SPATIAL FACTORS AFFECTING WAYFINDING AND ORIENTATION
A Case Study in a Shopping Mall

UFUK DOGU *is a Ph.D. student and graduate assistant in the Department of Interior Architecture and Environmental Design, Faculty of Art, Design, and Architecture at Bilkent University, Ankara, Turkey. Her research interests are in environmental psychology and environmental design.*

FEYZAN ERKIP, *Ph.D., is an assistant professor in the Department of Interior Architecture and Environmental Design, Faculty of Art, Design, and Architecture at Bilkent University, Ankara, Turkey. Her research interests are in environmental psychology, environmental design, service distribution, and social justice in the city.*

ABSTRACT: Although wayfinding and orientation in complex buildings is an important criterion for environmental behavior, research on the subject remains limited and the issue is not considered sufficiently during the design process. This article examines the factors that affect wayfinding behavior of individuals in a shopping mall and explains how their behaviors are influenced by factors such as building configuration, visual accessibility, circulation systems, and signage. The case study conducted in a mall in Turkey draws a sample profile of Turkish society from a wayfinding point of view. The relation between wayfinding behavior and shopping activity is discussed. The results show that people did not find the signage system sufficient. Although they found the mall an easy setting from the wayfinding point of view, they still required better solutions to find specific destinations such as telephone booths, restrooms, or stores located in parts of the building that were not visually accessible.

It is possible to identify a person's information-processing capabilities as they relate to architectural elements and space. Difficulties may arise when a person is taking in information from the environment and trying to comprehend or decipher it and then process the acquired information. Lynch's (1960)

AUTHORS' NOTE: *Correspondence should be addressed to Ufuk Dogu, Faculty of Art, Design, and Architecture, Department of Interior Architecture and Environmental Design, Bilkent University, 06533, Ankara, Turkey.*

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concept of legibility has had a profound influence on the fields of planning and architecture. Although the architecture itself, that is, the 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.

The legibility of key architectural elements, such as entrances, horizontal and vertical circulation, and major landmarks, is a prerequisite to understanding the spatial organization of a building. If the space does not have a clear spatial organization, it is not understood, hence it has a low legibility factor and does not help with wayfinding. The principle of its spatial organization has to be communicated to the wayfinding users (Arthur & Passini, 1992). The legibility of an architectural environment has been found to affect the usefulness of a wide range of building types. Its effect goes beyond mere ease-of-use of a building and includes other variables such as personal comfort. Wener and Kaminoff (1983) found that legibility in a correctional center significantly reduced user confusion, anger, perceived crowding, and overall emotional discomfort. The addition or deletion of certain architectural elements, for example, signage, can manipulate legibility of a place. However, even the graphics of signage systems—the choice of lettering; the contrast created by black, white, and colored elements; the size; the position; and illumination of a sign—all contribute to its comprehension, hence to the legibility of a space (Passini, 1984).

One obvious and potentially powerful influence on wayfinding behavior may be the degree of familiarity an individual has with a given setting. If familiarity is increased to sufficient levels, initial difficulties in orientation may be overcome. This will enable efforts to be directed toward increasing the knowledge level of naive users of a setting. If, on the contrary, familiarity alone does not explain disorientation, then other factors, such as visual or spatial features of the environment, ought to be considered (Weisman, 1981). There have been studies designed to examine various effects of building familiarity in conjunction with other variables. Garling, Lindberg, and Mantyla (1983) found that accuracy in locating "building targets" was positively correlated with familiarity and with "free-viewing-access." When we move about in a familiar environment we seldom experience disorientation. We also seem to be able to learn new spatial facts with little difficulty. This may be the case in an unfamiliar environment if we possess a legible map and are skilled at using it. Some studies indicate that the acquisition of a cognitive

map by direct observations is an automated process not requiring cognitive resources to any great extent (Moeser, 1988).

Recognition plays an important role in legibility and orientation. Recognition of places is not possible unless the environment is somewhat familiar. Maps, signposts, and other media may play an important role for orientation in unfamiliar environments. People rely on numerous types of environmental information to find their way within buildings. Weisman (1981) developed four groups of environmental variables thought to be influential on wayfinding: (a) visual access to familiar cues or landmarks within or exterior to a building, (b) the degree of architectural differentiation between different areas of a building that can aid recall, and hence orientation, (c) the use of signs and room numbers to provide identification or directional information, and (d) building configuration, which can influence the ease with which one can comprehend the overall layout of the building.

