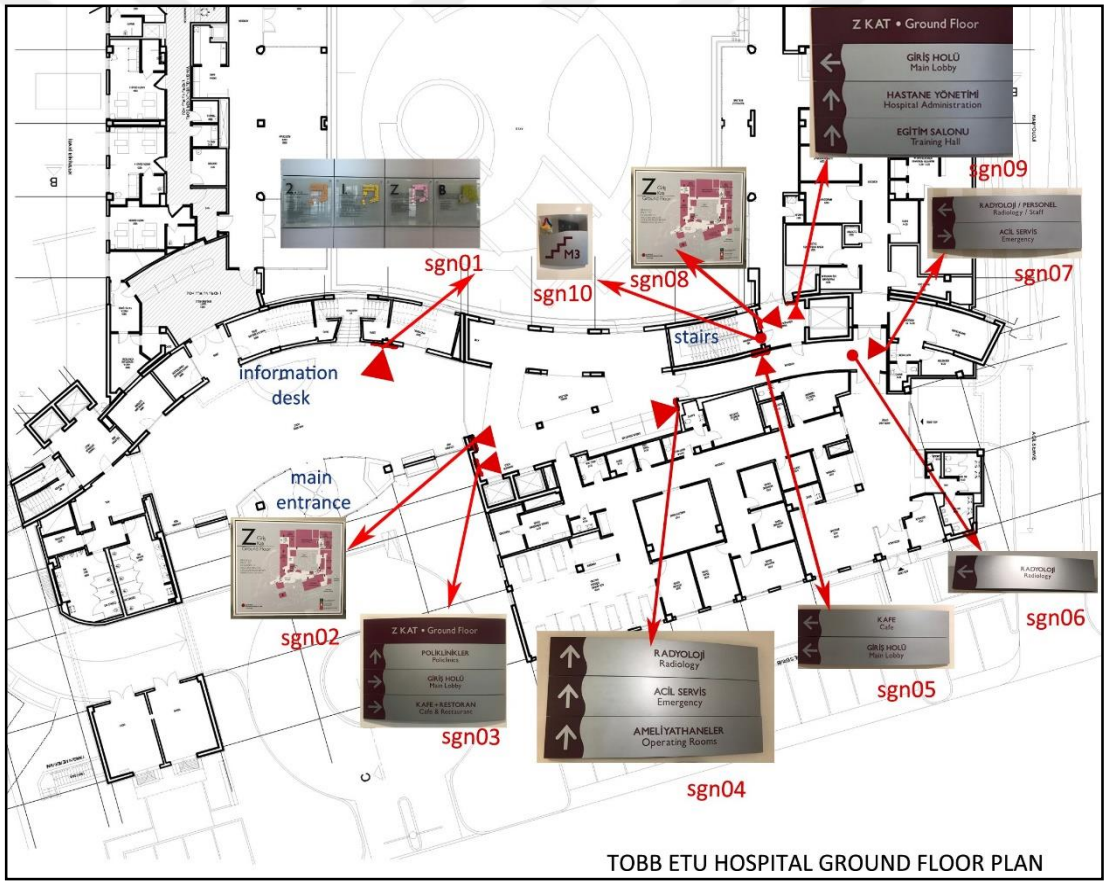


Figure 4.29. Signage Analyses of the Hospital on the Ground Floor (see Appendix D1)

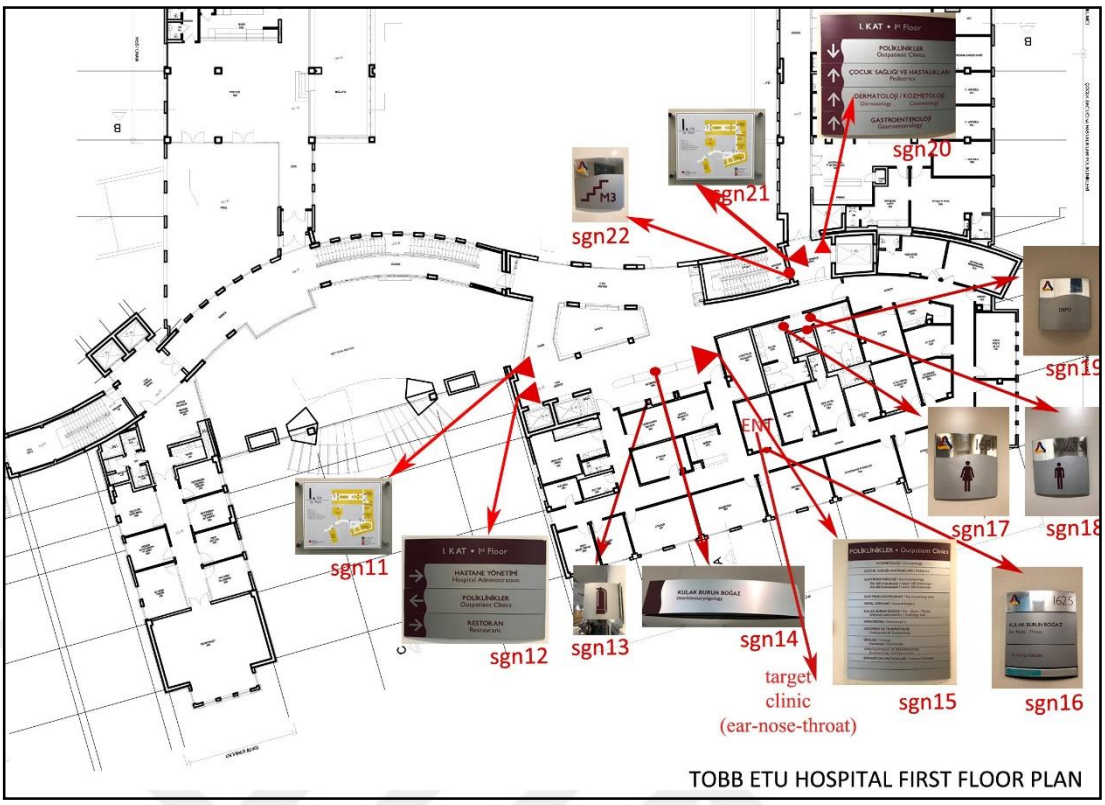


Figure 4.30. Signage Analysis of the Hospital on the First Floor Plan (see Appendix D2)

4.3. Method of the Study

In this study, the clients' wayfinding experiences in the entrances and the exit route of the Otorhinolaryngology polyclinic (the Ear-Nose-Throat polyclinic), which is the most frequently used polyclinic in 2018 in TOBB ETÜ Hospital located in Ankara, were examined. The aim of this study is to investigate the effect and adequacy of the signage systems and the spatial organization of the Otorhinolaryngology polyclinic on the client wayfinding experience, and how this experience differs according to different users' backgrounds.

In order to find answers to these questions, the study was carried out in three steps. In the first step, according to the strategies determined by Bechtel and Churchman (2002) for wayfinding behavior, the signage systems on the entrances and the exit route of the target polyclinic (Otorhinolaryngology polyclinic) were identified and examined. All information, such as the size, colors, materials and characters of these signage systems were transmitted.

In the second step of the study, examination of the wayfinding experience on the Otorhinolaryngology polyclinic route was carried out with 50 participants (22 males - 28 females) with ages ranging from 25 to 55, on weekdays, between the hours 09:30 and 13:30, and the designed route includes the inward route from the ground floor starting from the entrance of the building clinic located on the first floor and returning route to starting point.

According to the criteria for finding behavior for users determined by O'Neill (1991) (asking questions for finding way, pausing to analyze the environment and reading texts, returning actions), video footages were taken with participant permission, and in cases it was not permitted, time tracking and movements were measured with the stopwatch through the help of detailed field notes. The data obtained were recorded on floor plans, and the notes about the user were recorded in the researcher note card.

4.3.1. Limitations of the Study

In the scope of the study, the area selection and questionnaire application were carried out within the framework of certain limitations and the problem areas. These limitations are listed as follows:

- Because of the similarity of the Otorhinolaryngology polyclinic floor plan to other hospital floor plans, a single hospital polyclinic was evaluated.
- According to the TOBB ETÜ Hospital data, the Otorhinolaryngology polyclinic of this hospital was the most frequently used polyclinic in 2018. Therefore, the participants' route was evaluated through this polyclinic.
- The study was carried out with a total of 50 participants (22 males and 28 females).
- The ages of the participants were limited between 25 and 55. The reason for this is that the wayfinding skills of the participants outside of this age range change for different reasons, and this issue is not covered by the scope of the study.
- The study was carried out between December 1, 2018 and January 30, 2019, in a period of two months, including only weekdays. At the weekends, because of the higher density of clients in the hospital; wayfinding experiences, waiting and route times may be affected by this. Therefore, the study was limited to weekdays.

- The questionnaire study was set between the hours 09:00 and 13:30. In terms of the condition and density of the hospital environment, the same hours of the day were chosen in order to implement the questionnaire under similar conditions.

4.3.2. Questionnaires

In the last step, after the end of the participants' tours on the identified route, a questionnaire study was conducted to learn the evaluation of the signage system and spatial organization of the hospital, and to determine the changes according to user profiles (see Appendix-1).

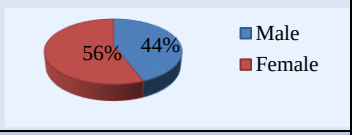
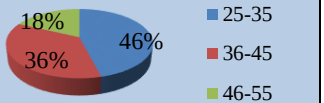
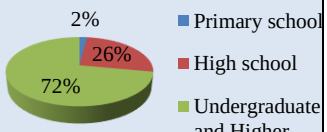
The questionnaire consists of 19 questions. The first four questions are about the demographic characteristics of the participants; such as age, gender, educational and occupational status. The next 15 questions are related to the wayfinding experience, signage systems and spatial organization of the hospital, which the participants follow during their tours.

The results of the questionnaires were analyzed by descriptive statistics, T-Test and Anova analysis, revealing the effect of the spatial organization and the signage systems of the hospital on the wayfinding experience of the participants.

4.3.3. The Sample

In the study conducted in TOBB ETU hospital, the questionnaires were applied for examining the clients' wayfinding experiences in entrances and exit routes of the Otorhinolaryngology polyclinic (the Ear-Nose-Throat polyclinic), which is the most frequently used polyclinic in 2018 (see Appendix 1). Initially, the TOBB ETU Hospital's user profile was designated as TOBB ETU employees, but in time, other clients with medium to high levels of income also started to use this hospital. The daily average number of hospital clients is 40, approximately. The study was carried out with a total of 50 participants (22 males and 28 females). Demographic characteristics of the participants who answered the questionnaire are given in Table 4.1. (see Appendix-C1-C2 for more details).

Table 4.1. Demographic characteristics of the participants

Demographic characteristics		Frequency	Percent	Graphics
Gender	Male	22	44,0	
	Female	28	56,0	
	Total	50	100,0	
Age Groups	25-35	23	46,0	
	36-45	18	36,0	
	46-55	9	18,0	
	Total	50	100,0	
Education	Primary school graduate	1	2,0	
	High school graduate	13	26,0	
	Undergraduate and Higher graduate	36	72,0	
	Total	50	100,0	

As shown in Table 4.1, the questionnaire was conducted with a participant group with 56% females and 44% males. The age distribution of the participants is between 25 and 55. The mean age of the participants was calculated as 38,60, and the age distribution percentage is 46% with the 25-35 age group, 36% with the 36-45 age group and 18% in the 46-55 age group. The questionnaire was conducted mainly with high school or university graduates and with participants with a master's degree. 72% of the participants were university and master's graduates, and 26% of the participants were high school graduates.

4.3.4. User Maps

The route followed by the participants on the designated route was drawn onto the user maps, and the participants' going and return times during the route trip were recorded on the researcher note card. The participants generally paused in two parts on the route; "While studying the floor plans at the entrance to the hospital" and" While waiting for the elevator", and this pause time lasted less than a minute. Except those, the participants' route trips were uninterrupted and carried out without hesitation. In addition, the participants were very relaxed and peaceful on the tour. They finished their route trips without any problems. The comparison of the going and return times of the participants on the route is given in Figure 4.31. (see Appendix-C3 for more details).

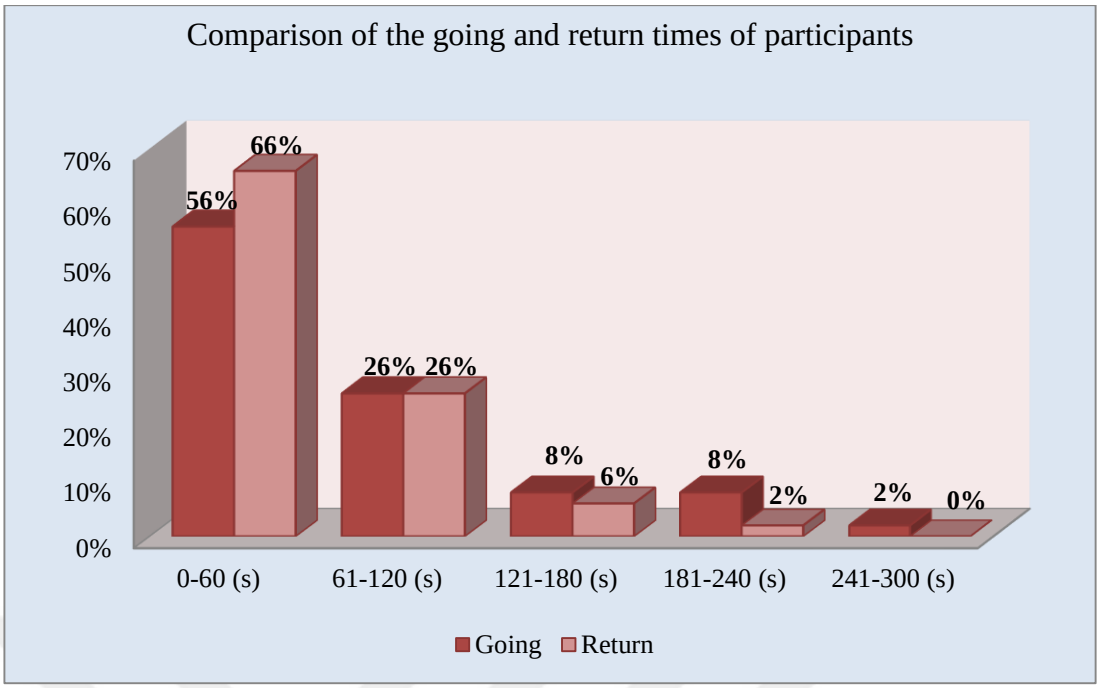


Figure 4.31. Comparison of the going and return times of participants

The average going time of the participants was 103 seconds, and the return time was 83 seconds, with 56% of the going and 66% of returning durations was less than one minute. At this stage of the study, after analyzing the normal distribution of the data, whether the gender, age and educational status of the participants affect the going and return times on the route were examined by T-test and ANOVA analysis. In the T-test, there was no statistically significant difference between the going and return time of male and female participants with 95% confidence.

According to the ANOVA analysis results, as "Sig.> 0.05" is for all groups, there was no statistically significant difference between the averages of the participants' ages and the going and return times with 95% confidence. As "Sig.< 0.05" is for all groups, there is a statistically significant difference between the averages of the participants' educational status and the going and return time with 95% confidence. As participants' levels of education increase, the going and return times on the route were decreasing. (see Appendix-C4, C5,C6 for more details).

