Evaluating the Influence of Environmental Design Elements on the Legibility of a Shopping Mall

Elif Güneş

Atılım University, Faculty of Fine Arts Design and Architecture, Department of Interior Architecture and Environmental Design, elif.gunes@atilim.edu.tr, Tel: 0312 586 8908

ABSTRACT

Shopping is an ordinary and necessary activity for human beings. Especially today, a mall becomes a community centre that contains social and recreational activities along with shopping. With the increase in number of large-scale shopping malls, shoppers have problems in finding their way. Legibility as the ease of finding one's way around in a setting becomes a crucial concern in shopping mall design. The environmental design elements (EDE) -layout, landmark, orientation aids and signage- affect the legibility of a building. This study was designed to contribute to the understanding of human wayfinding behaviors in shopping malls with the concentration on the legibility by addressing two aspects of influential factors: EDE and individual differences. An individual interviewing and pointing task comprised of a hundred and twenty shoppers was conducted in the shopping mall. Findings of the study verified that the appropriate usage of EDE improves the legibility of a shopping mall setting. In addition, gender and familiarity differences have found to be effective in the usage of EDE.

Keywords: Wayfinding, Legibility, Environmental Design Elements, Gender, Familiarity, Shopping Malls

1. INTRODUCTION

Awareness of the space around is critical for finding one's way especially in public buildings such as airports, hospitals or shopping malls. Many people have problems of finding their way due to not only their spatial-cognitive abilities, but also architecture that unadvanced for human spatial cognition (Hölscher et. al., 2006). According to Golledge (1999) finding one's way around is a purposive, directed and motivated activity. It is the process of wayfinding that refers to the organization and communication of people's dynamic relationship to space and the environments (Giuliani, 2001). Thus, it is an activity requires complete involvement with the environment (Passini, 1984). Peoples try to comprehend the environment they are in and with the information they obtained

during this involvement. Particularly unfamiliar, large-scale and complex layout environments, based upon that involvement process becoming compeller, are difficult to navigate. However, people needs to that involvement to know where they actually to feel themselves secure, safe and comfortable. Without the spatial knowledge that contains one's current location, destination and the spatial relation between them, people become disoriented (Çubukçu & Nasar, 2005). Disorientation and getting lost are very frustrating experience (Passini, 1984) makes people anxious, uncomfortable and unhappy (Darken & Peterson, 2002).Thus, buildings as a source of wayfinding information has to be clear, readable and architecturally legible.

Legibility means the apparent clarity of the environment and it is one of important concepts of environmental psychology and is crucial in environmental setting (Lynch, 1960). Legible environments offer to people security and heighten the potential depth and intensity of human experience. Therefore, many scientists from the field have researched this topic and different definitions have been made that meet in common ground. Abu-Ghazzeh (1996) defined legibility as the degree to which a building or groups of buildings facilitate the ability of users to find their way around. 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). Legible environment is where destinations can be directly observed and travel can be guided by directly viewing elements of the surrounding space (Reginald, 1999).

Humans have the basic cognitive need for information and legibility in their environment (Kaplan & Kaplan, 1982). As they mentioned, legibility is very important, as humans need to find their way and to find what they want in an environment. If they cannot, then they start to lose their control and that causes frustration. It can result in negative physical and psychological effects such as high blood pressure and stress (Carpman & Grant, 2002). Danielsson (2005) stated that for reducing these negative effects, the orientation of the building should be easy and the internal relations between the spaces should be logical.

People do not comprehend the overall plan of the building. In that case, providing a legible spatial structure for a building is an important factor in wayfinding performance.
Ng (2003) reported that, EDE affect the legibility of the building. By EDE in real and virtual world spaces, the difficulty of navigating in unfamiliar environments supported. The appropriate use of EDE positively affects the perceptions behavioral decisions, spatial orientation and wayfinding of users (Hidayetoğlu, Yıldırım & Akalın, 2012). However,

especially in complex and large-scaled buildings like a shopping mall, it is demanding to deal with all these factors and constitute definite design and practice rules. Precisely at this point, it becomes significant to analyze the EDE by their contribution to the legibility of the built environment with their problematic aspects that the user can reveal.

The current study was designed to contribute to the understanding of human wayfinding behaviors in shopping malls with the concentration on the legibility by addressing two aspects of influential factors that affects legibility: EDE and individual differences.

2. "EDE" EFFECT ON THE LEGIBILITY OF BUILDING

EDE can be categorized under two types of design strategies: architectural design elements and informational design elements (Pollett & Haskell, 1979; Giuliani, 2001). These elements help people to construct their mental map about the environment. Architectural design deals with the layout of the space and landmarks used in the space. Informational design deals with the building information system that are signage and orientation aids.

Legibility perception can be influenced by factors from both the environmental - architectural and informational design- and human individual differences. Individual differences influence wayfinding. Various aspects of individual differences such as familiarity, gender and age have been examined through previous studies. This study concentrated on familiarity and gender differences.

2.1. Architectural Design Elements

There are two primary architectural design elements: layout of the building and landmarks used in the building. In architectural design elements, the information as a source of spatial knowledge comes directly from the primary source of environment (Darken & Peterson, 2002).

Layout is one of the most important factors affecting the legibility of a building. The spatial layout is a source of information for finding one's way, when focusing on wayfinding in large scale built environment (Werner & Schindler, 2004). Doğu & Erkip (2000) stated that layout of a setting can be defined by its spatial content, form, organization and circulation system. The building tells us everything about its internal organization if these factors articulated well. Clear and organized buildings reduce wayfinding problems by creating spaces for making easy predictions. However, in complex settings, wayfinders bombarded with stimulation of all sorts of information and as a result finding relevant information becomes difficult (Arthur & Passini, 1992). A

simple plan of spaces plays an important orientation role by allowing visitor to concentrate on the purpose of the visit (Bourdeau & Chebat, 2003). Buildings organized around a simple orthogonal grid with regular angles are less problematic than irregular designs. Symmetry axes, elongation, use of visible structures such as an atrium, the outside landscape or other prominent features provide comprehensible environments (Werner & Schindler, 2004). Buildings organized around an open core provide an advantage of visual and auditory access to the form of the circulation system. The well-designed circulation system provides users an easier understanding of the building (Arthur & Passini, 1992).