People find their way in complex settings by trying to understand what the setting contains and how it is organized. To form a mental map of the setting, spatial clues must be identified. Among the basic building blocks of cognitive mapping are spatial entities. People can only map these spatial entities if they are distinct, that is, if they have an identity that distinguishes them from surrounding spaces (Arthur & Passini, 1992). Distinctiveness can be achieved by the form and volume of the space that define architectural and decorative elements, and by the use of finishes, light, colors, and graphics (Arthur & Passini). Passini, Rainville, Marchand, and Joanette (1998) emphasize the importance of distinguishing a zone; they suggest that a zone with a strong character may favor a certain spatial identification, if only in the sense of being somewhere distinct. It is assumed that most architectural settings and larger scale environments are too extensive to be perceived in their entirety from any one location. Wright, Lickorish, and Hull (1993) state that finding a particular destination can be difficult in many modern building complexes, where the corridors on different floors can look very much alike. In those circumstances, information regarding specific locations, spatial relationships among those locations, and those locations in relationship to the rest of the building must be stored easily in one's head.

The spatial factors that people rely on differ from one individual to another. In various studies (O'Neill, 1991; Peponis, Zimring, & Choi, 1990; Weisman, 1981), factors such as age, gender, occupation, individual psychology, familiarity with the environment, and so forth have been found to affect the way people find their way and orient themselves in the environment.

SPATIAL FACTORS AFFECTING WAYFINDING AND ORIENTATION

Wayfinding is a process that we go through in our daily life. This process may be as easy as moving from one room to another or as difficult as trying to escape a building on fire. Wayfinding difficulties may cause problems such as loss of time, decreased safety, stress, or discomfort. To eliminate these wayfinding problems users may face, it is important to understand how they are affected by the elements within the built environment. A wayfinding task is affected by two major physical factors: the layout of the setting and the quality of the environmental information. The layout is defined by its spatial content, its form, its organization, and its circulation. Environmental information is the architectural and graphic expression of information necessary to solve wayfinding problems (Passini et al., 1998).

Evans, Smith, and Pezdek (1982) report that the ability of people to recall a building and its location in an urban context depends on a wide range of factors, including shape, the number of persons moving around the building (i.e., crowd), and the physical properties and height of spaces. Lang (1987) states that color helps with the differentiation between elements in a setting and between settings themselves. To make the perception of objects easier, they can be of a color that contrasts with their backgrounds. On the other hand, large brightly colored areas may fatigue the eye and produce afterimages, especially when there is variation in the brightness of the surfaces of the environment. Strong contrasting colors do, however, attract the eye. On the other hand, too many eye-catchers may also create confusion.

Such visual or spatial variables as the types of signage provided, the ability to see through or out of a setting, the extent to which one location looks different from others, and the overall plan or layout of a setting all influence wayfinding behavior (Peponis et al., 1990). In respect to wayfinding, the form of a building's volume is particularly instructive. It provides users with cues about the internal organization and the circulation system. The circulation is, of course, the key organizing force of a layout; it is also the space in which people move and in which they have to find their way. Thus, it is this space that we try to understand and in this space that we have to make our wayfinding decisions (Arthur & Passini, 1992).

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 wayfinding behavior. A number of studies suggest that the complexity of a floor plan configuration is the primary influence on wayfinding performance. Weisman (1981) found that students reported being lost less frequently in university buildings whose floor plans they

judged "simpler" and more "legible." This effect remained consistent even for people who were very familiar with the buildings. Bronzaft and Dobrow (1984) suggest that simplicity and regularity of floor plans aid people in learning about the layout of a setting. O'Neill (1991) found that even with incremental increases in floor plan complexity, people have significantly greater problems with understanding spatial layout and suffer reduced wayfinding performance. He suggested that the complexity of a floor plan form influenced wayfinding performance negatively. Weisman found that the most serious disorientation problems occurred in buildings judged to be complex and difficult to describe by user groups. The main assumption behind floor plans is that they convey information about the layout of a building that cannot be mentally represented until the building is repeatedly traversed, or until the individual traversing the paths gets familiar with the built environment.