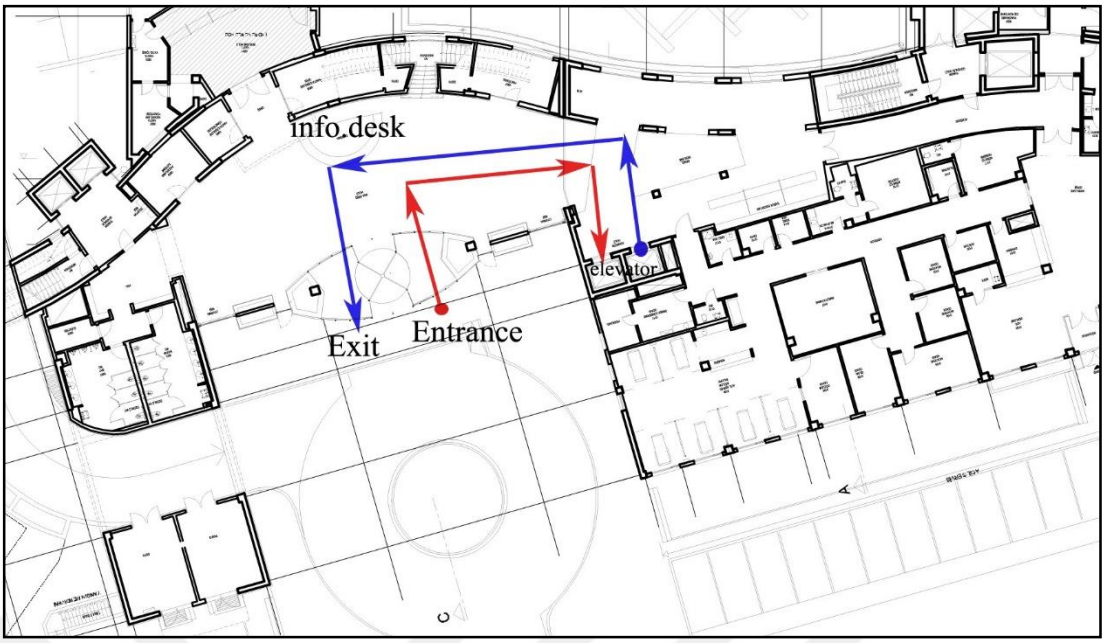


Figure 4.32. Tobb Etu Hospital Ground Floor User Map (see Appendix E1)

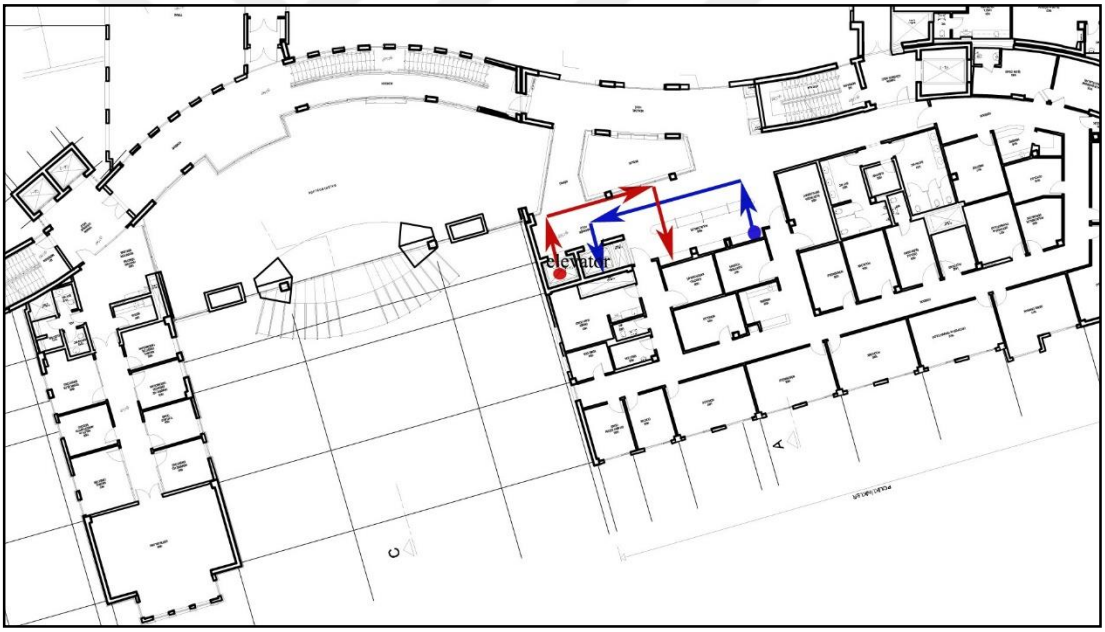
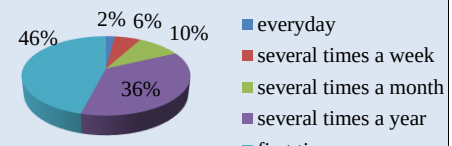
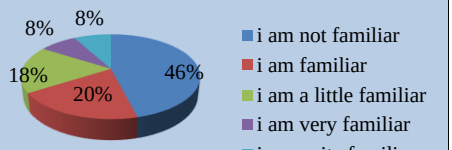
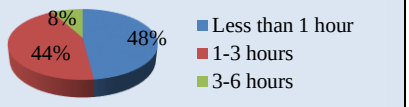


Figure 4.33. Tobb Etu Hospital First Floor User Map (see Appendix E2)

4.4. Findings of the Study and Discussion

At this stage of the study, descriptive statistical evaluations of the data obtained from the questionnaire were performed. The frequency of visits, the level of familiarity and the time spent in the hospital are given in Table 4.2.

Table 4.2. Frequency of visits, level of familiarity and time spent in the hospital

	Answers	Frequency	Percent	Graphics
Frequency of visits	everyday	1	2,0	
	several times a week	3	6,0	
	several times a month	5	10,0	
	several times a year	18	36,0	
	first time	23	46,0	
	Total	50	100,0	
Level of familiarity	i am not familiar	23	46,0	
	i am familiar	10	20,0	
	i am a little familiar	9	18,0	
	i am very familiar	4	8,0	
	i am quite familiar	4	8,0	
	Total	50	100,0	
Time spent	Less than 1 hour	24	48,0	
	1-3 hours	22	44,0	
	3-6 hours	4	8,0	
	Total	50	100,0	

Participants who responded to the questionnaire came to TOBB ETU Hospital for the first time with the ratio of 46% and several times a year with the ratio of 36%. They were generally not familiar with the TOBB ETU Hospital with the ratio of 46%, they were familiar with the ratio of 20% and were a little familiar with the ratio of 18%. The participants spend in the hospital less than 1 hour and 1-3 hours in general.

In Figure 4.32, participants' success level in wayfinding when they go to any place and the TOBB ETU Hospital were compared (see Appendix-C7 for more details).

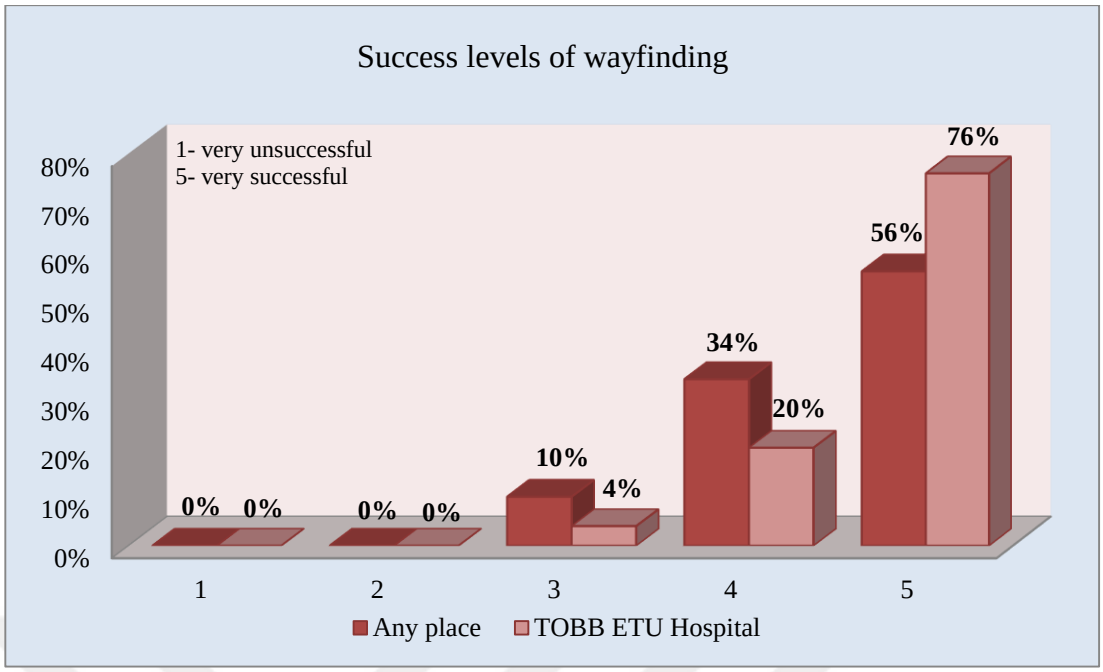


Figure 4.34. Participants' success level in wayfinding

As seen in Figure 4.34, 56% of the participants describe themselves as very successful in wayfinding where they go, while 76% of the participants describe themselves as very successful in wayfinding in TOBB ETU Hospital. In Figure 4.35, the method used by the participants for wayfinding in any place and the TOBB ETU Hospital were compared.

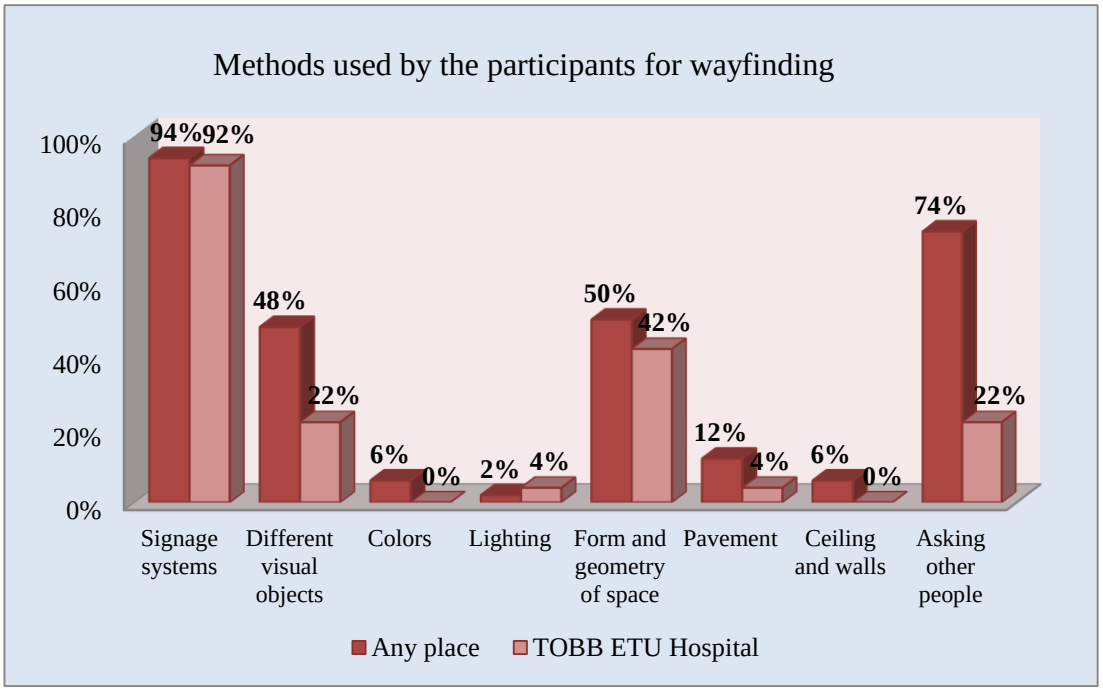


Figure 4.35. Methods used by the Participants for wayfinding

In Figure 4.35, 94% of the participants in any place and 92% of participants in TOBB ETU Hospital use signage systems to find their ways. However, 74% of participants whenever they enter any place and 22% of participants when they enter TOBB ETU hospital try to find their way by asking other people. This means that the clients who refer to TOBB ETU hospital can find their ways much faster and easier without asking any other people.

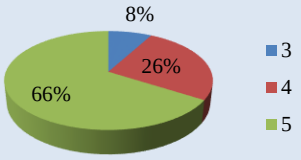
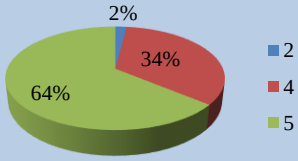
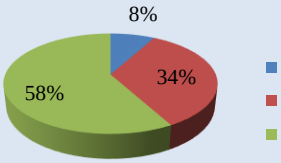
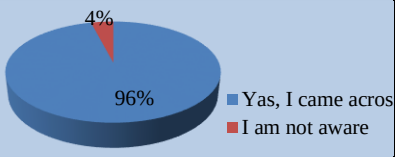
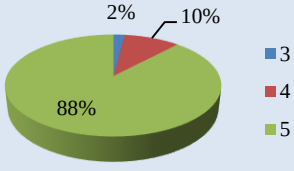
At the same time, no participant in TOBB ETU Hospital needed colors, ceilings and walls to finding their ways (see Appendix-C8 for more details). In general, the participants' feelings about the hospital were stated as confidence with the ratio of 74% and peace of mind with the ratio of 24%.

Most of the participants completed the tour with a relaxed and peaceful mood (see Appendix-C9 for more details). The assessments of the participants about the spatial organization and signage systems of the hospital are given in Table 4.3.

According to Table 4.3, the spatial organization and plan of the hospital were evaluated as very simple by 66% of the participants; 64% of participants found spatial organization of the hospital effective in a successful wayfinding experience. Signage systems of the hospital were evaluated fully adequate by 58% of the participants and adequate by 34% of the participants.

According to these results, the current signage systems of the hospital made it easier for the participants to find their ways. 88% of the participants stated that they had no difficulty in returning, and 96% of the participants stated that they came across signage systems on their routes. Figure 4.34 shows the evaluation of participants about the signage systems in the hospital.