Landmarks provide a support to the improvement of wayfinding ability by the development of legibility of buildings and route knowledge of a person (Lynch, 1960). Landmarks, work as a reference point to show the location of other points in the environment and they are remembered and perceived by their shape and structure (Osmann & Wiedenbauer, 2004). Raubal & Winter (2002) reported that landmarks might be used as route instructions in the mental representations of a space. In addition, a landmark acts as a visual attraction point if it has certain visual characteristics. Therefore, visibility, shape, color, and façade area of the landmarks can be used as the measures in determining their visual attraction. Reginald (1999) claimed that landmarks are fundamental pieces of spatial information used for environmental knowing and wayfinding purposes. He added that landmarks used as wayfinding aids and remembered by its dominance of their visible form and they perceived and recognized from a distance. The availability of various landmarks in setting eases encoding the routes verbally, and helps improving the spatial, visual and verbal memory of wayfinding knowledge (Meilinger, Knauff & Bülthoff, 2006). Çubukçu & Nasar (2005) found that people in environments with landmarks acquired better spatial knowledge with lower error scores in direction and sketching process than environments without landmarks.

2.2. Informational Design Elements

There are two primary informational design elements: orientation aids and signage systems used in the building. In informational design elements, the information as a source of spatial knowledge comes from the secondary source of environment (Darken & Peterson, 2002).

Orientation aids comprises maps, site plans, building and floor directories and information desk. Maps provide information to understand where one is in the building and the whole of the building (Pollett & Haskell, 1979). They enable people to create an understandable mental model of the site and the main routes on it, providing easy

orientation in the environments (Miller & Lewis, 1999). Maps may include visual properties of a drawing to represent geographical information of the environment. They generally used for the purpose of a guide to exploration, a substitute for exploration and a basis for directions (Hunt & Waller, 1999). Using familiar pictograms for reinforcing the text and providing "You-Are-Here" (YAH) symbols are important for emphasizing information (Giuliani, 2001). Marquez, Oman & Liu (2004) claimed that YAH maps are more beneficial than regular maps as they show users their location within the environment and surrounding areas. Information desk is another orientation aid and provides people direct information about the building. The placement of information desk is critical in the building for the visibility and usability of it. They should be located at each public entry visible from the front door (Arthur & Passini, 1992; Muhlhausen, 2006). Arthur & Passini (1992) added that information desk should clearly identified by the word "information" preferably above the desk and there should be directions to it, if there is more than one entrance to the building.

Signage is major element of information systems. Signage systems are widely used in buildings to provide information for wayfinding, by assisting in navigation during normal circulation of pedestrians and exiting information during emergencies (Xie et al., 2007). To reduce the risk of disorientation and for helping people understanding their environments, various signs provided in buildings. Pollett & Haskell (1979) defined identification signs and directional signs as fundamental types of signs. Identification signs provide information at the destination and generally include names and pictographs (Arthur & Passini, 1992). Directional signs include an arrow and some directional indicators to show people which way they need to go (Miller & Lewis, 1999).

Signage can cause wayfinding problems in unfamiliar environments and can disorient people. Montello & Sas (2006) reported that effective signage must have certain properties such as being legible from a distance, being clear and simple in design, having enough but not too much information, and being placed where the people needs information like at decision points. According to them, a perfectly clear sign may be confusing if it placed in a sea of competing visual clutter. Bourdeau & Chebat (2003) agreed from the content point of view as it should be considered in the design process due to the remembrances of signs decrease when the number of contained words increases.

2.3. Individual Differences

Gender influences the use of EDE and it affects the wayfinding process. Gender differences have been reported in some studies. Lawton, Charleston & Zieles (1996)

reported that men were significantly more accurate than women in indicating the direction of the destination. In addition, women expressed greater uncertainty about wayfinding task because of not being sure of the direction. In another study, women and men show differences in the amount of success at finding destinations in three-dimensional environments. Therefore, they use different spatial referents in finding destinations, as women use landmarks more than men do while men use cardinal directions more than women (Lawton & Kallai, 2002). In addition, Lawton (2001) reported that women are affected by the absence and presence of landmark cues more than men and men are more accurate than women in judgments of directional relationship. On the other side, Schmitz (1999) reported that men are more successful in recalled route directions in maps and descriptions than women are, but they showed a weak preference in the use of landmarks to route directions. However, Chebat, Chebat & Therrien (2005) found that men used significantly more landmarks than women used and ask less often for their way. In another study Lawton, Charleston, & Zieles (1996) reported that women and men are equally efficient in finding their way to a destination in a building.

Familiarity is one of the essential factors that influence the use of EDE and affects the wayfinding process. Prestopnik & Ewoldsen (2000) reported that length of time living in an environment is important for developing a sense of familiarity as the most important factor in predicting wayfinding. Hölscher et. al. (2006) reported from their study that familiar persons are more often relied on their knowledge and they walked a well-known route that they had completely planned. They navigated faster than unfamiliar persons taking the same route. In addition, they do not have to collect as much information from their surroundings because of their knowledge as unfamiliar persons, who has to search and look signs as well as outside. Chebat, Chebat & Therrien (2005) stated that familiar persons use more information stored in their long term memory and unfamiliar persons are use external sources more such as maps, signs, other persons. They also claimed that familiar persons ask less help for wayfinding and used fewer maps than unfamiliar shoppers use. Sense of direction also affects one's familiarity in addition to features of an environment, memories of successes and failures in recent wayfinding process (Cornell, Sorenson & Mio, 2003).