The form of the circulation system may not necessarily be visible to the users of a setting. Buildings organized around an open core have the advantage of providing the users with a visual and sometimes auditory access to the form of the circulation system (Arthur & Passini, 1992). The architectural expression of the circulation system makes a building easier to understand. The building form can express the spatial organization of the setting and also the connecting circulation system. The well-articulated building tells us everything about its internal central organization. A person perceiving a well-articulated building is in possession of valuable wayfinding information. The perceived spatial organization serves as a framework for constructing a cognitive map and for integrating information that will be obtained once inside (Arthur & Passini).

Wayfinding design is described as a set of tools devised to help people reach their destination in an unfamiliar environment. With the emergence of large public spaces, which are above the scale of human perception, the need for wayfinding designs has significantly increased. Information can be obtained from various wayfinding support systems such as information booths, signs, and maps, as well as from the architectural and spatial characteristics of a setting (Passini, 1984). Although it is universally acknowledged that putting up signs is an acceptable effort to prevent people from getting lost, it does not always get the desired result. For a variety of reasons, people can often be as lost with the signs as they are without them.

Overall, people make fewer wrong turns in settings with signage than in those without (O'Neill, 1991). Findings suggest that graphic and textual signage may be applied to optimize different aspects of wayfinding. As buildings get larger and more complex, it becomes increasingly difficult to provide adequate wayfinding simply with signs and other cues if the suggested

pattern of movement ignores the ways people use and understand the configuration of a space.

Environmental information may be divided into three categories:

1. Architectural information is contained or inherent in the built environment whether the user is in the building or outside. A building shape or layout may be difficult or easy to read. Nonetheless, even difficult buildings have a wealth of information present in their details: Stairs, lifts, corridors, doorways, and floor finishing are all landmarks used to determine the way to a given destination (Sims, 1991).
2. Graphic information may be further subdivided into general information about building tenants, directions to destinations in a building, and the identification of those destinations.
3. Verbal information includes the sorts of information that can be conveyed to passersby, security guards, and occupants through the use of self-help telephones.

On a practical level, environmental graphic designers and architects need to work together as wayfinding designers. Architecture should not be considered as one element and signage quite another. The roles should be complementary. Contrary to the belief of many architects, the addition of signs to an environment is not consistent with a lack of architectural integrity or design failure (Sims, 1991). Peponis et al. (1990) suggest that wayfinding, assisted by proper signage and considerations of parameters, will seem natural rather than forced when important facilities and key points, such as the entrance, are carefully positioned with respect to the integration core, and when the latter is carefully designed. Graphic information has to be appropriately designed for environmental perception, which consists of the scanning and glancing process. People tend to ignore information displays that are not designed appropriately, or to walk away from such displays after spending a minimum of time in futile search (Arthur & Passini, 1992).

WAYFINDING IN A SHOPPING MALL AS A COMPLEX BUILDING

The activity of wayfinding takes place in every stage of our lives. Finding our way within any complex setting spares us from stress, anxiety, and confusion. Hospitals, airports, and shopping malls are some examples of the most frustrating complex settings when necessary environmental information does not exist. Although wayfinding in shopping malls seems to be a less

important concern than wayfinding in a hospital, wayfinding can become a serious problem for visitors even in spaces of leisure activity. There is a respectable amount of research on wayfinding in shopping malls (see Bolen, 1988; Canter, 1996; O'Neill & Jasper, 1992; Passini, 1995, 1996; Rawdon & Willis, 1993; Yoo, 1992). Visitors expect to find comfort and safety in such spaces. Therefore, a shopping mall should provide security and pleasantness. Visitors may feel lost and insecure, and backtracking may produce inconveniences. Theft, beggars, and homeless people may become disturbing in a shopping mall. The feeling of security is closely related with feeling lost. Foreigners visiting a land where the language is different may feel especially stressed and uncomfortable trying to communicate with strangers. It is easy to become lost in a complex setting when one cannot understand the language spoken or the signs used. Visual noise is distracting when one is trying to understand his or her location within a complex setting; with foreigners the situation may become worse. Thus, signs should not be based on language; on the contrary, they should be composed of universal pictographs.