Table 4.3. Assessment of the participants about the spatial organization and signage systems of the hospital

Indicator	Answers	Frequency	Percent	Graphics
Evaluation of the spatial organization of the hospital	1	0	0,0	
	2	0	0,0	
	3	4	8,0	
	4	13	26,0	
	5	33	66,0	
	Total	50	100,0	
Effectiveness of the spatial organization of the hospital in wayfinding	1	0	0,0	
	2	1	2,0	
	3	0	0,0	
	4	17	34,0	
	5	32	64,0	
	Total	50	100,0	
Sufficiency of signage systems on the route for wayfinding	1	0	0,0	
	2	0	0,0	
	3	4	8,0	
	4	17	34,0	
	5	29	58,0	
	Total	50	100,0	
Knowledge on signage systems on the route	Yas, I came across	48	96,0	
	No, I didn't	0	0	
	I am not aware	2	4,0	
	Total	50	100,0	
Degree of having trouble whwn return back	1	0	0,0	
	2	0	0,0	
	3	1	2,0	
	4	5	10,0	
	5	44	88,0	
	Total	50	100,0	

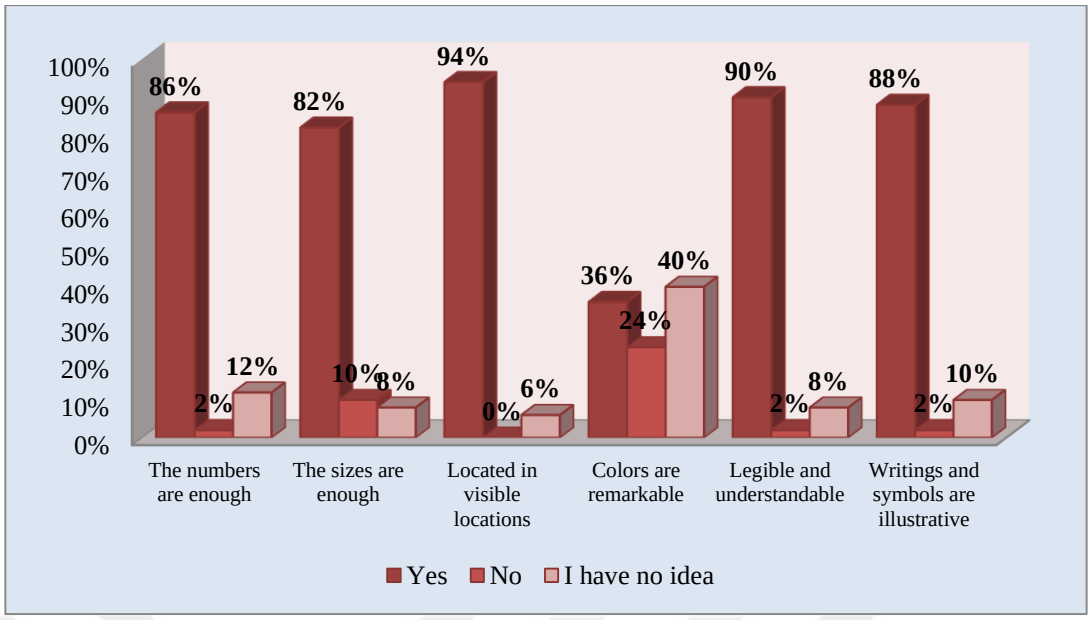


Figure 4.36. Evaluations of participants about signage systems

According to Figure 4.36, participants indicated that signage systems are adequate in number with the ratio of 86%, adequate in size with the ratio of 82%, located in visible locations with the ratio of 94%, colors are remarkable with the ratio of 36%, legible and understandable with the ratio of 90%, and they are understandable and writings and symbols are illustrative with the ratio of 88% (see Appendix-C10). The existing signage system of the hospital was found be successful according to the questionnaire and the standards in the literature (Çetintaş, 2016; Güler; 2008; Helvacioglu, 2007; Arthur and Passini, 1992, 2002). Figure 4.37 shows the elements remaining the most in the mind of participants during the tour in the hospital.

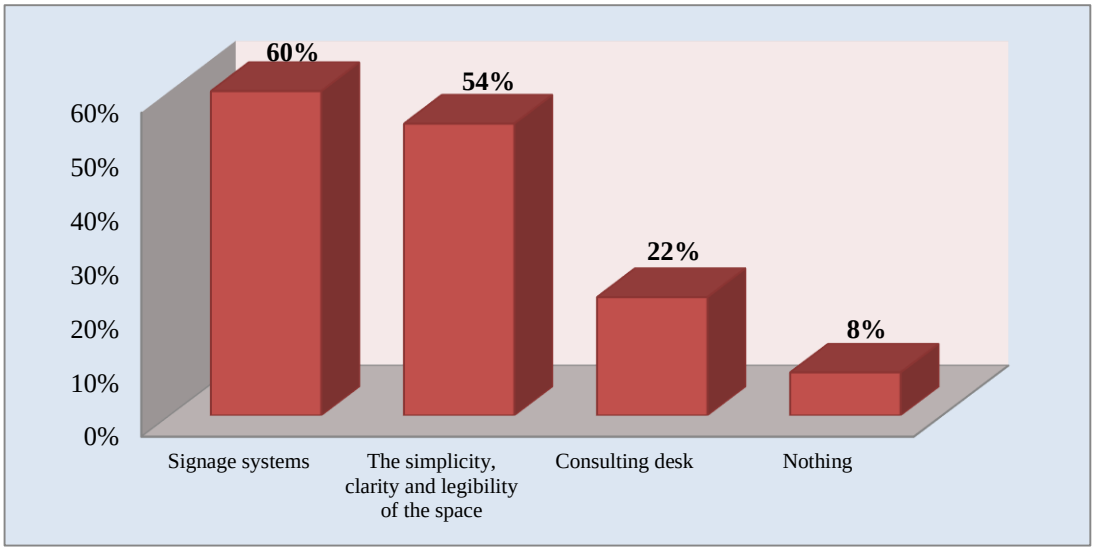


Figure 4.37. Elements remaining the most in the mind of participants during the tour

According to Figure 4.37, elements remaining the most in the minds of the participants are the signage systems with a ratio of 60%, the simplicity, clarity and legibility of the space with a ratio of 54%, and consulting desk with a ratio of 22%. At this stage of the study, the effects of age, gender and educational status of the participants on the answers to the questionnaire are examined. Likert scale (scoreable) questions that can be related to age, gender and educational status of participants were evaluated (see Appendix C11-C12-C13 for more details).

In the T-test, there was no statistically significant difference between the answers to the questionnaire of male and female participants with 95% confidence. According to Lawton et al., (1996), Cornell, Sorenson and Mio (2003), Schmitz (1999) and Allen (1999), there are some differences between males and females in wayfinding experience, but in the present study, no differences were found between male and female participants in the wayfinding experience.

At the same time, according to the ANOVA analysis results, as "Sig.> 0.05" is for all groups, there is no statistically significant difference between the averages of the participants' ages and their answers with 95% confidence.

According to Osmann and Wiedenbauer's (2004), Cubukcu and Nasar (2005), Galea and Kimura (1993), Kirasic (2000) and Helvacıoğlu (2007), users of different ages experience different events in wayfinding, but in this study, no differences were found between different age groups of participants in wayfinding experience.

As "Sig.< 0.05" is for all groups., there is a statistically significant difference between the averages of the participants' educational status and their answers with 95% confidence. Participants with a high education level compared with others were more successful in finding their ways during the route trip in TOBB ETU hospital, they additionally evaluated the spatial organization and signage systems of the hospital to be more simple, more understandable and more effective in the wayfinding experience.

In addition, the effect of spatial organization and signage systems of the hospital on the participants' success level in wayfinding has been tested via ANOVA analysis. According to the ANOVA analysis results, as "Sig.< 0.05" is for all groups, there is a statistically significant difference between the averages of the participants' success level in wayfinding and spatial organization and signage systems of the hospital with 95% confidence (see Appendix-C14 for more details).

According to Kavaz and Zorlu (2018), Hasgül (2011), Lynch (1960), Passini (1984a), Arthur and Passini (1992, 2002), Sönmez and Önder (2015), the spatial organization and signage systems of the space have great importance in wayfinding experiences of individuals; therefore, the results of this study support that the spatial organization and signage systems of the hospital have been effective and sufficient in participants' wayfinding experience with a positive impact.

Additionally, the effect of the participants' familiarity level of hospital on their success level in wayfinding have been tested via ANOVA analysis. According to the ANOVA analysis results, as "Sig.> 0.05" is for all groups, there is no statistically significant difference between the averages of the participants' familiarity level and their success level in wayfinding in the hospital with 95% confidence (see Appendix-C15 for more details).

According to some researchers such as Franz and Wiener (2005), O'Neill (1992), Chebat, Chebat and Therrien (2005), Hölscher (2007) and Duran (2016), the experience of wayfinding becomes more successful as the level of familiarity with the place increases. However, in this study, the familiarity of the participants was ineffective in their wayfinding experience.This can be explained with the simple plan scheme and the sufficiency of signage systems in the hospital.

CHAPTER 5

CONCLUSION

Wayfinding is defined as the action of an individual to reach the desired location easily, in time, without being lost or being stressed. People who cannot find their direction immediately may easily experience various physical, psychological and even financial problems. Thus, it is of great importance to consider the factors which facilitate wayfinding during the design phase of places. In comparison to other complex structures, it is more important to find direction in hospitals, because it directly affects human health. For this reason, the issue of wayfinding in hospitals is discussed in this study. To remind once more, the major research question of this thesis is; "how do the spatial organization and signage systems affect the wayfinding experience of hospital clients", and the minor research question is; "how does experience differentiate for clients with different backgrounds". In order to find answers to these questions, the main factors affecting the wayfinding experience were searched, and the effects of the spatial organization and signage systems on the orienting experience were revealed.

In this study, the data gathered from the most commonly used polyclinic (the Ear-Nose-Throat (Otorhinolaryngology polyclinic) of TOBB ETU hospital in 2018 were evaluated, and the clients' wayfinding experiences in the Otorhinolaryngology polyclinic entrances and the exit route were analyzed by using "user map" and "questionnaire" methods.

The study was carried out in three steps. In the first step, according to the strategies determined by Bechtel and Churchman (2002) for wayfinding behavior, the signage systems on the entrances and the exit route of the target polyclinic (Otorhinolaryngology polyclinic) were identified and examined. All information, such as dimensions, colors, materials and characters of these signage systems have been transmitted and compared according to the standards in the literature.

In the second and third steps, wayfinding experiences of 50 participants, 22 males and 28 females, were examined. In order to obtain homogenous data, participants between 25 and 55 years of age were preferred, and practical work with participants was conducted between the hours 09:30 and 13:30 on weekdays, between December 1, 2018 and January 30, 2019. In the second step, participants were asked to return to the Otorhinolaryngology polyclinics, and the roundtrip times, movements and data were recorded on the floor plans and researcher note cards. During roundtrips, researchers accompanied the participants.

In the third step, a questionnaire was conducted after the participants completed their trips to the Otorhinolaryngology outpatient clinic. The questionnaire had 19 questions, and the first 4 questions were related to demographic data, and the other 15 questions were related to the wayfinding experiences of the participants.

The data obtained from the second and the third steps were analyzed, and the following results were reached;

- The average going time of the participants was 103 seconds and the return time was 83 seconds, with 56% of the going and 66% of returning durations was less than one minute.
- There was no statistically significant difference in the wayfinding performance depending on the age and gender of the participants.
- There was a statistically significant difference between the educational status of the participants and the duration of return and turnaround times, and the time of departure and turnaround time decreased as the level of education increased.
- 56% of the participants found themselves very successful in finding their way to go anywhere, while 76% of participants found themselves very successful in finding their ways in TOBB ETU Hospital. According to this result, TOBB ETU Hospital can be considered as a more successful hospital than a complex structure in terms of wayfinding.
- 94% of the participants in any place and 92% of participants in TOBB ETU Hospital use signage systems to find their ways. However, 74% of participants whenever they enter any place and 22% of participants when enter TOBB ETU hospital try to find their way by asking other people. This means that the clients

who refer to TOBB ETU hospital can find their ways much faster and easier without asking any other people.

- None of the participants has used colors, ceilings or walls to find their way, and at the same time, only 36% of the participants found signage, boards and wayfinding signs colors attractive. In this way, it could be proposed to use color factor much effectively in designing spatial spaces of hospitals, and color scale and contrast in signage and wayfinding signs could be extended and improved.
- Participants' feelings about TOBB ETU Hospital are stated as confidence with a rate of 74% and peace with 24%.
- The spatial organization and the plan of the hospital were evaluated as very simple by 66% of the participants.
- The spatial organization and plan of the hospital was effective in the wayfinding experience of 64% of the participants. This value indicates that the spatial organization and the plan of the hospital successfully affect the way finding performance of clients.
- Signage systems, signs and direction information were evaluated as satisfactory with a rate of 58% and sufficient with a rate of 34%. This result indicates that the hospital is successful and user-friendly in terms of wayfinding.
- Participants pointed out that the number of signage systems, signage and direction information were sufficient with a rate of 86%, 82% were content with their sizes, 94% found them visible, 36% found the colors attractive, 90% of them found them to be legible and clear, and finally, 88% of participants were satisfied with the explanatoriness of the signs and descriptions.
- The striking elements were the signage, signs and directions with a rate of 60%; the simplicity, intelligibility and spaciousness of the space with a rate of 54%, and the proximity and the form of the consultancy desk to the entrance with a rate of 22%.
- With 95% reliability, there was no statistically significant difference between the participants' age and gender and their responses to the questionnaire questions.
- With 95% reliability, there is a statistically significant difference between the participants' educational status and their responses to the questionnaire.

As the education levels of the participants increased, they were more successful in finding directions wherever they go, they found their directions on the routes in the hospital more easily; they evaluated the spatial organization / plan of the hospital as very simple and understandable, and they found signage systems, signs and directions more helpful and sufficient in finding directions.

- With 95% reliability, there was no statistically significant difference between the wayfinding experiences of the participants who are familiar with the place and those who are not. They have been equally successful in wayfinding in the hospital. Thus, even the first-time arriving clients may easily find the direction in this hospital; therefore, his hospital could be evaluated as successful in terms of wayfinding.
- With 95% reliability, there is a statistically significant difference between the participants' responses to the question "Did you easily find your way around your route?" and their responses to the questionnaire. The spatial organization / plan of the hospital and signage systems in the hospital, the sufficiency of signage and direction information seem to be effective for the participants as they easily find their directions on their routes.

As a result, it is concluded that the hospital is successful in terms of spatial organization and signage systems, and it has been found that the majority of the clients can easily find their way to their destination. The survey participants did not have a negative statement about the wayfinding success of the hospital.

Therefore, the hypothesis that the spatial organization and signage systems of hospitals have an impact on the wayfinding experience of their clients is confirmed. In addition, variables such as age, gender and familiarity levels do not have significant influence in wayfinding experience in this hospital, but the educational status affected the results.

Finally, this study constituted recommendations to architects and designers. In designing structures for a specific client group, who are physically and/or psychologically disturbed, such as hospitals, and whose needs and behaviors need to be handled more carefully, the elements that provide ease of wayfinding should be considered by the architect or the designer when they are still at the design stage. Project planning is critical, and for this reason, in hospitals, architectural design and spatial organization should be created as it is necessary to shape client behavior.

The spatial organization of hospitals is also important in terms of the perception of the service and institution and/or brand identity; therefore, instead of creating workarounds to resolve the incoming complaints from customers, it should be noted that these concepts should be taken into consideration in the decision-making phase of the designs. In addition, the results of this study may support other researchers who will conduct researches about wayfinding and design of signage systems.

At the same time, they can obtain information about the design of hospitals and their departments. This study may provide a background for researchers who want to study complex structures (such as kindergarten or culture and congress centers) with different type of clients (such as children or elderly people).

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APPENDICES

APPENDIX A: Sample Of Questionnaire

TOBB ETÜ HASTANESİ KULLANICI YÖN BULMA DENEYİMİ DEĞERLENDİRMESİ ANKETİ

Bu anket çalışmasının amacı, hastane kullanıcılarının yön bulma deneyimleri hakkında bilgi edinmektir. Ankete katılan kişilerden istenen, girişten başlayıp Kulak-Burun-Boğaz polikliniğine gitmeleri ve geri dönmeleridir. Bu süreçte kullanıcı rotasını kendisi belirlerken, tur boyunca araştırmacı kendisine arkasından eşlik edecektir. Araştırma sonuçları ankete katılan kişilerin şahıslarıyla ilişkilendirilmeyecek olup, bilimsel amaçlar dışında kullanılmayacaktır.