3. LEGIBILITY IN SHOPPING MALLS

Shopping is an ordinary and necessary activity for human beings. Especially today, a mall becomes a community centre that contains social and recreational activities along with shopping. Bloch, Rigdway, and Dawson (1994) stated six reasons for shopping to be enjoying; the aesthetics, escaping from routine and boredom, exploring new stores or

products, engaging in a state of absorption, acquiring new information about the stores and products, and social interaction. Because of all these reasons, shopping and the activities that malls include such as restaurants, cinema, theatre, playground, sport centers etc. shopping malls became very important in human lives and people started to visit the malls very often.

With the increase in number of large-scale shopping malls, shoppers may have problems in finding their way. This makes legibility an important concern in shopping mall design. Therefore, there is a respectable amount of research on wayfinding in shopping malls (eg. Doğu & Erkip, 2000; Ng, 2003; Chebat, Chebat & Therrien, 2005; Chebat, Chebat & Therrien, 2008). Even in space of leisure activity, wayfinding can become a serious problem for shoppers (Doğu & Erkip, 2000). Finding the way within large-scaled settings like shopping malls spares shoppers from stress, anxiety, and confusion. Shoppers want to find comfort and safety in malls. They may feel lost and insecure due to not understanding the language spoken of the sign used. Thus, signs should not be based on a specific language; they should be based on universal pictographs. The wayfinding process in shopping malls may be too costly in terms of time and psychology (Chebat, Chebat & Therrien, 2005). For reducing these costs, the building should provide a legible environment for the users.

4. THE CASE STUDY

Wayfinding and legibility is a crucial topic in the field of environmental psychology and many studies have since explored wayfinding in buildings and the reasons for its difficulties. Studies that concentrated on legibility and for the way of easing the problem of a setting has not been conducted enough with the contribution of pointing task procedure in shopping malls. This study was aimed to concentrate on the legibility of a shopping mall with the effects of EDE and individual differences.

The hypotheses of study are as follows:
Hypothesis 1: EDE affects the legibility of the building.
Hypothesis 2: Gender differences influences the use of EDE.
Hypothesis 3: Familiarity influences the use of EDE.

4.1. Method of the Study

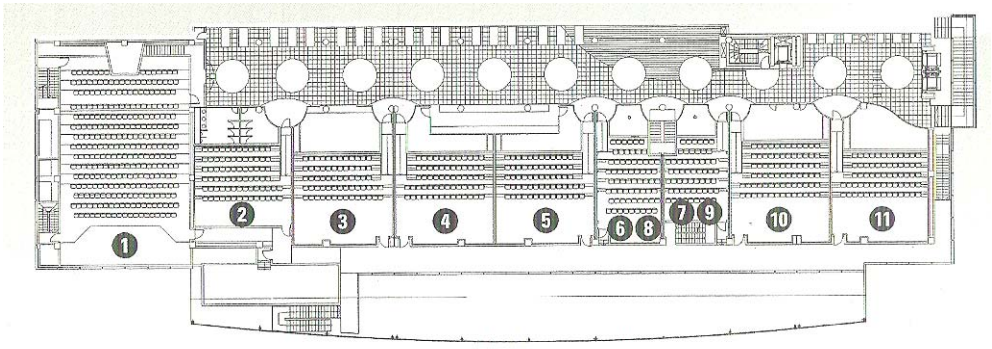
4.1.2. Environmental Setting

In order to explore the effects of EDE on the legibility of a shopping mall, the current study was conducted on a shopping mall which is one of the most popular and used settings in Ankara, Turkey. The shopping mall is used by heterogeneous visitors in terms

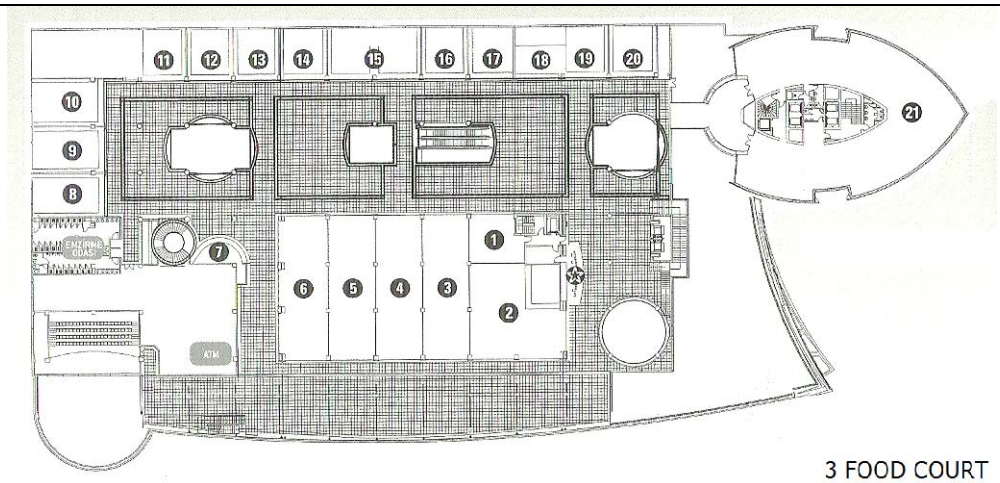
of gender, age, occupations, income level and so forth. The research was conducted during weekends, as it is considered the number of visitors in a setting may have effect on participants' perception of space and wayfinding performances.