In the context of a shopping center, Galper (1987) notes that "inability to see from one end of the mall to the other, . . . and the presence of landscaping or architectural features blocking the view of major destinations can contribute to wayfinding problems in these settings" (p. 72). Central to the issue of wayfinding in shopping centers is the idea that wayfinding is at the core of the decisions that direct the shopper's movements through the mall space as he or she goes about finding items to shop for or purchase. In other words, wayfinding is the common and fundamental task that all shoppers must undertake through the shopping center. It may seem that many of the decisions occur almost automatically and with little thought, but in reality the shopper is constantly involved in a process of making decisions and solving wayfinding problems. While looking for a particular item, a shopper may visit several stores during a shopping trip, and these stores may be scattered throughout the mall (Yoo, 1992). With all the reasons for shopping at a shopping mall, and for all resulting patterns of movements through the mall, shoppers are faced with numerous decisions that will guide and determine the spatial extent of the shopping trip. It is well known that our feelings about a shopping mall or other such commercial facilities are colored by how well or how easily we get around within such a facility. Proprietors of department stores used to design around the concept of actually confusing the shoppers on the assumption that if they could keep people on the premises longer, more merchandise would be sold. Developers today are discovering that good wayfinding practice is a positive marketing benefit (Arthur & Passini, 1992).

Shopping activity may be related to the nature of the goods to be purchased and may be affected by the time and financial constraints of the

shopper. Whatever the reason, the individual has basic requirements from the environment. Provision of certain environmental information (i.e., signage, visual accessibility) is necessary for one to reach the necessary destination. Provision of safe and clear spaces (with clear routes and paths) leading to this destination and ease of access are also needed. Passini (1984) found that some people navigating in a large commercial complex relied heavily on the spatial properties of the setting, such as the clarity of the organization of the building, whereas others relied more strongly on signs. In certain complex settings, such as shopping malls, the selection of information could also be too confusing. This is particularly true if wayfinders are bombarded with stimulation from a variety of marketing techniques, signage, sounds, and crowds. In such cases, a condition of overload could develop in which people reduce their intake of information as an ultimate coping device. The result is that even if they are looking at the relevant information, they are not able to process it.

Kaplan (1975) emphasizes that people prefer environmental features that aid spatial understanding and provide cues for additional learning about the environment. In the case of shopping malls, O'Neill and Jasper (1992) state that the amount of knowledge possessed by the consumer influences spatial behavior. Thus, shopping patterns are initially restricted to areas on which information is available. The scope of this pattern enlarges as the consumer learns more about the environment. Consumers are thought to have a certain territory or area containing stores that they are familiar with and might patronize.

Shopping malls, then, should be recognized as complex environments where people often experience wayfinding difficulties. Despite this fact, there are no regulations concerning wayfinding in shopping malls. Esthetic concerns lead urban designers, architects, and interior architects to create complex environments that are confusing. It seems that standards should be established for user safety and satisfaction. Therefore we aimed to test how wayfinding behavior is affected by spatial factors within a shopping mall.

THE CASE STUDY: WAYFINDING IN A SHOPPING MALL IN ANKARA

The aim of this study was to carry out empirical research about the importance of the spatial factors affecting wayfinding and orientation in the Karum shopping mall in Ankara, Turkey. In recent years, shopping in malls has become a part of Turkish daily life. The number of shopping malls in Turkey has been significantly increasing each year (see Table 1).

TABLE 1
Shopping Mall Developments in Turkey

Name	*Location*	*Total Enclosed Area (m^2)*	*Gross Rentable Area (m^2)*	*Year of Opening*
Galleria	Istanbul	79,000	45,000	1987
Atrium	Istanbul		12,000	1992
Akmerkez	Istanbul	55,000	36,000	1993
Capitol	Istanbul	57,000	23,800	1993
Carrousel	Istanbul		18,000	1995
Carrefour	Istanbul			1996
Migros	Istanbul	55,000		1997
Atakule	Ankara	28,500	10,700	1989
Karum	Ankara	48,000	22,500	1991
Galleria	Ankara	18,000		1996
Bursa Sönmez Plaza	Bursa	23,000		1993
Bursa Pembe Çarsi	Bursa	9,862	5,511	1996
Bursa Kumluk	Bursa		12,500	1996
Galleria	Adana	33,000		1993
Outlet Center	Izmit		27,500	1997
Gulfstar	Izmit	29,000	15,300	1997

NOTE: From Tokatli and Boyaci (1998).