A. ANKETİ YANITLAYAN KİŞİ İLE İLGİLİ BİLGİLER

1. Yaş:	2. Cinsiyet: □ Kadın □ Erkek
3. Eğitim durumunuz: ( ) Okuryazar değil ( ) İlkokul ( ) Lise ( ) Lisans ve üstü	
4. Mesleğiniz:	

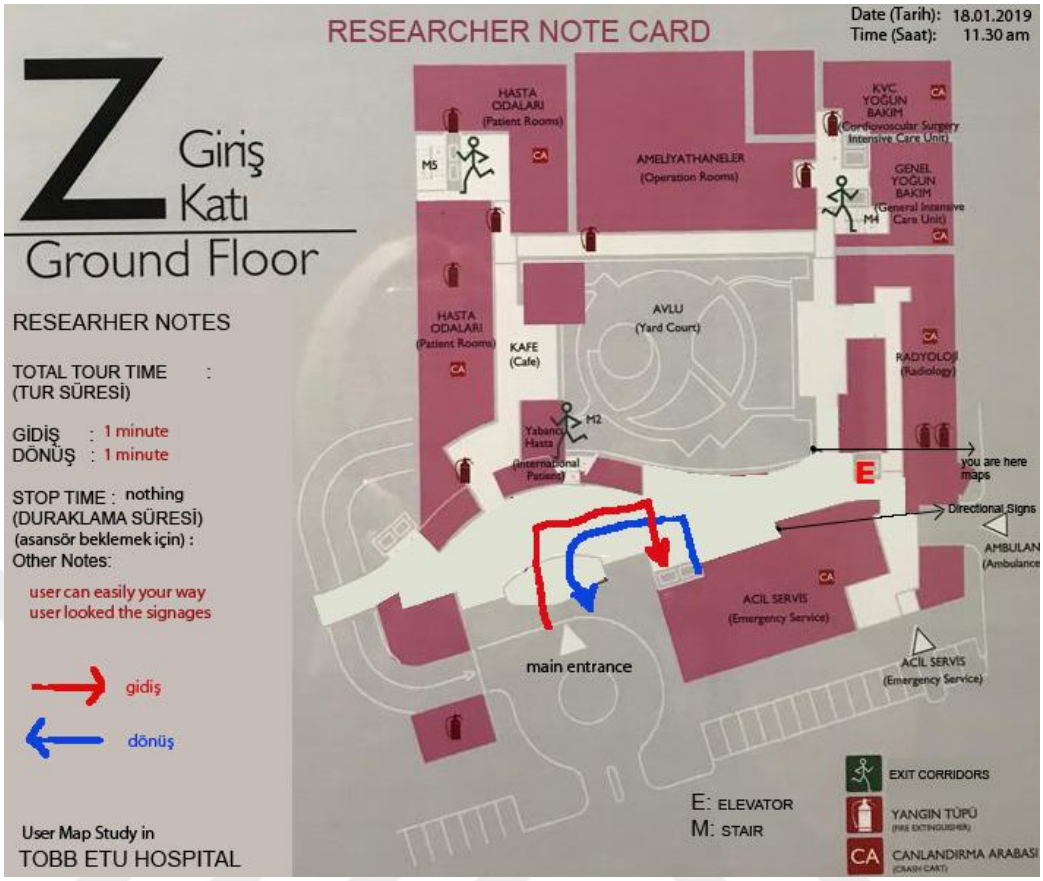
B. YÖN BULMA DENEYİMİNE İLİŞKİN BİLGİLER:

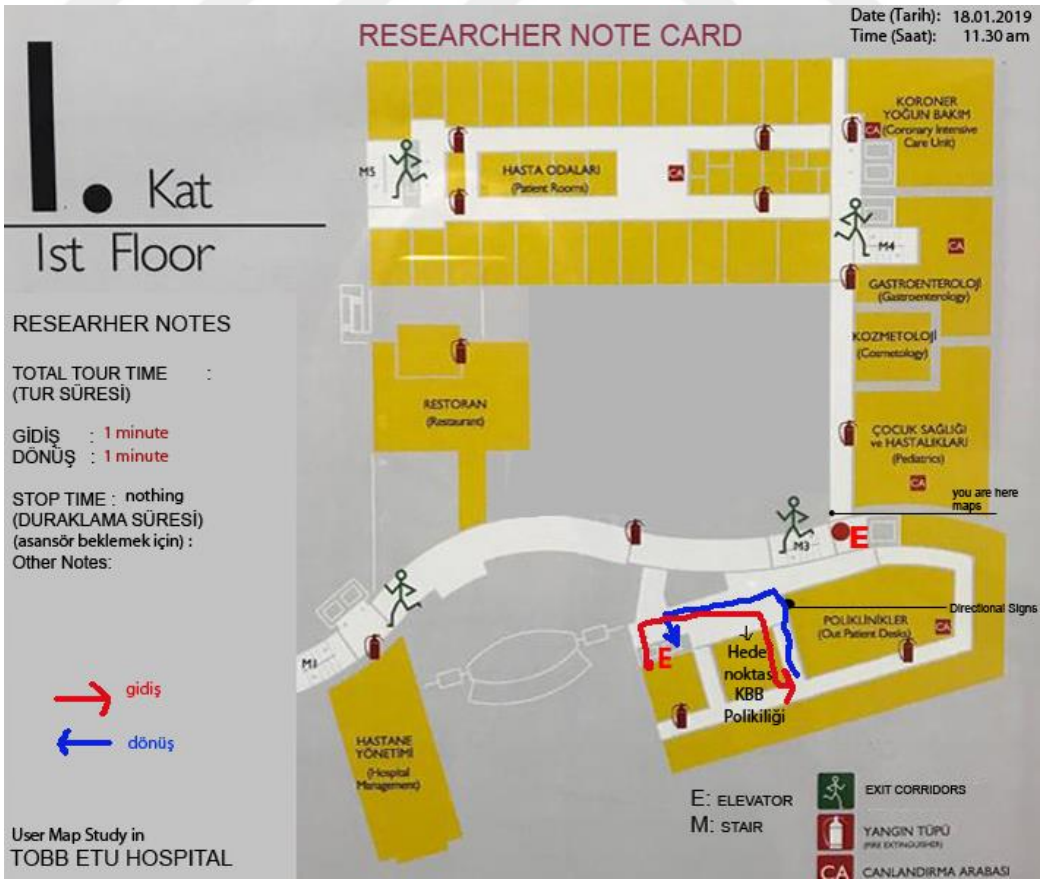
5. Bu hastaneye ne sıklıkla geliyorsunuz?	( ) İlk gelişim ( ) Her gün ( ) Haftada birkaç kez ( ) Ayda birkaç kez ( ) Yılda birkaç kez
6. Hastaneyi ne kadar bildiğinizi düşünüyorsunuz?	( ) Aşina değilim ( ) Biraz aşinayım ( ) Aşinayım ( ) Oldukça Aşinayım ( ) Çok Aşinayım
7. Hastanede ne kadar zaman geçiriyorsunuz?	( ) 1 saatten az ( ) 1-3 saat arası ( ) 3-6 saat arası ( ) 6-10 saat arası ( ) 10 saatten fazla
8. Herhangi bir yere gittiğinizde yönünüzü bulma açısından ne kadar başarılı olduğunuzu düşünüyorsunuz?	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 (1-Çok başarısız 5-Çok başarılı)
9. Herhangi bir yapının içine girdiğinizde yönünüzü bulmak için okuyacağım hangi alternatifleri kullanırsınız? (Birden fazla seçenek işaretlenebilir.)	( ) Tabela, işaretler ve yön bilgilerini kullanarak yönümü buluyorum. ( ) Farklı görsel nesneleri hatırlayarak yönümü buluyorum. ( ) Renkler üzerinden yönümü buluyorum. ( ) Aydınlatmalar yardımı ile yönümü buluyorum. ( ) Mekânın formu ve geometrisi yönümü bulmama yardımcı oluyor. ( ) Yer döşemesinde kullanılan malzeme yönümü bulmama yardımcı oluyor.

	( ) Tavan ve duvarların dokusu yönümü bulmama yardımcı oluyor. ( ) Diğer insanlara sorarak istediğim yere ulaşıyorum. ( ) Diğer……
10. Bu hastanede rotanız üzerinde ilerlerken, yapının iç mekânına ilişkin ne hissettiniz?	( ) Gizem ( ) Güven ( ) Kaybolma hissi ( ) Huzur ( ) Diğer……
11. Rotanız üzerinde gidiş yönünüzü kolaylıkla bulabildiniz mi?	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 (1-Çok zor 5-Çok kolay)
12. Rotanız boyunca yönünüzü bulmak için hangi elemanları kullandınız? (Birden fazla seçenek işaretlenebilir.)	( ) Tabela, işaretler ve yön bilgileri ( ) Farklı görsel nesneler ( ) Renkler ( ) Aydınlatmalar ( ) Mekânın formu ve geometrisi ( ) Yer döşemesi ( ) Tavan ve duvarlar ( ) Diğer insanlara sorarak ( ) Kayboldum ( ) Diğer……
13. Hastanenin mekânsal düzeni/planını nasıl değerlendiriyorsunuz ?	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 (1- Çok karmaşık bir planı var. 5- Çok basit, anlaşılır bir planı var.)
14. Hastanenin mekânsal organizasyonu/planı yönünüzü bulma deneyiminizde etkili oldu mu?	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 (1-Hiç etkili değil 5 – Çok etkili)
15. Rotanız üzerinde işaretleme elemanları, tabela ve/veya yön bulma bilgilerine rastladınız mı?	( ) Evet, rastladım. ( ) Hayır rastlamadım. ( ) Farkında değilim.

<table>
<tr><td>16. Rotanız üzerinde karşınıza çıkan işaret sistemleri, tabelaları ve yön bilgilerinin yön bulmada ne derece yardımcı ve yeterli olduğunu düşünüyorsunuz?</td><td>( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5
(1-Yeterli değil 5 – Çok yeterli)</td></tr>
<tr><td>17.Rotanız üzerinde karşınıza çıkan işaret sistemleri, tabelaları ve yön bilgileri ile ilgili okuyacağım seçenekleri değerlendiriniz.</td><td>
<table>
<tr><td></td><td>Evet</td><td>Hayır</td><td>Hiçbir fikrim yok</td></tr>
<tr><td>Sayıca yeterliler.</td><td></td><td></td><td></td></tr>
<tr><td>Büyüklükleri yeterlidir.</td><td></td><td></td><td></td></tr>
<tr><td>Görünür yerlere erleştirilmiştir.</td><td></td><td></td><td></td></tr>
<tr><td>Renkleri dikkat çekicidir.</td><td></td><td></td><td></td></tr>
<tr><td>Okunaklı ve anlaşılabilirler.</td><td></td><td></td><td></td></tr>
<tr><td>Yazılar ve simgeler çıklayıcıdır.</td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>18. Geri dönmekte zorlandınız mı?</td><td>( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5
(1-Çok zorlandım 5-Hiç zorlanmadım)</td></tr>
<tr><td>19. Yön bulma açısından değerlendirdiğinizde, hastanedeki tur boyunca aklınızda en çok kalan unsur(lar) nedir?</td><td></td></tr>
</table>

APPENDIX B: Sample of Researher Note Cards



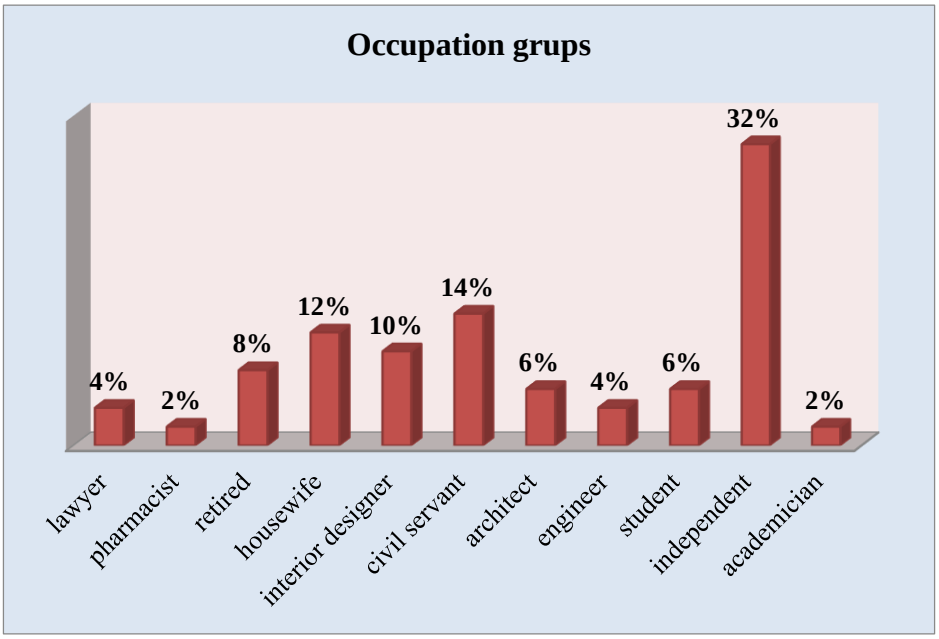


APPENDIX C: STATISTICAL ANALYSIS OF THE STUDY

APPENDIX C1: Table of Distribution Of Occupation Groups

Occupation Groups	Frequency	Percent
Lawyer	2	4%
Pharmacist	1	2%
Retired	4	8%
Housewife	6	12%
Interior Designer	5	10%
Civil Servant	7	14%
Architect	3	6%
Engineer	2	4%
Student	3	6%
Independent	16	32%
Academician	1	2%
Total	50	100

APPENDIX C2: Graphic of Occupation Groups



APPENDIX C3: Table of Going And Returning Times

Time (s)	Going		Return	
	Frequency	Percent	Frequency	Percent
0-60	28	56,0	33	66,0
61-120	13	26,0	13	26,0
121-180	4	8,0	3	6,0
181-240	4	8,0	1	2,0
241-300	1	2,0	0	0
Total	50	100	50	100

APPENDIX C4: T-Test Analysis Of Gender and Going Returning Time

		Levene's Test		T-test		
		F	Sig.	t	Sig. (2-tailed)	Std. Error
Going time	Equal variances assumed	,203	,655	-,345	,731	,3007
	Equal variances not assumed			-,343	,733	,3027
Return time	Equal variances assumed	,475	,494	-,676	,503	,2018
	Equal variances not assumed			-,686	,496	,1988

APPENDIX C5: Anova Analysis Of Age And Going-Returning Time

		Sum of Squares	Mean Square	F	Sig.
Going time	Between Groups	3,825	1,913	1,805	,176
	Within Groups	49,795	1,059		
	Total	53,620			
Return time	Between Groups	,001	,001	,001	,999
	Within Groups	24,319	,517		
	Total	24,320			

Dependent variable: Age

APPENDIX C6: Anova Analysis Of Educational Status and Going-Returning Time

		Sum of Squares	Mean Square	F	Sig.
Going time	Between Groups	11,007	5,503	6,070	,005
	Within Groups	42,613	,907		
	Total	53,620			
Return time	Between Groups	7,123	3,562	9,735	,000
	Within Groups	17,197	,366		
	Total	24,320			