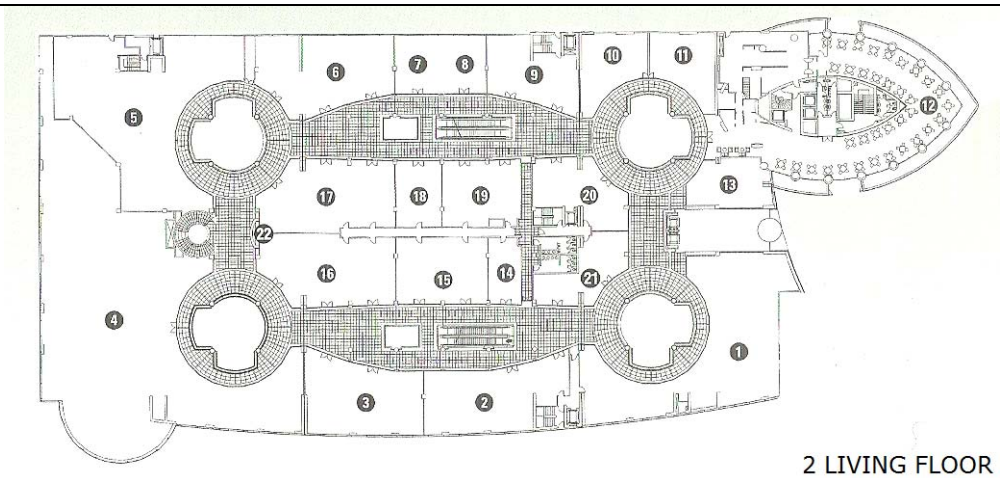
The spatial layout and EDE of shopping mall was analyzed to constitute the proper questions and techniques for the study. There are four different entrances to the building. The main entrance is on the entrance floor. It is significant and perceived from a distance and leads visitors to the information desk. The information desk is visually accessible for visitors and the security guards are helpful when needed. The second and the third entrances are on the shopping floor. All three entrances are accessible from car parking areas and reach directly to the shops. The fourth entrance is connecting the building to the underground parking lot and is on the market floor.

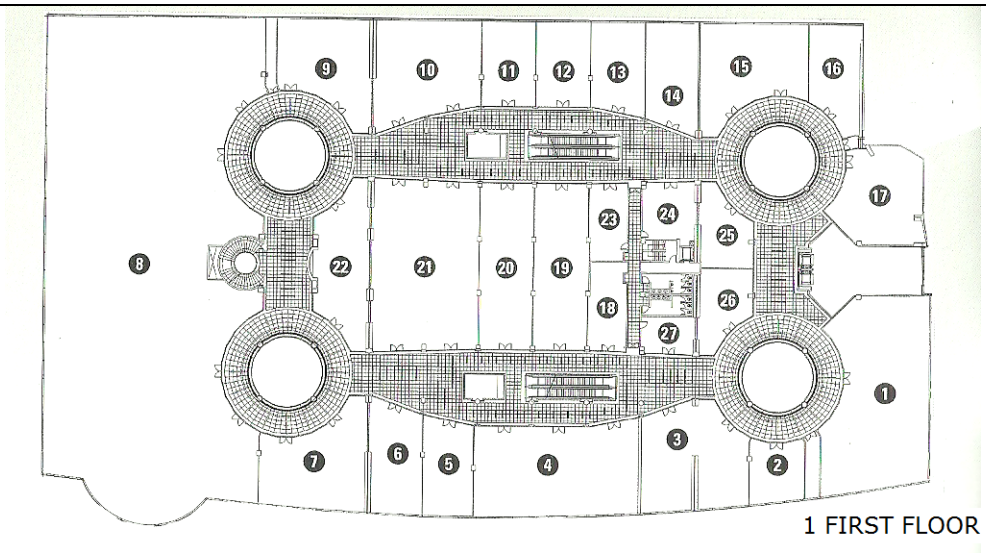
The plan layout is almost symmetrical and almost the same in each floor. The market floor, food court and cinema floor are differed from the other four shopping floors. The plan layouts of the shopping floors are the same. The shops on the floors are gathered around two main axes. These two main axes bring visitors to vertical circulation systems - escalators, stairs, elevators. WC's and service lines are located in corridors connecting two axes (see Figure 1 for floor plans of the shopping mall).