In this study, mainly the spatial factors affecting people's wayfinding and orientation were determined and measured in a particular setting, that is, Karum. This is because Karum is one of the most used settings in Ankara by heterogeneous users; people of various gender, age, occupations, and so forth visit the setting. Karum was built in 1991. It was the third shopping mall in Turkey and the second in Ankara. As high density is considered to be a required situation for a shopping mall, the research was conducted during weekends, allowing observation of a high-density condition.

The hypotheses are as follows:

Hypothesis 1: The signage system of a shopping mall is more important than the building configuration for wayfinding and orientation.

Hypothesis 2: The greater the frequency of visits and number of areas visited the greater the improvement in wayfinding.

Hypothesis 3: Gender differences affect wayfinding and orientation.

METHOD

The spatial layout of Karum was analyzed, and questionnaires were used to conduct the case study.

Figure 1: Exterior View of the Karum Shopping Mall

ANALYSIS OF THE SPATIAL LAYOUT OF KARUM

The environmental information in the Karum shopping mall can be categorized and evaluated in terms of the previously mentioned categories: architectural, graphic, and verbal information.

ARCHITECTURAL INFORMATION

The main entrance of the mall is significant and can be perceived from a distance, partly due to the fountain and gathering area in front that mark the mall (see Figure 1). The setting is composed of shops and stores organized around a central atrium, which also greets the visitors from the main entrance and therefore gives them a high visual accessibility. These shops are followed by corridors on each floor separating them from the second row of shops and stores almost all through the periphery of the mall (see Figure 2).

The plan layout is almost symmetrical, and the main entrance leads the visitors to the atrium placed on the main axis. There are three entrances other than the main entrance: one connecting the building to the underground parking lot and the other two connecting to stairs attached to the complex on the right side. These entrances are emphasized by the signage system located at the intersections of the corridors and the atrium (see Figure 3).