Dependent variable: Educational status

APPENDIX C7: Table of Participants' Success Level in Wayfinding

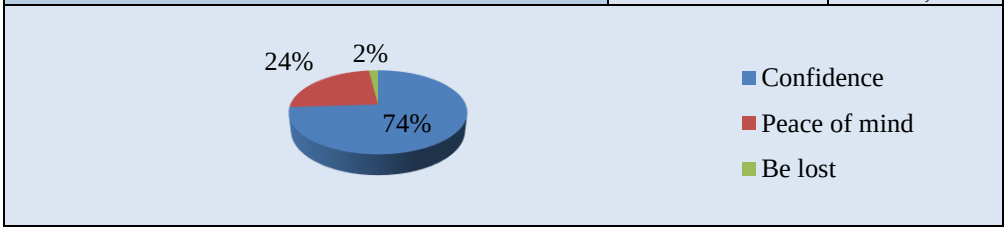
Participants' success level in wayfinding in any place (1- very unsuccessful 5- very successful)	Frequency	Percent	Participants' success level in wayfinding in the TOBB ETU Hospital (1- very unsuccessful 5- very successful)	Frequency	Percent
1	0	0,0	1	0	0,0
2	0	0,0	2	0	0,0
3	5	10,0	3	2	4,0
4	17	34,0	4	10	20,0
5	28	56,0	5	38	76,0
Total	50	100,0	Total	50	100

APPENDIX C8: Table of The Method Used By The Participants for Wayfinding

The method used by the Participants	In any place		In TOBB ETU Hospital	
	Frequency	Percent	Frequency	Percent
Signage systems	47	94	46	92
Different visual objects	24	48	11	22
Colors	3	6	0	0
Lighting	1	2	2	4
Form and geometry of space	25	50	21	42
Pavement	6	12	2	4
Ceiling and walls	3	6	0	0
Asking other people	37	74	11	22

APPENDIX C9: Graphic of The Participants' Feelings About the Hospital

The participants' feelings about the hospital	Frequency	Percent
Confidence	37	74,0
Peace of mind	12	24,0
Be lost	1	2,0
Total	50	100,0



APPENDIX C10: Table Of The Evaluation of Participants about Signage Systems

The evaluation of participants about signage systems	Yes		No		I have no idea	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
The numbers are enough	43	86,0	1	2,0	6	12,0
The sizes are enough	41	82,0	5	10,0	4	8,0
Located in visible locations	47	94,0	0	0	3	6,0
Colors are remarkable	18	36,0	12	24,0	20	40,0
Legible and understandable	45	90,0	1	2,0	4	8,0
Writings and symbols are illustrative	44	88,0	1	2,0	5	10,0

APPENDIX C11: Table of T-Test Analysis of Gender And Answers

		Levene's Test		T-test		
		F	Sig.	t	Sig. (2-tailed)	Std. Error
How successful do you think you are in finding your way when you go anywhere?	Equal variances assumed	,786	,380	-,468	,642	,1943
	Equal variances not assumed			-,460	,648	,1976
Did you easily find your way during your route?	Equal variances assumed	5,991	,180	1,152	,255	,1522
	Equal variances not assumed			1,213	,231	,1445
How do you evaluate the spatial organization of the hospital?	Equal variances assumed	,464	,499	,105	,916	,1847
	Equal variances not assumed			,107	,915	,1812
Has the spatial organization of the hospital been effective in finding your way?	Equal variances assumed	,023	,879	-,560	,578	,1739
	Equal variances not assumed			-,580	,565	,1681
Do you think that the signage systems on your route are sufficient?	Equal variances assumed	,619	,435	,000	1,000	,1862
	Equal variances not assumed			,000	1,000	,1828

APPENDIX C12: Anova Analysis Of Age And Answers

		Sum of Squares	Mean Square	F	Sig.
How successful do you think you are in finding your way when you go anywhere?	Between Groups	1,608	,804	1,816	,174
	Within Groups	20,812	,443		
	Total	22,420			
Did you easily find your way during your route?	Between Groups	1,667	,833	3,156	,052
	Within Groups	12,413	,264		
	Total	14,080			
How do you evaluate the spatial organization of the hospital?	Between Groups	2,211	1,106	2,892	,065
	Within Groups	17,969	,382		
	Total	20,180			
Has the spatial organization of the hospital been effective in finding your way?	Between Groups	1,420	,710	2,013	,145
	Within Groups	16,580	,353		
	Total	18,000			
Do you think that the signage systems on your route are sufficient?	Between Groups	1,005	,502	1,211	,307
	Within Groups	19,495	,415		
	Total	20,500			

Dependent variable: Age

APPENDIX C13: Anova Analysis Of Educatioanal Status and Answers

		SUM OF SQUARES	**MEAN SQUARE**	**F**	**SIG.**
How successful do you think you are in finding your way when you go anywhere?	Between Groups	3,362	1,681	4,146	,022
	Within Groups	19,058	,405		
	Total	22,420			
Did you easily find your way during your route?	Between Groups	3,849	1,925	8,842	,001
	Within Groups	10,231	,218		
	Total	14,080			
How do you evaluate the spatial organization of the hospital?	Between Groups	3,464	1,732	4,870	,012
	Within Groups	16,716	,356		
	Total	20,180			
Has the spatial organization of the hospital been effective in finding your way?	Between Groups	7,130	3,565	15,416	,000
	Within Groups	10,870	,231		
	Total	18,000			
Do you think that the signage systems on your route are sufficient?	Between Groups	3,887	1,943	5,498	,007
	Within Groups	16,613	,353		
	Total	20,500			

Dependent variable: Educational status

APPENDIX C14: Anova Analysis Of Participants' Success Level In Wayfinding

		Sum of Squares	Mean Square	F	Sig.
How do you evaluate the spatial organization of the hospital?	Between Groups	5,469	2,735	8,737	,001
	Within Groups	14,711	,313		
	Total	20,180			
Has the spatial organization of the hospital been effective in finding your way?	Between Groups	6,232	3,116	12,444	,000
	Within Groups	11,768	,250		
	Total	18,000			
Do you think that the signage systems on your route are sufficient?	Between Groups	6,347	3,174	10,540	,000
	Within Groups	14,153	,301		
	Total	20,500			

Dependent variable: Participants' success level in wayfinding

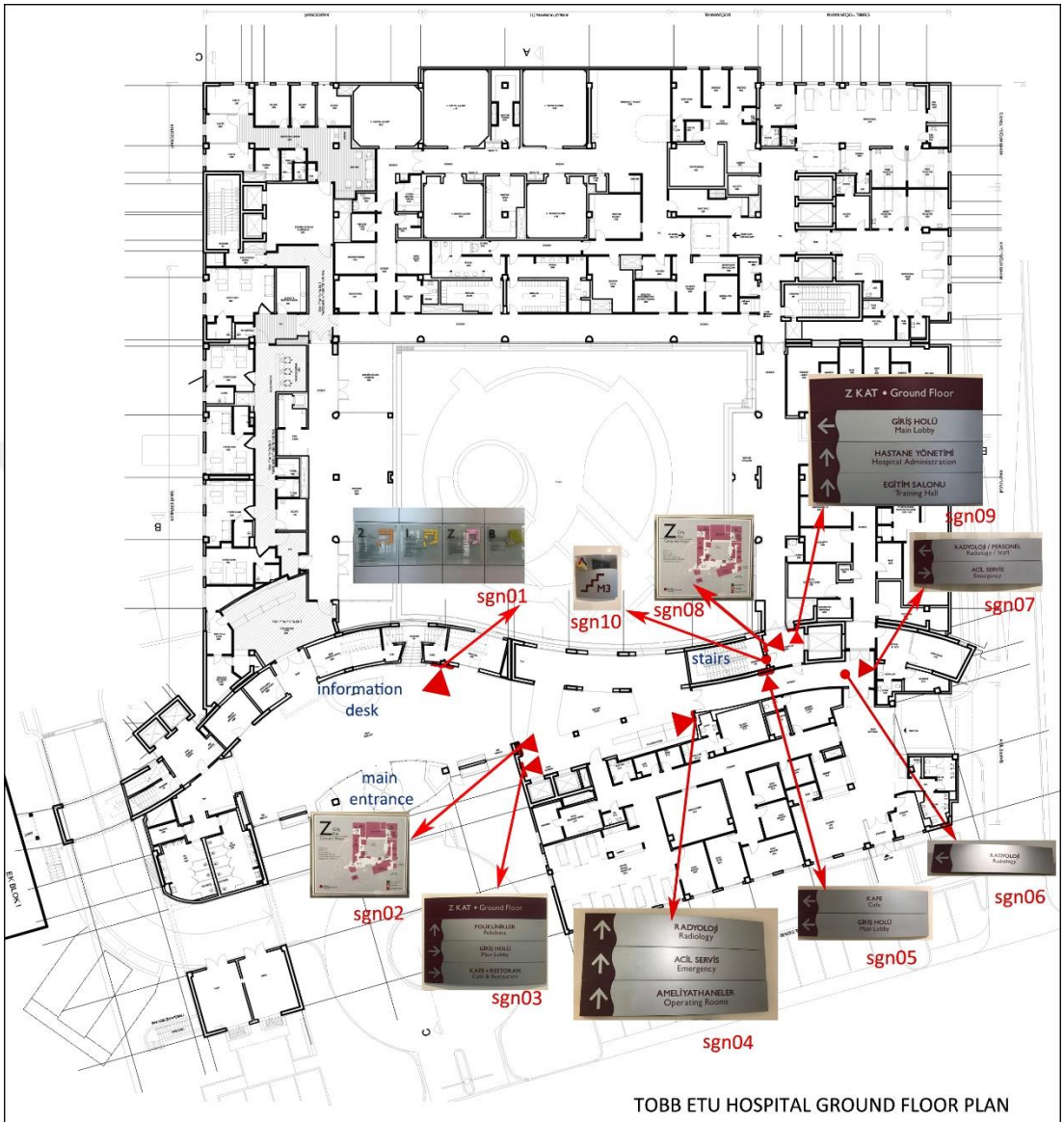
APPENDIX C15: Anova Analysis of Participants' Familiarity Level in Wayfinding

		Sum of Squares	Mean Square	F	Sig.
How often do you come to this hospital?	Between Groups	1,617	,808	,830	,442
	Within Groups	45,763	,974		
	Total	47,380			
How much do you think you know this hospital?	Between Groups	1,204	,602	,342	,712
	Within Groups	82,816	1,762		
	Total	84,020			
How much time do you spend in this hospital?	Between Groups	,158	,079	,187	,830
	Within Groups	19,842	,422		
	Total	20,000			

Dependent variable: Participants' success level in wayfinding

APPENDIX D: SIGNAGE ANALYSIS OF THE HOSPITAL FLOOR PLAN

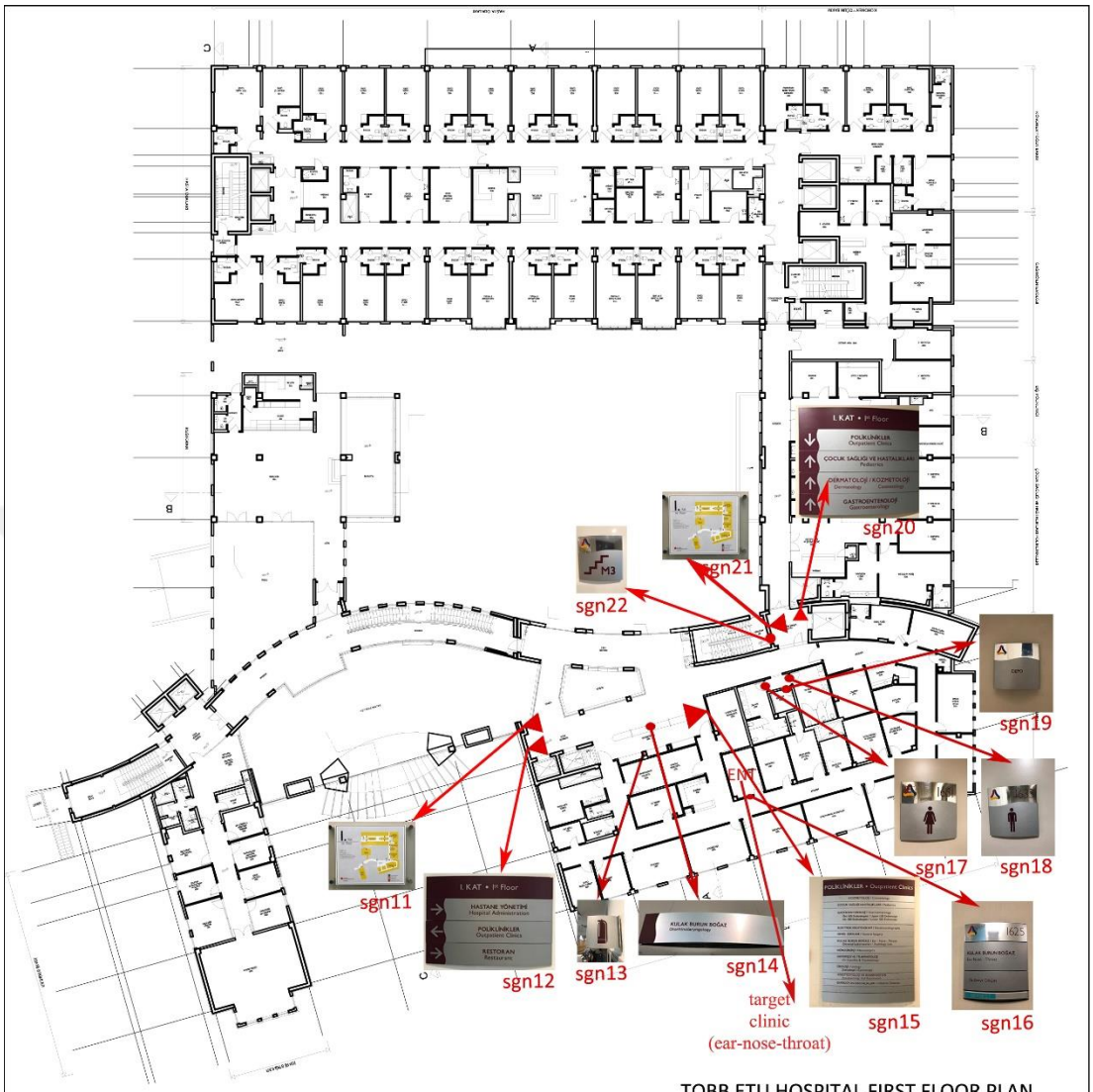
APPENDIX D1: Signage Analysis Of Hospital on The Ground Floor



TOBB ETU HOSPITAL GROUND FLOOR PLAN

Signage 01: Orientation Signs in main entrance (see figure 4.11 and 4.12)
Signage 02: You Are Here Map in the ground floor (see figure 4.19)
Signage 03: Directional Sign in the ground floor (see figure 4.13)
Signage 04: Directional Sign in the ground floor (see figur 4.13)
Signage 05: Directional Sign in the ground floor (see figure 4.14)
Signage 06: Directional Sign in the ground floor (see figure 4.15)
Signage 07: Directional Sign in the ground floor (see figure 4.14)
Signage 08: You Are Here Map in the ground floor (see figure 4.19)
Signage 09: Directional Sign on the wall near the elevator
Signage 10: Pictogram on the stairway door (see figure 4.21)