4 CINEMA FLOOR


3 FOOD COURT


2 LIVING FLOOR


1 FIRST FLOOR

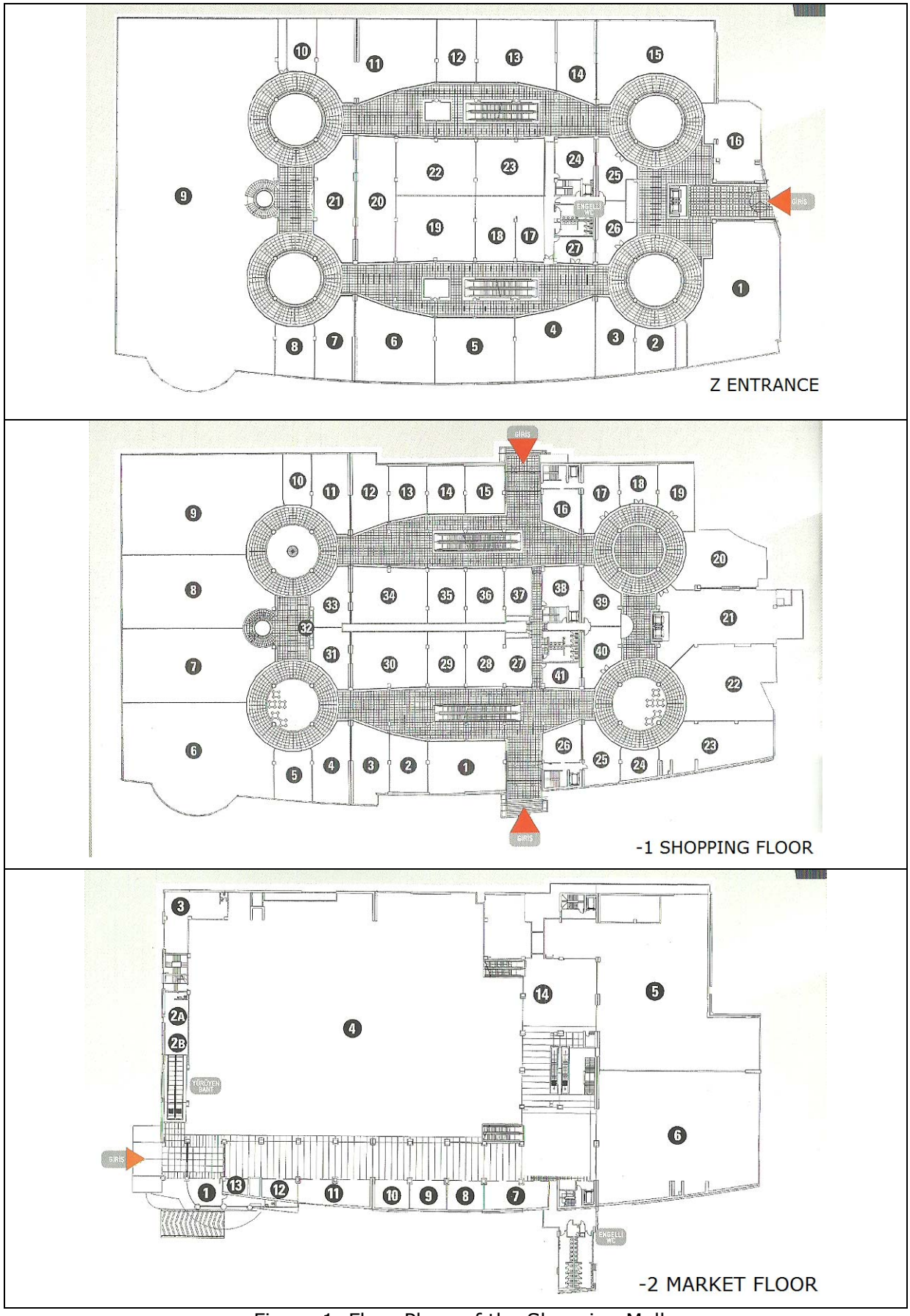


Figure 1. Floor Plans of the Shopping Mall

Information signs located on the landing and exit points of all escalators and the names of the stores in the respective floors are written on them. The location, illumination, color and typography of signs have a crucial role in representing beneficial and functional information systems. Pollett & Haskell (197) reported that 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. The locations of information sign are visible at intersections in this mall. However, the texts are more than five lines, the character height and font types are not appropriate to readability and because of the artificial illumination and the material of the surface, there is glare on them. On the other hand, there is an optimal contrast between the text and the background. The color of the text is white on dark gray background that makes the contrast convenient (see Figure 2 for information sign). In addition, the graphic signs are plain and typographies are used for "WC" and "Exit", written in English. The exit signs are placed at two main axes.

Figure 2. Information Sign

4.1.3. Participants

The procedure of individual interviewing and pointing task of the study was comprised of a hundred and twenty people who are visiting the shopping mall. They were chosen by stratified quota sampling based on their gender and familiarity. In order to achieve a

more sound statistical result, the distribution of gender and familiarity with the mall of the participants were equally doled out (see Table 1 for the distribution of participants).

Table 1. Distribution of the Participants.

INDIVIDUAL INTERVIEWING AND POINTING TASK		GENDER		
		Female	Male	Total
FAMILIARITY	Familiar	30	30	60
	Unfamiliar	30	30	60
	Total	60	60	120

4.1.4. Individual Interviewing

In this study, structured individual interviewing was conducted. The interview questions consisting of two parts: the first part asked for general information about the participants and asked information about their frequency of visiting the shopping mall to understand their familiarity; the second part consisted of questions about the usage of EDE in wayfinding process, the reason for their usages, their opinions about the EDE of the mall.

4.1.5. Pointing Task

In the second phase of the interview, the participants performed a "pointing task". The participants were asked to direct the location of a specific shop in the mall. The shop was selected as it is located at the left of the main entrance floor that can be an important clue for wayfinding. The participants were asked to perform pointing task one by one. They were asked to show the location of the shop with their fingers, while they were positioned in the midpoint of the food court, turning their bodies towards the north, where a store was on the right side of them. They used the technique of an index finger while they were stretching their arm, turning their whole body towards the pointed direction. The answers were analyzed for understanding the participants' awareness and knowledge about the layout of the building and if they use any specific point as landmark for this task.

5. RESULTS

Statistical Package for the Social Sciences (SPSS) 12.0 was used to analyze the data. In the analyses of the data, the chi-square test, chi-square goodness of fit test and frequency tables were used.

5.1. Individual Interviewing

The analyses of the statistical evaluations from the individual interview are given in respect to the research hypotheses.

5.1.1. Effects of EDE on the Legibility of the Mall

In order to analyze the effects of EDE on the legibility of the mall, the usage of the architectural and informational design elements were asked to the participants. The hypothesis of the effects of EDE on the legibility of the building were assessed by comparing the percentage of using any EDE and percentage of not using any EDE during finding the way around in the mall. According to the descriptive analyses, EDE was used by 98 of 120 participants (total of the usage of EDE) for making the setting legible (see Table 2 for frequency and valid percents). The fact that the number of participant who use EDE to make the setting legible and to find their way is much higher than those who do not use any EDE indicates that the EDE are effective for legibility of the mall. Thus, the first hypothesis is confirmed.

Chi-Square Goodness Of Fit Test was used to compare the usage of EDE. It was indicated that, there is a significant difference between EDE in their usage (χ^2=48,417, df=4, p=,000). Signage system of the mall are the most preferred EDE (%42,5) for finding a way in that mall as followed by not using any EDE (%21,7).

Table 2. Results of the Usage of EDE by Frequency and Percentage.

		Frequency	Valid Percent
Valid	SIGNAGE	51	42,5
	LANDMARK	5	4,2
	INFORMATION DESK	16	13,3
	NOT USING ANY EDE	26	21,7
	ASKING SOMEBODY	22	18,3
	Total	120	100,0

5.1.2. Influence of Gender on the Use of EDE

To determine if there is a significant difference between the female and male participants of the study on their usage of EDE, Chi-Square Test was conducted. According to the analysis, there is a significant difference between gender on their usage of EDE (χ^2=24,476, df=4, p=,000). The frequency of female and male participants of using EDE

for the process of finding the way in the setting showed that, male participants almost always use EDE, while female participants may prefer not to use any EDE for the process (see Table 3 for frequency of female and male participants and their usage of EDE). The second hypothesis is verified by the statistical analyses.