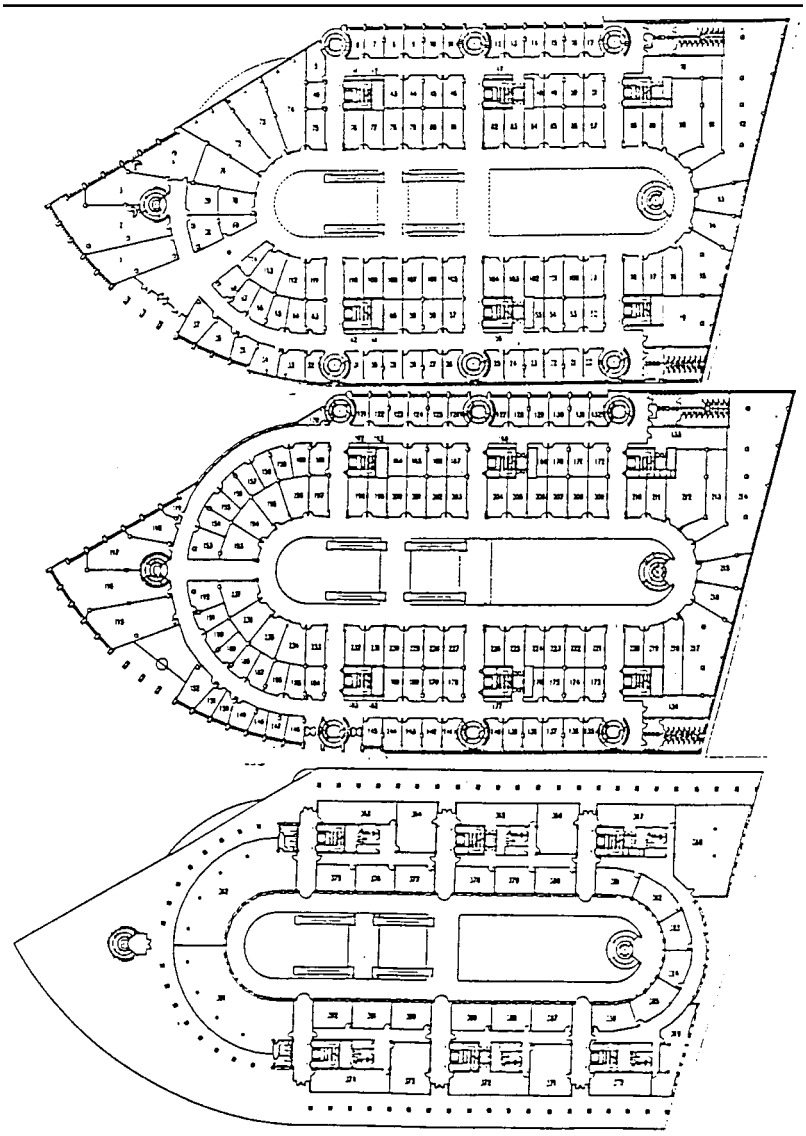

Figure 2: Floor Plans of the Karum Shopping Mall

The two circulation paths (one surrounding the atrium and the other parallel to it between the first and second row of the shops) are connected to each other at right angles on five nodes. These nodes, however, are not dominant.

Figure 3: The Signage of the Entrance of the Underground Parking Lot

Figure 4: A View of the Corridor

The atrium eases most problems of visual accessibility for the shops and stores facing it, but this is by no means the case for the shops located on the secondary corridor (see Figure 4). The corridors in Karum certainly indicate the direction of movement and provide an understanding of the circulation around the building, but this may not be sufficient to find a certain facility located in a place that cannot be perceived.

The elevators and escalators constitute the major elements of the vertical circulation. The setting puts significance on these elements as they are placed in the atrium. The main elevator is placed toward the end of the atrium and can be perceived from the main entrance (see Figure 5). The rest of the elevators are situated on corridors that link the atrium to the secondary corridor.

GRAPHIC INFORMATION

The graphic information provided in Karum sustains a consistency of style. The graphics are plain, and typographies are used only for "WC" and "Exit," written in English. The rest of the information is given by using pictographs. The utility and exit signs are placed at intersection points. The door numbers, however, are confusing. All stores and shops on the ground level are numbered from 1 to 100, but not all shops on the second floor have numbers in the 200s; some of them have numbers in the 300s. The same applies for the third floor, where some shops have numbers in the 400s. The numbers are not completely in order. Apparently, some stores were divided into two after they were numbered, and therefore they were given a number following the last shop built.

The "You Are Here" map and the directory are on the ground floor across from the main entrance. The problem is that they are placed parallel to the axis of approach to the building and people hardly notice them (see Figure 6). When building directories are a part of a particular wayfinding system, they are generally and properly associated with maps. Too often, however, they compound wayfinding difficulties instead of helping solve them (Arthur & Passini, 1992). They may, for example, be organized by bureaucratic hierarchy in the structure of departments rather than by shopper needs. This appears to be the case in Karum. The directory is incoherent and rather confusing. There seems to be a lack of logical and consistent organization that would make it easier to find the item being searched for.

VERBAL INFORMATION

The information desk is situated on the ground floor and is visually accessible for users seeking verbal assistance. In addition, the security guards are helpful when approached (see Figure 7).

Figure 5: A View of the Main Elevator

Figure 6: The You-Are-Here Map and Directory at the Entrance

QUESTIONNAIRE

A questionnaire (see appendix) was handed out to 78 female and 76 male respondents chosen by quota sampling on the basis of sex difference. All respondents were informed about the purpose of the study. The questionnaires were given to adults only during the weekends within the setting. They were questioned separately from each other to prevent bias.