APPENDIX D2: Signage Analysis Of Hospital in The First Floor

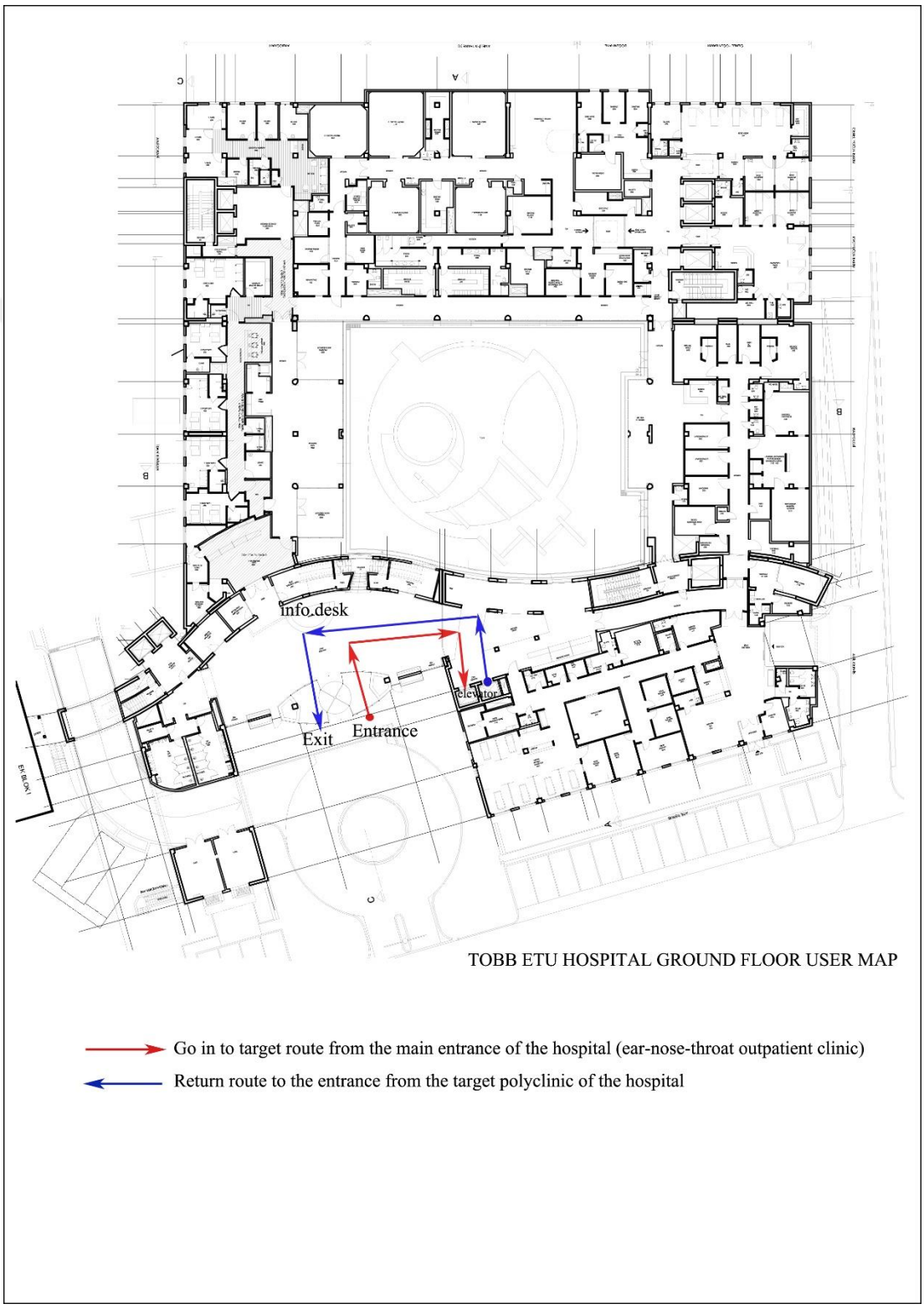


TOBB ETU HOSPITAL FIRST FLOOR PLAN

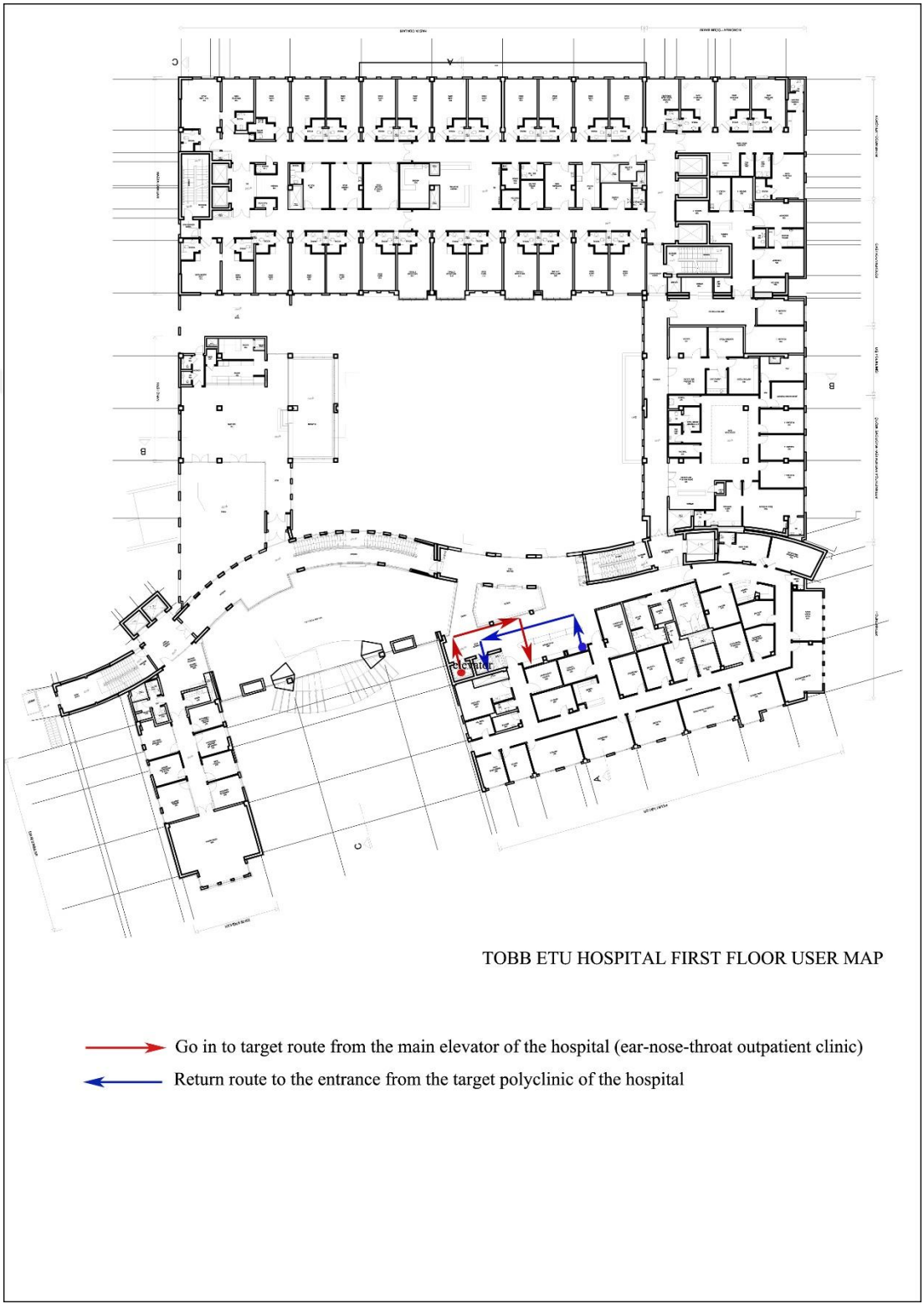
Signage 11: You Are Here Maps in the First floor (see figure 4.20)
Signage 12: Directional Sign in the First Floor (see figure 4.16)
Signage 13: Fire Pictogram in the First Floor (see figure 4.24)
Signage 14: Directional Sign in the First Floor (see figur 4.15)
Signage 15: Identification Signs in First Floor (see figure 4.18)
Signage 16: Door Information Pictogram (see figure 4.25)
Signage 17: Door Information Pictogram (see figure 4.22)
Signage 18: Door Information Pictogram (see figure 4.22)
Signage 19: Door Information Pictogram (see figure 4.23)
Signage 20: Directional Sign in the first Floor (see figure 4.16)
Signage 21: You Are Here Maps in the First floor (see figure 4.20)
Signage 22: Pictogram on the stairway door (see figure 4.21)

APPENDIX E: TOBB ETU HOSPITAL USER MAPS

APPENDIX E1:TOBB ETU Hospital Ground Floor User Map

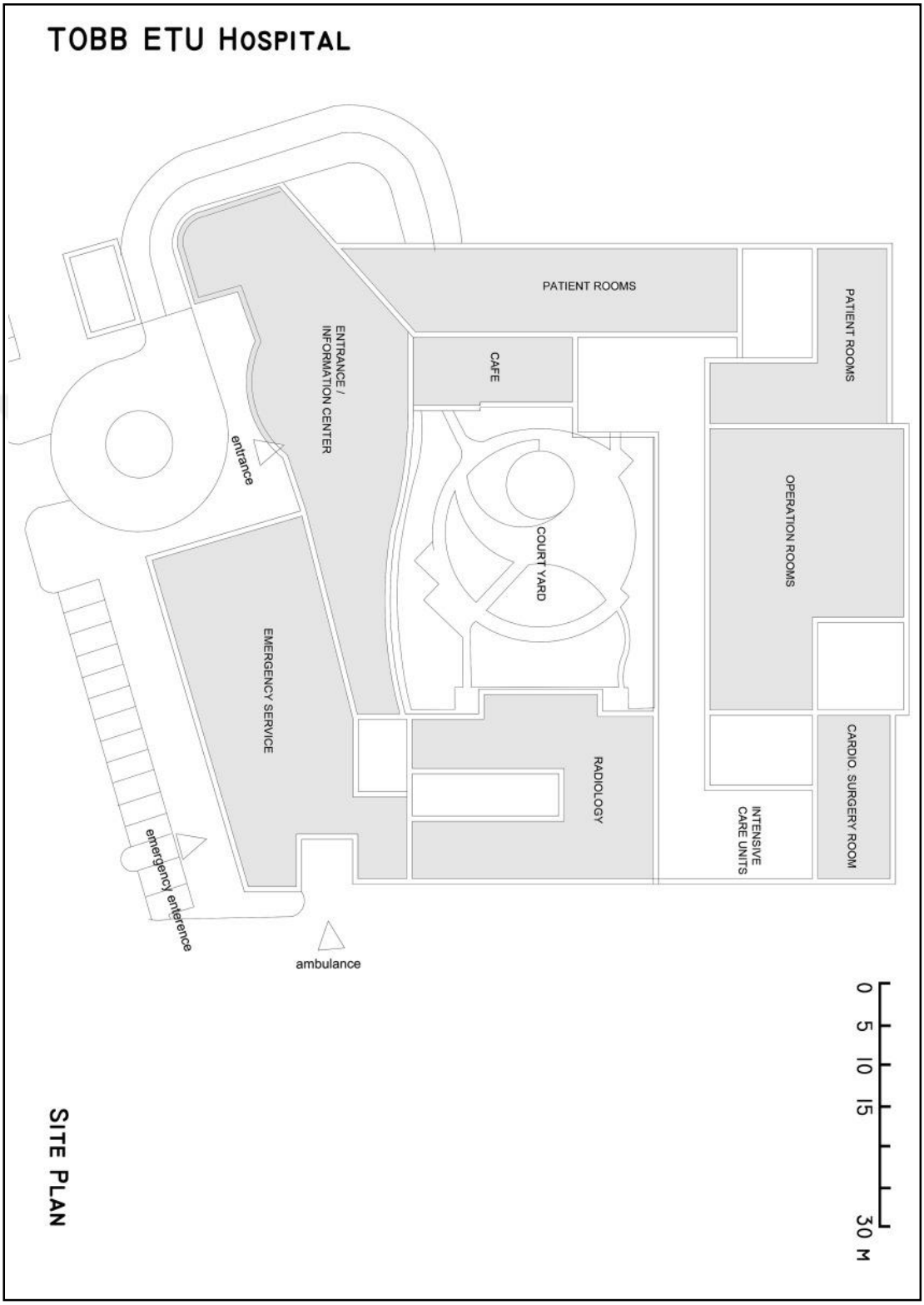


APPENDIX E2: TOBB ETU Hospital First Floor User Map



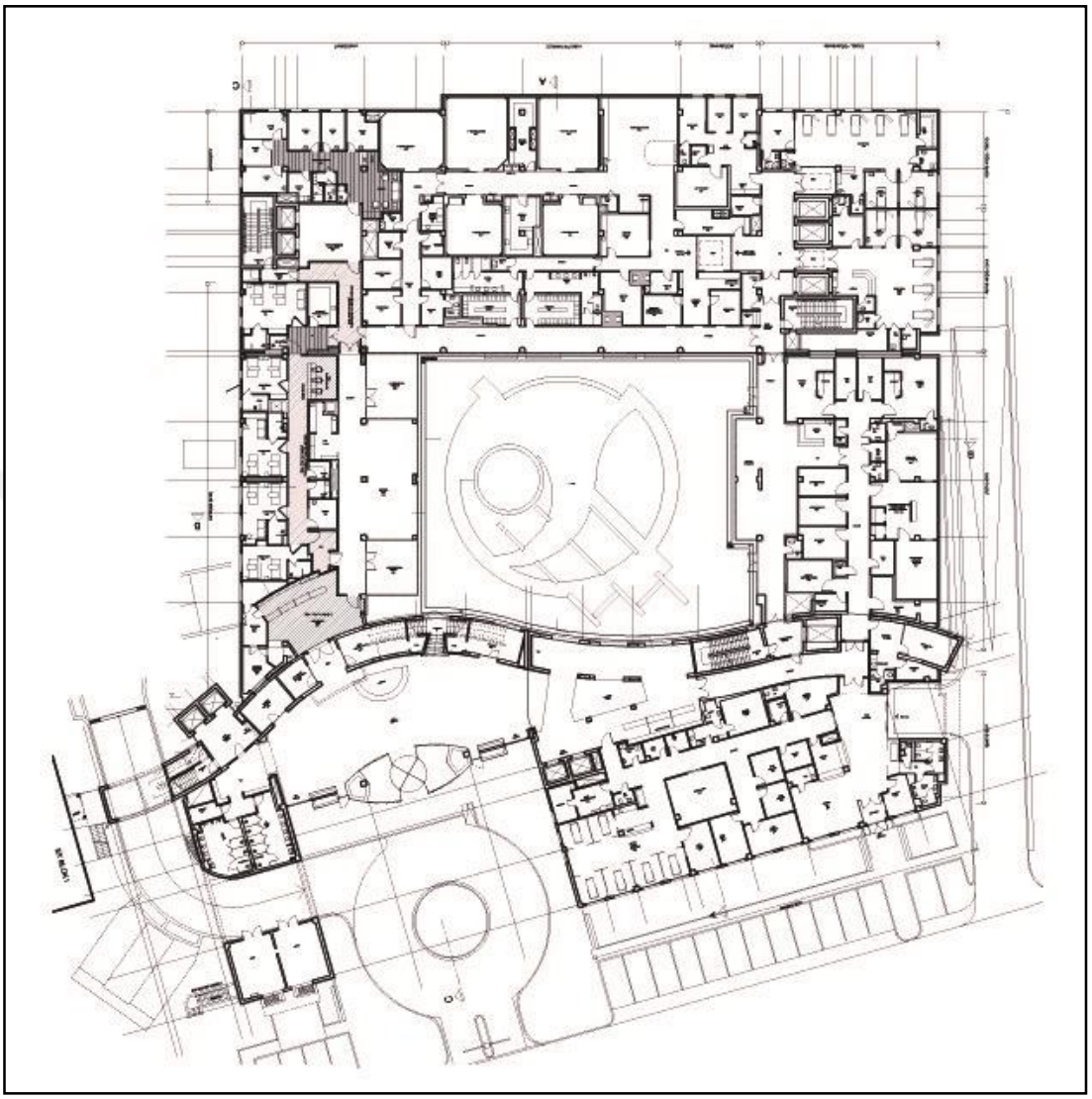
APPENDIX F: TOBB ETU HOSPITAL PLANS AND ELEVATIONS