Table 3. Results of the Usage of EDE in Respect to Gender Difference by Frequency and Percentage.

			GENDER		
			FEMALE	MALE	Total
EDE	SIGNAGE	Count	23	28	51
		% within EDE	45,1%	54,9%	100,0%
		% within GENDER	38,3%	46,7%	42,5%
		% of Total	19,2%	23,3%	42,5%
	LANDMARK	Count	5	5	10
		% within EDE	50,0%	50,0%	100,0%
		% within GENDER	8,3%	8,3%	8,3%
		% of Total	4,2%	4,2%	8,3%
	INFORMATION DESK	Count	7	9	16
		% within EDE	43,8%	56,2%	100,0%
		% within GENDER	11,7%	15,0%	13,3%
		% of Total	5,8%	7,5%	13,3%
	NOT USING ANY EDE	Count	20	1	21
		% within EDE	95,2%	4,8%	100,0%
		% within GENDER	33,3%	1,7%	17,5%
		% of Total	16,7%	,8%	17,5%
	ASKING SOMEBODY	Count	5	17	22
		% within EDE	22,7%	77,3%	100,0%

	% within GENDER	8,3%	28,3%	18,3%
	% of Total	4,2%	14,2%	18,3%
Total	Count	60	60	120
	% within EDE	50,0%	50,0%	100,0%
	% within GENDER	100,0%	100,0%	100,0%
	% of Total	50,0%	50,0%	100,0%

5.1.3. Influence of Familiarity with the Use of EDE

The usages of EDE between the participants familiar with the mall and participants unfamiliar with the mall was analyzed by Chi-Square Test . According to the analysis there is a significant difference between familiar and unfamiliar participants on their usage of EDE (χ^2=25,036, df=4, p=,000). The frequency of familiar and unfamiliar participants of using EDE for the process of finding the way in the setting showed that, unfamiliar participants use the signage system and information desk more than familiar participants. In addition, the number of familiar participants who may not use any EDE in the process of finding the way is more than unfamiliar participants (see Table 4 for frequency of familiar and unfamiliar participants and their usage of EDE).

Table 4. Results of the Usage of EDE in Respect to Familiarity Difference by Frequency and Percentage.

			FAMILIARITY		
			FAMILIAR	UNAFAMILIAR	Total
EDE	SIGNAGE	Count	21	30	51
		% within EDE	41,2%	58,8%	100,0%
		% within FAMILIARITY	35,0%	50,0%	42,5%
		% of Total	17,5%	25,0%	42,5%
	LANDMARK	Count	9	1	10
		% within EDE	90,0%	10,0%	100,0%
		% within FAMILIARITY	15,0%	1,7%	8,3%

		% of Total	7,5%	,8%	8,3%
	INFORMATION DESK	Count	2	14	16
		% within EDE	12,5%	87,5%	100,0%
		% within FAMILIARITY	3,3%	23,3%	13,3%
		% of Total	1,7%	11,7%	13,3%
	NOT USING ANY SOURCE	Count	17	4	21
		% within EDE	81,0%	19,0%	100,0%
		% within FAMILIARITY	28,3%	6,7%	17,5%
		% of Total	14,2%	3,3%	17,5%
	ASKING SMOELSE	Count	11	11	22
		% within EDE	50,0%	50,0%	100,0%
		% within FAMILIARITY	18,3%	18,3%	18,3%
		% of Total	9,2%	9,2%	18,3%
Total		Count	60	60	120
		% within EDE	50,0%	50,0%	100,0%
		% within FAMILIARITY	100,0%	100,0%	100,0%
		% of Total	50,0%	50,0%	100,0%

5.2. Pointing Task

The participants were asked to direct the location of a specific shop in the mall for understanding their awareness and knowledge about the building. The results showed that there is no significant difference between participants who successfully completed the task and those who have failed (see Table 5 for the frequency and valid percent).

Table 5. Results of the Pointing Task Performance by Frequency and Percentage.

		Frequency	Valid Percent
Valid	CORRECT	64	53,3
	INCORRECT	56	46,7
	Total	120	100,0

To determine if there is a significant effect of gender on pointing task performance of the participants, Chi-Square Test was conducted. The analysis pointed out that there is not a significant difference between female and male participants (χ^2=,000, df=1, p=1,000). They were performed almost equal.

In addition to gender difference, familiarity differences were tested by Chi-Square Test. According to the analysis, there is a significant difference between familiar and unfamiliar participants on their pointing task performance (χ^2=19,286 df=1, p=,000). Familiar participants performed more accurate in this task (see Table 6 for the frequency and valid percent).

Table 6. Results of the Pointing Task Performance in Respect to Familiarity Difference by Frequency and Percentage.

			FAMILIARITY		
			FAMILIAR	UNAFAMILIAR	Total
POINTINGTASK	CORRECT	Count	44	20	64
		% within POINTINGTASK	68,8%	31,2%	100,0%
		% within FAMILIARITY	73,3%	33,3%	53,3%
		% of Total	36,7%	16,7%	53,3%
	INCORRECT	Count	16	40	56
		% within POINTINGTASK	28,6%	71,4%	100,0%

	% within FAMILIARITY	26,7%	66,7%	46,7%
	% of Total	13,3%	33,3%	46,7%
Total	Count	60	60	120
	% within POINTINGTASK	50,0%	50,0%	100,0%
	% within FAMILIARITY	100,0%	100,0%	100,0%
	% of Total	50,0%	50,0%	100,0%

6. DISCUSSION AND CONCLUSION

Shopping is an essential activity and a form of leisure. Today people go malls for not only acquire the goods required for daily use but also for getting social. The design of shopping malls facilitates social interaction by hosting various activities in such as pubs, cafes, cinema, theatre, sport centers etc. As a centre offering various areas of consumption, shopping malls should try to purvey their shoppers' physiological and psychological needs for safety and comfort. Especially in large-scale settings, shoppers need to be able to find what they want. Shoppers may become exhausted by inadequate EDE within the mall and they may become unable to find their way around. This process may end up with stress and anxiety. In addition, time efficiency is one of the main advantages of shopping in the malls due to the services offered. In addition, time efficiency is one of the main advantages of shopping malls as all the general and special needs are met in a single environment, without the need to go to different buildings. Thus, by creating legible settings, shoppers can complete their needs in a short time and the time spend advantage can be maintained.