The questionnaire consists of three phases, all with multiple choices (three scale). The questionnaire format was a combination of Weisman's (1981) study, which he used to gather self-report data on a participant's wayfinding behavior and perceptions in a specific setting, and Lawton's (1996) study in which self-reported strategies for indoor wayfinding were identified. The first phase of the questionnaire concerns indoor orientation and asks questions about the frequency of use, the last time the building was visited, the approximate area browsed, and items related to the legibility of the building. The questions related to legibility ask the respondents their knowledge of their direction (orientation) within the building, memory of the direction of the entrance used, knowledge of the relation of the interior and the exterior, self-confidence in directing a stranger to a destination within the building, and so forth. The second phase consists of questions related to indoor route. This phase asks questions related to graphic information, such

Figure 7: A View of the Information Desk

as the usefulness of the signs directing people to different parts of buildings, how helpful You-Are-Here maps are, whether door numbers and information desks were found to be useful, whether numbers were generally noticed, and whether the numbers were sufficient or not in Karum. The third phase of the questionnaire measures the attention of the respondents to architectural information such as symmetry, regularity, the intersection of corridors, memory of landmarks, and lighting systems in general. Respondents were asked about their recollection of these factors and whether they found them to be sufficient in Karum. Finally, in the last phase, the respondents were asked to perform a "pointing task." The respondents pointed out the direction of a shop or store randomly chosen from a list of names after it was determined that the respondents had a familiarity with the building.

ANALYSIS AND RESULTS

Chi-square analysis was used to test the hypotheses. Although the analyses did not verify the first hypothesis that signage was more important than the building configuration for wayfinding and orientation, there was a significant relation between the evaluation of Karum in terms of wayfinding and its

TABLE 2
Evaluation of Signage and You-Are-Here Maps in Karum

Item Evaluated	*Males*	*%*	*Females*	*%*	*Total*	*%*
Signage						
Is sufficient	31	40.78	30	38.46	61	39.62
Is not sufficient	45	59.22	48	61.54	93	60.38
Total	76	100	78	100	154	100
You-Are-Here Maps						
Are sufficient	19	25	30	38.46	49	31.81
Are not sufficient	57	75	48	61.54	105	68.19
Total	76	100	78	100	154	100

signage system ($\chi^2 = 13.91$, $df = 4$, $p < .01$). Participants who evaluated wayfinding as easy found the signs sufficient. However, findings also revealed that a large number of respondents did not notice the signage, and a significant number of the participants who did notice the signage found it insufficient (see Table 2). In addition, there was a statistically significant relation between wayfinding and the You-Are-Here maps ($\chi^2 = 11.55$, $df = 4$, $p < .05$). Although You-Are-Here maps were found to be useful by most respondents, 47% of them claimed that such maps did not exist in Karum (see Table 3). On the contrary, maps of each floor with an indication of the visitor's position in the building exist on the entrance floor at an information booth. But it is obvious that it is not emphasized enough or correctly located so that it can be noticed by most of the visitors (see Figure 6). There was also a relationship between the evaluation of Karum in terms of wayfinding and the door numbers, though not very significant ($\chi^2 = 8.13$, $df = 4$, $p < .10$). Indoor landmarks were found to be noticed by a high range of respondents (see Table 3). Most respondents regarded the cafe area on the entrance floor as a landmark, but few spoke of the fountain located in the center of this area (see Figure 8).

Although most people stated that they always pay attention to the items mentioned in the questionnaire, they did not notice most of these factors in Karum. There may be several reasons for this: poor, insufficient, difficult-to-understand, or carelessly placed signage; confusing floor plan configuration; limited illumination; or lack of emphasis.

The second hypothesis, that greater frequency of visits and amount of space browsed within the shopping mall improved wayfinding and orientation, was not supported by chi-square analysis. On the other hand, there was a significant relation between frequency of visits to Karum and amount of area browsed within the shopping mall ($\chi^2 = 7.77$, $df = 2$, $p < .05$). The results also