APPENDIX F1: Site Plan of TOBB ETU Hospital



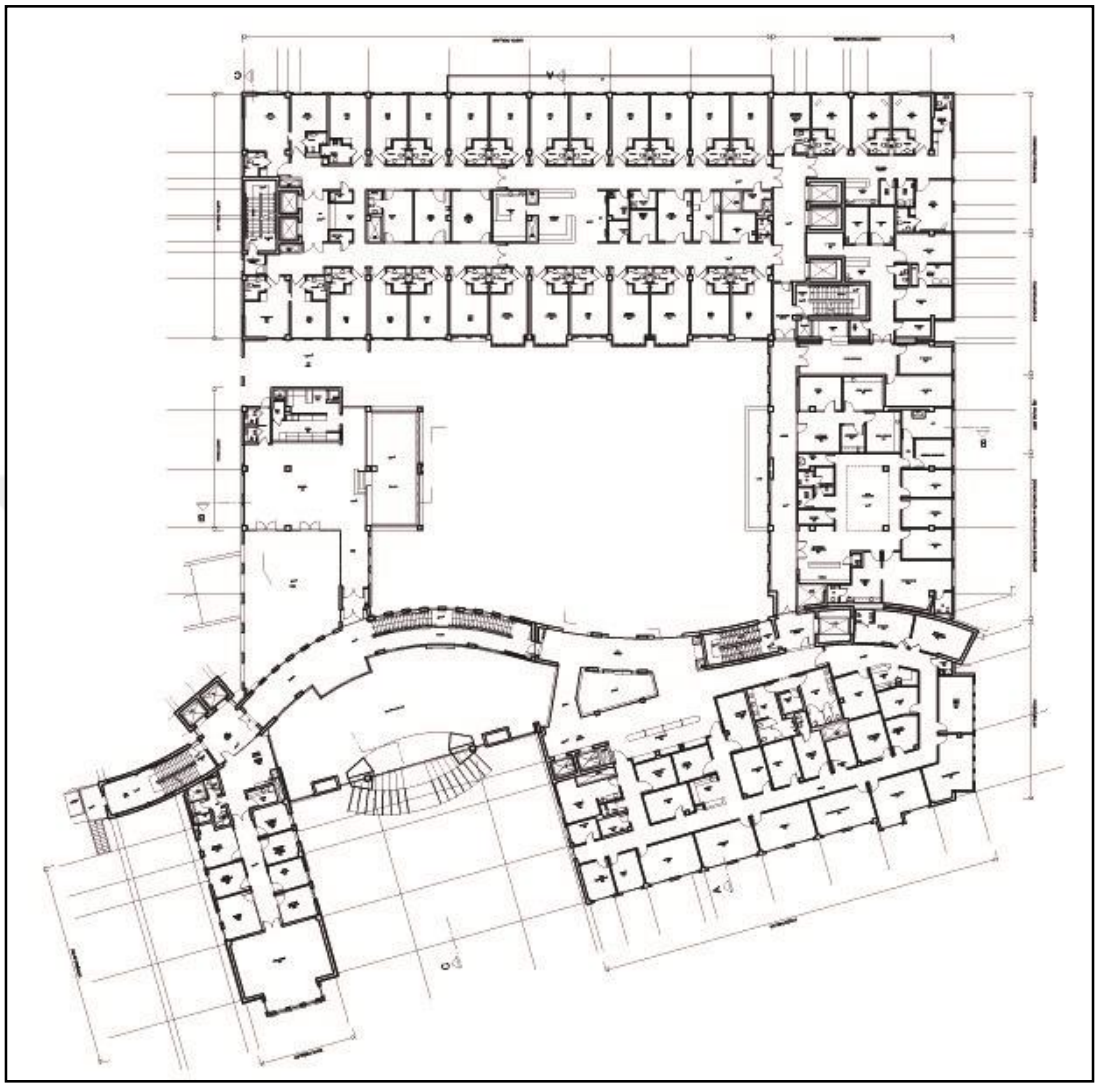
(Sended From MTK Architects-Consultants Office by Turhan Kayasu, February 2019)

APPENDIX F2: TOBB ETU Hospital Ground Floor Plan



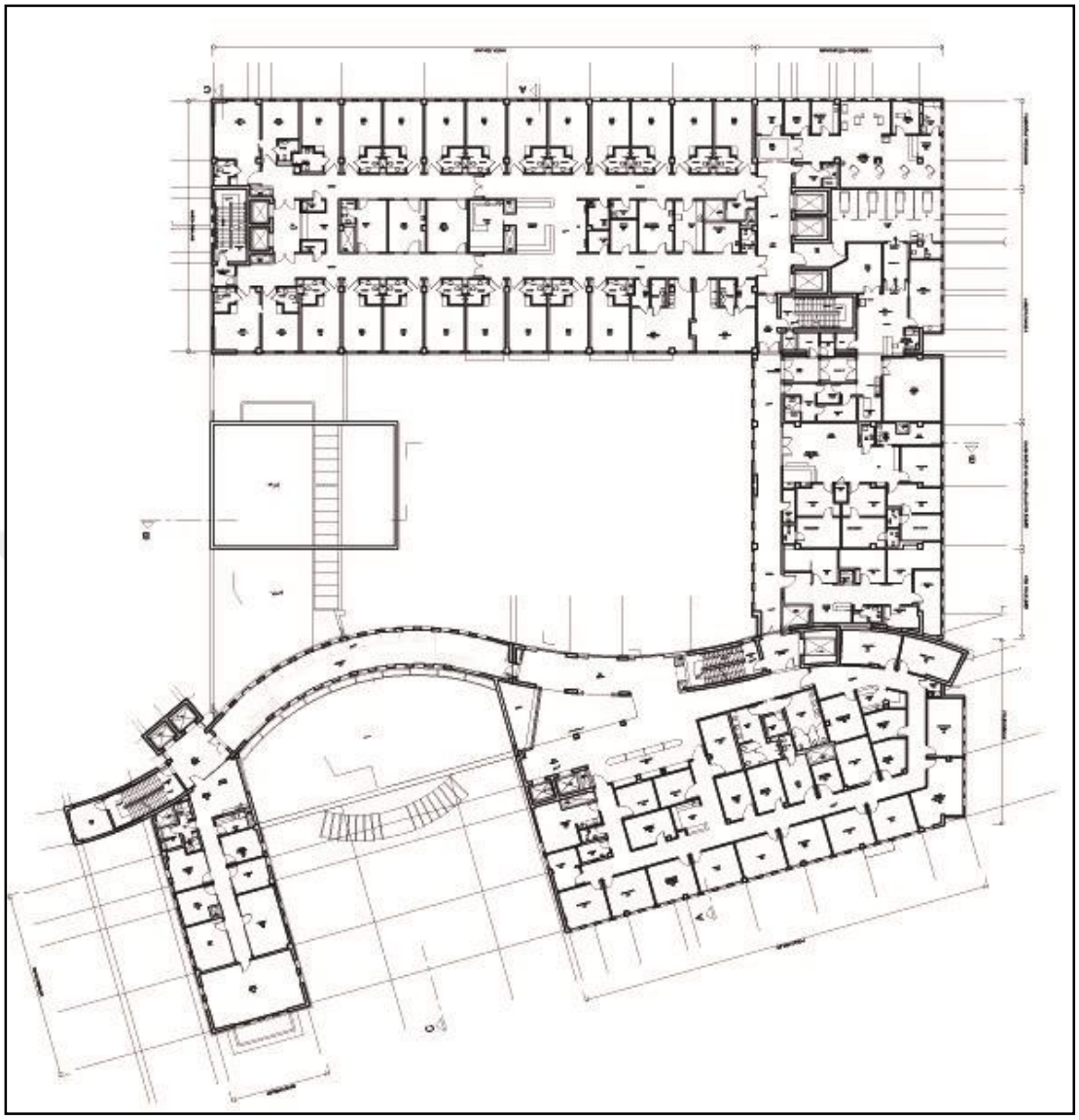
(Sended From MTK Architects-Consultants Office by Turhan Kayasu, February 2019, Ankara.)

APPENDIX F3: TOBB ETU Hospital First Floor Plan



(Sended From MTK Architects-Consultants Office by Turhan Kayasu, February 2019, Ankara.)

APPENDIX F4: TOBB ETU Hospital Second Floor Plan

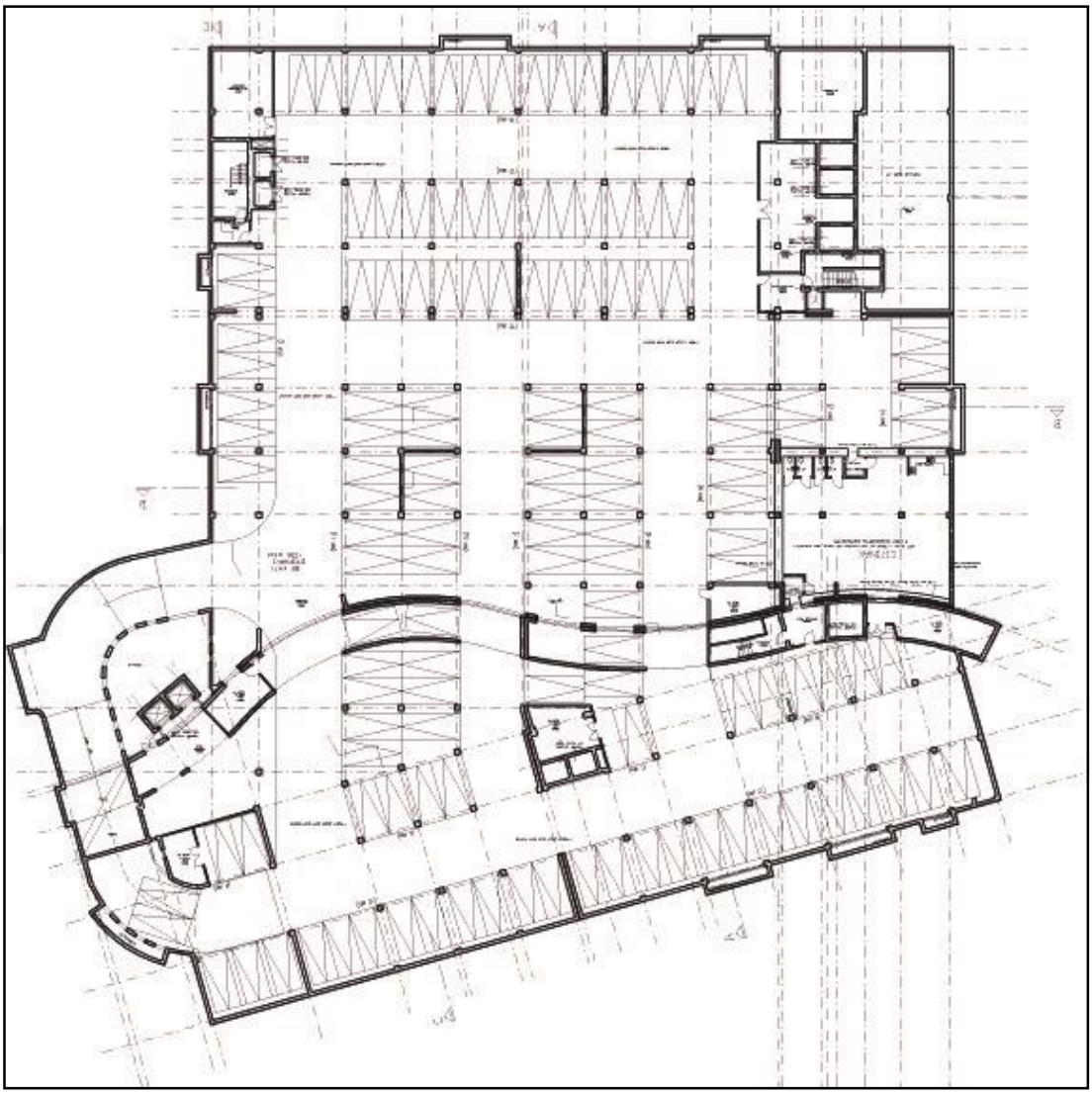


(Sended From MTK Architects-Consultants Office by Turhan Kayasu, February 2019, Ankara.)

APPENDIX F5: TOBB ETU Hospital 1. Basement Floor Plan

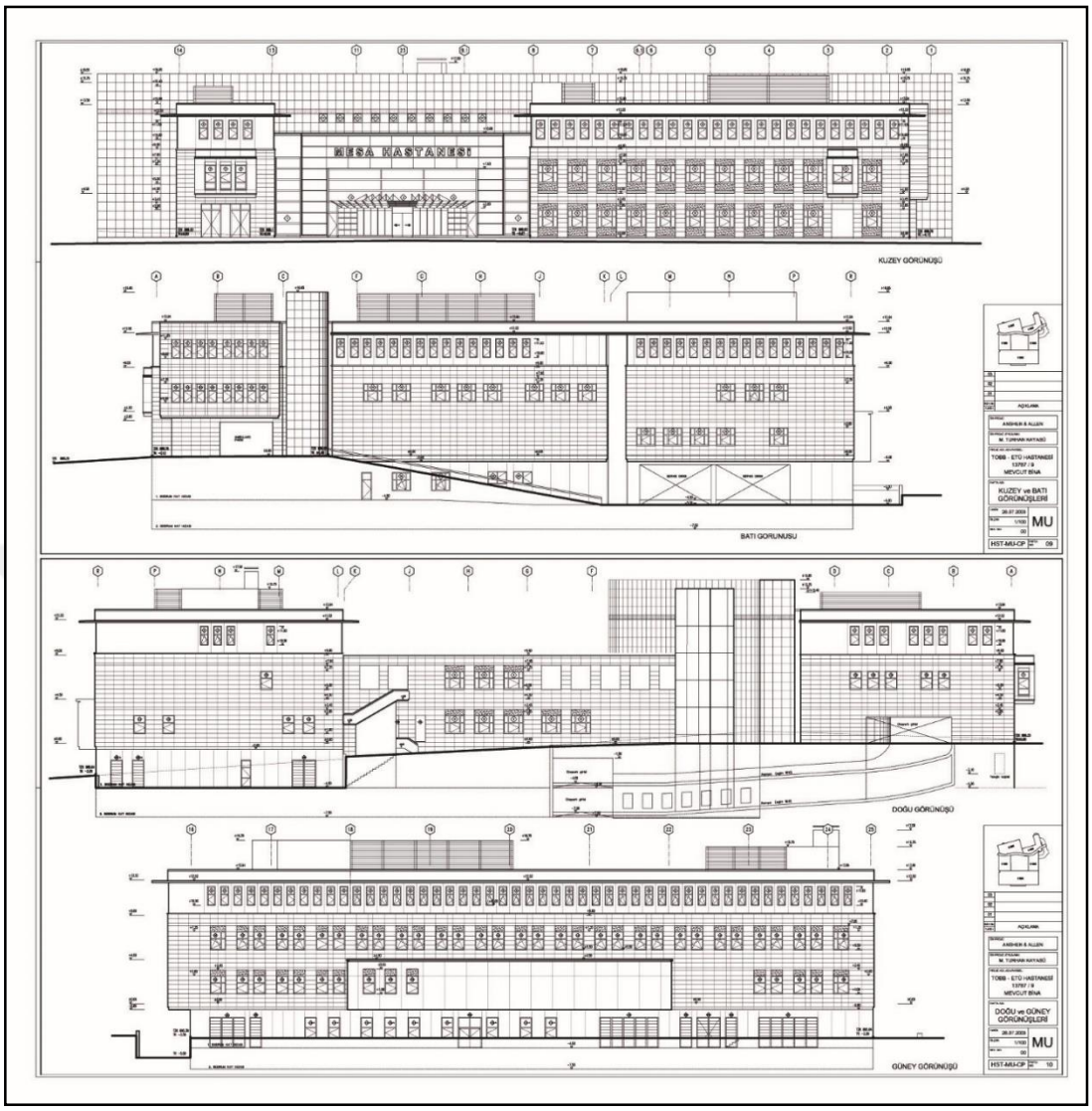
(Sended From MTK Architects-Consultants Office by Turhan Kayasu, February 2019, Ankara.)