Legible environments offer visitors security and heighten the potential depth and intensity of human experience. It means the apparent clarity of the environment is crucial in environmental setting (Lynch, 1960). Today, with the increase number of large scale shopping malls, many shoppers may have problem in finding their way especially due to the complexity of setting. Thus, EDE, which comprises layout, landmarks, orientation aids and signage and their collaborative involvement with the setting, became critical for reducing problems.

The main concentration of this study was to investigate the legibility of shopping mall with respect to the EDE. As supported by the literature survey, these elements are

expected to affect the legibility of the building as shoppers preferred to use these elements for their wayfinding process (Ng, 2003). The findings of the current study supported the literature in the fact that the number of participant who use EDE to make the setting legible and to find their way is much higher than those who do not use any EDE. It indicates that the EDE is effective for legibility of the mall. By this result, the first hypothesis of the study confirmed. According to the results, signage systems of the mall are used most frequently than the other EDE (see Table 2). 26 participant from 120 stated that they do not use any EDE for their wayfinding process. They trust their wayfinding abilities without using any signs or landmarks, also they stated that their main purpose is visiting and shopping. Therefore, for them, using a specific clue is not necessary in the shopping mall, as the main intent is leisurely shopping.

Although signage systems of the mall found mostly preferred EDE by the participants in the mall, many of them was complaining about the design of the information signage. They mentioned that the font size of the text, the color choice of the text and the background, the glare on the signage surface and the overload in the information affects the legibility of signage and makes confusion. The reasons for that complaint are very important as they prevent respondents' ability to read.

Landmarks, work as a reference point to show the location of other points in the environment and they are remembered and perceived by their shape and structure (Osmann & Wiedenbauer, 2004). It is one of the most important support for the legibility of a building. However, only 5 participant from 120 stated that they use landmarks as EDE. This may have been due to the lack of a visual attraction spot in the mall. Thus, participants were asked to what they defined and used as landmark. Most of them stated that they use the specific shops, which they used frequently as reference points. In addition, the specific properties of the layout such as atrium holes, location of the vertical circulation systems, and the grouping of the shops according to their specialization are stated to use as landmarks.

Gender influences the use of EDE and it affects the wayfinding process. Studies in the literature have been reported the gender differences (e.g. Lawton et. al., 1996; Schmitz, 1999; Lawton, 2001; Lawton & Kallai, 2002 etc.). In this study, it was hypothesized that there will be a significant difference between female and male participants in respect to their usage of EDE. Shopping is stereotypically a female activity. This leads to consider shopping values as a mediating variable between gender and wayfinding efficiency (Chebat, Chebat & Therrien, 2008). In other words, female shoppers was assumed to differ from male shoppers in the sense that they enjoy more the activity of shopping that

may makes them cognitively more alert in shopping malls. Therefore, in line with the literature, it is reported a significant difference between gender on their usage of EDE. Male participants usually use EDE, while female participants may prefer not to use any EDE for finding their way (see Table 3). As stated before, females enjoy spending time in shopping malls. Thus, it is not surprising that they are not specifically concentrated on focusing their target. It is more important to be socially interacted in shopping mall by spend more time in it. Males are more focused to solve the problems by direct information gathering. Because of that, males prefer to ask directly the security guard in front of the information desk or the other shopper where they want to go.

Familiarity is one of the essential factors that influence the use of EDE. The length of time living in an environment develops familiarity toward that environment and becoming familiar to a particular environment improves the ability of finding the way around. In this study, the usages of EDE between the participants familiar with the mall and participants unfamiliar with the mall were analyzed. According to the analysis, there is a significant difference between familiar and unfamiliar participants on their usage of EDE. The usages of EDE of unfamiliar participants are more than the familiar one.

In the study, the participants were asked to perform a pointing task in which they asked to direct the location of a specific shop to understand their knowledge of the building. The results showed that there is no significant difference between participants in terms of their performances. The participants who performed accurately used same landmarks that are the main entrance, information desk and the escalator, which goes up to the food-court, when they performed pointing task. No gender differences were found in the pointing task process. However, familiar participants performed more accurate in this task as it was expected.

This study provides some insight on the relationship between spatial factors and legibility of the buildings. It emphasizes the critical role of EDE on the peoples' spatial knowledge and wayfinding abilities. To provide physiologically and psychologically, more secure and comfortable environments, the results of the study should be taken into account.

7. REFERENCES

Abu-Ghazzeh, T. M. (1996). Movement and wayfinding in the King Saud University built environment: A look at freshman orientation and environmental information. *Journal of Environmental Psychology*, 16, 303-318.

Arthur, P., & Passini, R. (1992). Wayfinding: People, Sign and Architecture. New York:McGraw-Hill.

Bloch, P. H., Ridgway, N. M., & Dawson, S. A. (1994). The shopping mall as consumer habitat. *Journal of Retailing*, 70, 23-42.

Bourdeau, L. & Chebat, J. C. (2003). The effect of signage and location of works of art on recall of titles and paintings in art galleries. *Environment and Behavior*, 35 (2), 203-226.

Carpman, J.R., & Grant, M.A. (2002). Wayfinding-abroad view. *Handbook of Environmental Psychology*. R.B. Bechtel & A. Churchman, Ed. JohnSons, Inc., Newyork:USA.

Chebat, J.C., Chebat, C.G., & Therrien, K. (2005). Lost in a mall, the effects of gender, familiarity with the shopping mall and the shopping values on shoppers' way finding processes. *Journal of Business Research*, 58, 1590-1598.

Chebat, J.C., Chebat, C.G., & Therrien, K. (2008). Gender-related wayfinding time of mall shoppers. Journal of Business Research, 61 (10), 1076-1082.

Cornell, E., Sorenson, A., & Mio, T. (2003). Human sense of direction and wayfinding. *Annals of the Association of American Geographer*, 93, 399-425.

Cubukcu, E. & Nasar, J. L. (2005). Relation of physical form to spatial knowledge in large-scale virtual environments. *Environment and Behavior*, 37 (3), 397-417.

Danielsson, C. (2005). Environmental stressors and their effects on health, creativity and interaction. [Online] Available: http://scholar.google.com/scholar?hl=en&Ir=&q=cache:q9ITZO0jWPEJ:www.syd.kt

Darken, R. P. & Peterson, B. (2002). Spatial orientation, wayfinding and representation. *Handbook of virtual environment technology* (pp.1-22). Stanney, K. Ed.

Doğu, U., & Erkip, F. (2000). Spatial factors affecting wayfinding and orientation. *Environment and Behavior*, 32, 731-755.

Giuliani, R. W. (2001). *Universal Design New York*. New York: Mayor Publication.

Golledge, R. G: (1999). *Wayfinding Behavior: Cognitive Mapping And Other Spatial Processes.* London: The Johns Hopkins University Press.

Herzog, T. r. & Leverich, O. L. (2003). Searching for legibility. *Environment and Behavior*, 35 (4), 459-477.

Hidayetoğlu, M. L., Yıldırım, K. & Akalın, A. (2012). The effects of color and light on indoor wayfinding and the evaluation of the perceived environment. Journal of Environmental Psychology, 32, 50-58.

Hölscher, C., Meilinger, T., Vrachliotis, G., Brösamle, M. & Knauff, M. (2006). Up down the staircase: Wayfinding strategies in multi-level buildings. Journal of Environmental Psychology, 26, 284-299.

Hunt, E. & Waller, D. (1999).*Orientation and wayfinding: A review. (ONR technical report N00014-96-0380).* Arlington, VA: Office of Naval Research.

Kaplan, S. & Kaplan, R. (1982). Cognition and Environment: Functioning in an Uncertain

World. NewYork: Praeger.

Lawton, C.A. (2001). Gender and regional differences in spatial referents used in direction giving. *Sex Roles*, 44, 321-337.

Lawton, C.A., Charleston, S.I., & Zieles, A.S. (1996). Individual and gender-related differences in indoor wayfinding. *Environment and Behavior*, 28, 204-219.

Lawton, C.A., & Kallai, J. (2002). Gender differences in wayfinding strategies and anxiety about wayfinding: A Cross-cultural comparison. *Sex Roles*, 47, 389-401.

Lynch, K. (1960). *The Image of the City*. Cambridge: the Technology Press & Harvard University Press.

Marquez, J. J., Oman, C. M. & Liu, A. M. (2004). You-Are-Here Maps for international space station: Approach and guidelines. Massachusetts Institute of Technology. Retrieved December 11, 2006, from http:// web.mit.edu/amliu/www/Papers/Marquez-YAH-2004-01-2584-pdf

Meilinger, T., Knauff, M. & Bülthoff, H. H. (2006). Proceedings of the 28th Annual Conference of the Cognitive Science Society: *Working memory in wayfinding-a dual task experiment in a virtual city.*

Miller, C. & Lewis, D. (1999). Wayfinding: Effective Wayfinding and Signing Systems-Guidance for Healthcare Facilities. London: The Stationery Office Books.

Montello, D. R. & Sas, C. (2006). Human factors of wayfinding in navigation. Retrieved December 05, 2018, from http://eprints.lancs.ac.uk/42335/1/MontelloSas.pdf

Muhlhausen, J. (2006). Wayfinding is not signage. Signs of the Times. Retrieved September 12, 2006, from http://er1org/docs/sample%20solutions/Commentary/Wayfinding%20Is%20Not%20Signage.htm

Ng, C. (2003). Satisfying shopper's psychological needs: From public market to cyber-mall. *Journal of Environmental Psychology*, 23, 439-455.

Osmann, P.J., & Wiedenbauer, G. (2004). The representation of landmarks and routes in children and adults: A case study in a virtual environment. *Journal of Environmental Psychology*, 24, 347-357.

Passini, R. (1984). *Wayfinding in Architecture.* New York: Van Nostrand Reinhold.

Pollett, D. & Haskell, P. (1979). Sign systems for libraries: solving the wayfinding problem. In D. Levine (Ed.), *Universal Design New York2*. (pp.54-74). New York: Idea Publications.

Prestopnik, J.L., & Ewoldsen, B.R. (2000). The relations among wayfinding strategy use, sense of direction, sex, familiarity, and wayfinding ability. *Journal of Environmental Psychology*, 20, 177-191.

Raubal, M., & Winter, S. (2002). Enriching wayfinding instructions with local landmarks. *GIScience*, 2478, 243-259.

Reginald, G. (1999). Human wayfinding and cognitive maps. *Wayfinding Behavior: Cognitive mapping and other spatial processes.* John Hopkins University Press: Baltimore, MD.

Schmitz, S. (1999). Gender differences in acquisition of environmental knowledge related to wayfinding behavior, spatial anxiety and self-estimated environmental competencies. *Sex Roles*, 41, 71-93.

Werner, S. & Schindler, L. E. (2004). The role of spatial reference frames in architecture: Misalignment impairs way-finding performance. *Environment and Behavior*, 36 (4), 461-482.

Xie, H., Filippidis, L., Gwynne, S., Galea E. R., Blackshields, D. & Lawrence, P. J. (2007). Signage legibility distances as a function of observation angle. Journal of Fire Protection Engineering, 17 (1), 41-64.