APPENDIX F6: TOBB ETU Hospital 2. Basement Floor Plan



(Sended From MTK Architects-Consultants Office by Turhan Kayasu, February 2019, Ankara.)

APPENDIX F7: Elevations TOBB ETU Hospital



(Sended From MTK Architects-Consultants Office by Turhan Kayasu, February 2019)

APPENDIX G: TOBB ETU HOSPITAL PHOTOGRAPHS

APPENDIX G1: Exterior View TOBB ETU Hospital Building

(https://hastane.etu.edu.tr/page/tobb-etu-hospital-heart-center)

APPENDIX G2: Entrance View TOBB ETU Hospital Building

(https://hastane.etu.edu.tr/page/tobb-etu-hospital-heart-center)

APPENDIX G3: Waiting Area View Of TOBB ETU Hospital Building

(https://hastane.etu.edu.tr/page/tobb-etu-hospital-heart-center)

APPENDIX G4: Outpatient Clinic Area & Restaurant Area Of Hospital Building

(https://hastane.etu.edu.tr/page/tobb-etu-hospital-heart-center)

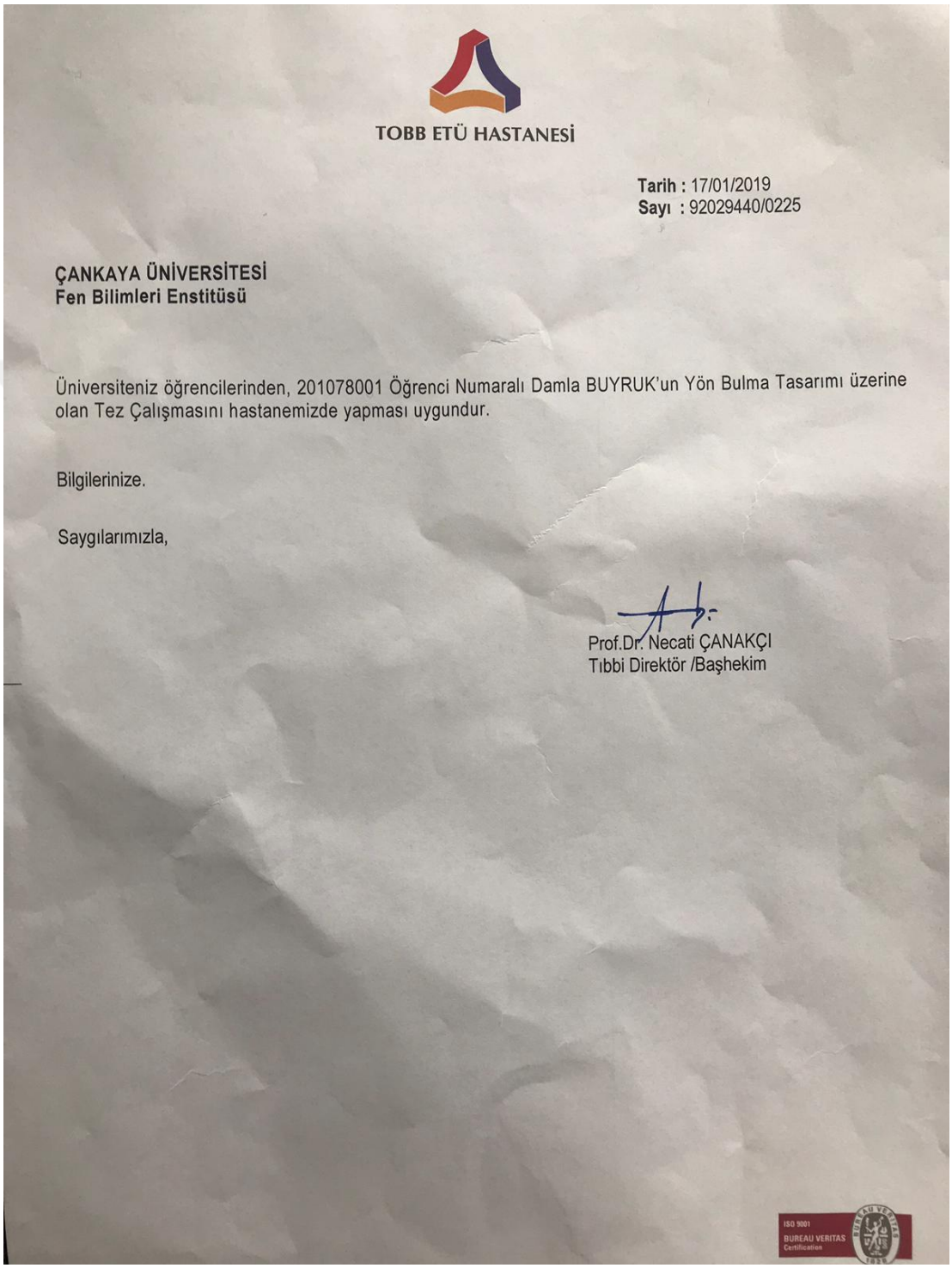
APPENDIX G5: Corridor View Of Hospital Building

(Photographed by the author)

APPENDIX G6: Landmark Of Hospital Building

(Photographed by the author)

APPENDIX H: APPROVAL CERTIFICATE FROM TOBB ETU HOSPITAL FOR THESIS CASE STUDY



TOBB ETÜ HASTANESİ

Tarih : 17/01/2019
Sayı : 92029440/0225

ÇANKAYA ÜNİVERSİTESİ
Fen Bilimleri Enstitüsü

Üniversiteniz öğrencilerinden, 201078001 Öğrenci Numaralı Damla BUYRUK'un Yön Bulma Tasarımı üzerine olan Tez Çalışmasını hastanemizde yapması uygundur.

Bilgilerinize.

Saygılarımızla,

Prof.Dr. Necati ÇANAKÇI
Tıbbi Direktör /Başhekim

ISO 9001 BUREAU VERITAS Certification

APPENDIX I: ETHICS COMMITTEE CERTIFICATE

Çankaya Üniversitesi - ÜNİVERSİTE ETİK KURULU
Tarih: 14.02.2019 10:37
Sayı: 80281877-050-E.00000029937
E.00000029937

ÇANKAYA ÜNİVERSİTESİ
REKTÖRLÜK

Sayı : 80281877-050
Konu : Etik Kurul Raporu

MİMARLIK FAKÜLTESİ DEKANLIĞINA,

İlgi : 05.02.2019 tarih ve 41645618-050/00000029107 sayılı yazınız.

Fakülteniz Şehir ve Bölge Planlama Bölümü öğretim üyesi Doç.Dr. Ezgi KAHRAMAN, İç Mimarlık Bölümü Dr.Öğr.Üyesi G. Ufuk DEMİRBAŞ ve yüksek lisans öğrencisi Damla BUYRUK tarafından yürütülen "TOBB ETÜ Hastanesi Kullanıcı Yön Bulma Deneyimi Değerlendirmesi" adlı araştırma projesi ve yüksek lisans tez çalışması kapsamında gerçekleştirilmesi düşünülen anket çalışması, Üniversitemiz Bilimsel Araştırma ve Yayın Etiği Kurulu tarafından değerlendirilmiş ve uygun görülmüştür.

Bilgilerinizi ve ilgiliye bilgi verilmesini rica ederim.

e-imzalıdır
Prof. Dr. Can ÇOĞUN
Rektör

Ek : 23.01.2019 tarih ve 168 sayılı Araştırma ve Yayın Etiği Kurulu Proje Onay Formu

Merkez Kampüs: Yukarıyurtçu Mah. Mimar Sinan Cad. No:4 06790, Etimesgut-ANKARA / Balgat Kampüsü : Çukurambar Mah. Öğretmenler Cad. No: 14, 06530 - ANKARA Tel:0 (312) 233 10 00/1134 / 0 (312) 284 45 00 / 134 Faks:0 (312) 233 11 49 / 0 (312) 286 96 31 E-Posta:genelsekreterlik@cankaya.edu.tr

ÇANKAYA ÜNİVERSİTESİ BİLİMSEL ARAŞTIRMA VE YAYIN ETİĞİ KURULU

TARİH : 23/01/2019 **SAYI :** 168

YER : Çankaya Üniversitesi, Eskişehir yolu 29. Km Yenimahalle/Ankara

KATILIMCILAR : Etik Kurul Üyeleri

ARAŞTIRMA VE YAYIN ETİĞİ KURULU PROJE ONAY FORMU	
Projenin Adı :	TOBB ETÜ HASTANESİ KULLANICI YÖN BULMA DENEYİMİ DEĞERLENDİRMESİ
Projenin Niteliği:	Araştırma projesi ve yüksek lisans tez çalışması
Proje Araştırmacıları:	Doç. Dr. Z. Ezgi Kahraman Dr. Öğr. Üyesi G. Ufuk Demirbaş Damla Buyruk (yüksek lisans öğrencisi)
Proje Yürütücüsünün Haberleşme Bilgileri:	Doç. Dr. Z. Ezgi Kahraman e-posta: ekahraman@cankaya.edu.tr Tel: 2844500/139
Araştırmanın Amacı:	Çalışmanın amacı hastanelerde yön bulma konusunda kullanıcı deneyimlerinin incelenmesidir. Bu kapsamda çalışmanın temel araştırma sorusu "hastanelerin mekânsal organizasyonunun ve işaretleme sistemlerinin kullanıcının yön bulma deneyimini nasıl etkilediği"dir. Araştırmanın alt araştırma soruları ise: i. Farklı demografik niteliklere sahip kullanıcılar için yön bulma deneyimi nasıl farklılaşmaktadır? ii. Hastanenin plan şeması yön bulma deneyimi üzerinde etkili midir? iii. Hastanedeki mevcut işaretleme sistemi yön bulma deneyiminde etkili midir? Bu kapsamda, öncelikle yön bulma deneyimini etkileyen temel unsurlar araştırılacak, bu temel unsurlardan mekânsal organizasyonun ve işaret sistemlerinin yön bulma süreçlerindeki etkisi incelenecektir. Araştırma bir saha çalışması ile desteklenecektir.
Araştırmanın Gerekçesi :	Hastane iç mekanları "sağlık kurumları" olarak yön bulma konusu, alışveriş merkezleri, ofis binaları, oteller gibi kompleks yapılara göre daha

	kritik bir öneme sahiptir. Hastanelerde yön bulma konusunda yaşanacak tereddütler, zaman kayıpları ya da kaybolma durumları hastanın duygusal davranışlarını etkileyebilmekte, hastaya yapılacak müdahaleyi geciktirebilmekte, sağlık kayıplarına neden olabilmektedir (O'neill, 1999; Sönmez and Önder, 2015). Bu sebeplerle, bu çalışma hastanelerdeki yön bulma olanaklarının ve sorunlarının araştırılması ve kullanıcı deneyimlerinin ortaya çıkarılmasını hedeflemektedir. Çalışmanın ulaşacağı sonuçların hastane iç mekânlarının tasarlanması sürecinde plan şemasının geliştirilmesi ve işaretleme sistemlerinin niteliklerinin belirlenmesi aşamalarına katkıda bulunabileceği düşünülmektedir.
Araştırmanın Yöntemi:	Kullanıcıların hastane iç mekânı içerisindeki yön bulma deneyimlerini incelemek amacıyla araştırma bir saha çalışması olarak tasarlanmıştır. TOBB ETU Hastanesi'nde gerçekleşecek çalışmada öncelikte hastanenin mevcut plan şeması üzerinden mekânsal organizasyonu ve işaretleme sistemleri niteliksel ve niceliksel olarak değerlendirilecektir. Ardından farklı cinsiyet, yaş aralıkları, eğitim seviyesi ve aşinalık durumlarına sahip 50-60 kişilik bir örneklem üzerinde hastanenin 2018 verilerine göre en çok kullanılan polikliniklerinden olan Kulak Burun Boğaz Polikliniğine hastane girişinden itibaren gidiş ve dönüş rotası olmak üzere nasıl ulaştıkları gözlemlenerek ve destekleyici anket çalışmaları (EK1) yapılarak ortaya çıkarılmaya çalışılacaktır. Böylece farklı nitelikteki kullanıcı grupların yön bulma deneyimleri değerlendirilecek, hastanenin mekânsal kurgusunun ve yön bulamaya yardımcı görsel elemanların kullanıcının mekânsal davranışlarını nasıl şekillendirdiği incelenmiş olacaktır. Hastane kullanıcılarının mekânsal deneyimleri rota/kullanıcı haritaları (user maps) yardımıyla analiz edilecek, yapılandırılmış anket çalışmalarıyla rota esnasında kullanıcıların deneyimlerine yönelik gözlemlenemeyen verilere ulaşılması mümkün olabilecektir. Anket çalışmalarında elde edilen veri betimleyici istatistikler ve regresyon analizleri ile çözümlenecektir.
Kullanılacak biyolojik,psikolojik ve teknik vb tüm yöntemleri açıklayan etik ile ilgili özet:	Araştırma, rota haritalarının çıkarılması ve yüzyüze anket uygulamalarına dayanmaktadır. TOBB ETU Hastanesi kullanıcıları ile yapılacak bu iki aşamalı çalışma ile kullanıcıları yön bulma deneyimlerinin ortaya çıkarılması ve araştırmanın temel sorusuna yanıt bulunması hedeflenmiştir. Çıkarılan rota haritaları ve anket sorularına verilen yanıtlar yalnızca bilimsel amaçlı yürütülen araştırma kapsamında kullanılacaktır. Anket sorularının içinde tanımlayıcı kimlik bilgilerine yer verilmemiştir. Soruların katılımcıların üzerinde olumsuz bir etki yaratması beklenmemektedir. Çalışmaya katılım gönüllülük esasına dayanmaktadır. Ayrıca hastane yönetiminden TOBB ETU Hastanesi'nde yukarıda tariflenen nitelikte bir çalışmayı gerçekleştirebilmek için bir izin belgesi alınmıştır (EK2). Araştırmacılar, yön bulma deneyimini etkileyen mekansal faktörler ve tasarım elemanları konusunda teorik bilgi birikimine, saha çalışması tecrübesine ve bir bilimsel araştırma yürütebilme/gerçekleştirebilme becerilerine sahiptir.