TABLE 3
Evaluation of Landmarks in Karum

Landmarks Exist in Karum	*Males*	*%*	*Females*	*%*	*Total*	*%*
Agree	49	64.47	58	74.36	107	69.48
Disagree	27	35.53	20	25.64	47	30.52
Total	76	100	78	100	154	100

supported an association between gender and frequency of visits to the shopping mall, with females visiting the shopping mall more frequently than males ($\chi^2 = 13.17$, $df = 2$, $p < .01$). Therefore, it was hypothesized that gender differences affected the use of environmental information and thus wayfinding and orientation. However, the statistical analyses indicated only the following differences. There was a strong relation between the evaluation of Karum in terms of wayfinding and the signage system only for male participants ($\chi^2 = 19.64$, $df = 4$, $p < .01$). Male participants who evaluated the signage of the mall as sufficient also reported it to be an easy setting from the wayfinding point of view (see Table 4). There was also a relationship between frequency of visits and evaluation of Karum in terms of wayfinding for male participants ($\chi^2 = 8.03$, $df = 4$, $p < .10$).

The participants were also asked to point out a shop that they could not see from where they were given the pointing task. More than 60% of the respondents performed the pointing task correctly: 64.4% of the females and 62.5% of the males. The results in Lawton's study (1996) showed that men were more accurate than women in pointing to unseen landmarks in a building. Our results, however, revealed that women were as accurate as men in the pointing task, although the ratio of a close guess is higher for men (see Table 5). The high accuracy rate for women may be because of the site, with which women are assumed to be more familiar.

It is interesting to note that none of the architectural characteristics of the site (i.e., symmetry, floor plan, lighting) appeared to be statistically significant for the evaluation of wayfinding.

A high percentage of the respondents found the layout of the shops and stores facing the central gallery legible and stated that Karum was an easy setting in which to achieve wayfinding and orientation. This was because Karum is small and has a central open space allowing high visual perception of the whole space (see Figure 9). However, when it came to the back corridor, which takes a considerable amount of space and leads to many shops facing it, the respondents stated that they hesitated or avoided giving directions

Figure 8: View of the Cafe With the Fountain

TABLE 4
Evaluation of Wayfinding and Signage in Karum

Evaluation of Signage	*Females*				*Males*			
	Easy	*Medium*	*Difficult*	*Total*	*Easy*	*Medium*	*Difficult*	*Total*
Sufficient	21	8	1	30	27	4	0	31
Insufficient	32	19	5	53	18	19	8	45
Total	53	27	6	78	45	23	8	76

TABLE 5
Pointing Task Results by Percentage

Pointing Accuracy	*Females*	*Males*	*Total*
Correct	64.4	62.5	63.4
Incorrect	17.8	8.4	13.2
Close	17.8	29.1	23.4

to shops in these areas. They also deemed these areas to be poor in terms of identification and complex in plan. In addition, familiarity was found to be a factor that affected the wayfinding ability of visitors. Respondents reported

Figure 9: An Interior View of the Atrium of Karum

that the more they visited the site, the more familiar they became with it. They therefore found their way and the shops they were looking for more easily. High rate of pointing accuracy may be an indication of familiarity with the site, but this relation needs to be analyzed further.

CONCLUSION

The relationship between wayfinding and shopping activity was thought to be best observed in shopping malls. Because physical factors such as directories, You-Are-Here maps, utility signs, exit signs, and information desks influence wayfinding performance, they were also studied and discussed. As supported by the literature survey, spatial factors have significant effects on the wayfinding and orientation of individuals. Building configuration, visual accessibility, circulation paths, and signage are important aspects influencing people significantly as they navigate within structures. Although these aspects other than signage did not appear to be significant for wayfinding in this case study, the degree of influence they have on individuals needs further investigation.

Cultural norms and traditions may also influence an individual's wayfinding abilities. Previous studies (e.g., Lawton, 1996) support that experi-

ential factors (i.e., greater opportunities for boys than girls to engage in activities that help to develop directional skills) may be included in explanations of gender differences in spatial behavior; perhaps women are encouraged to shop at the early stages of their lives and therefore get more acquainted with shopping areas, whereas men have the opportunity to develop their skills at exterior performances (e.g., driving). Perhaps this could be considered as an important factor explaining different cultures' wayfinding performance in general and the equivalence of the women's performance to that of the men on the pointing task in this case study. Males' higher performance in getting a close guess supports previous findings of their superiority in directional skills.

Contrary to the belief that women in Turkey are forced to stay at home, they are interested in leisure activities outside of their homes and participate in events that support socializing. Today, shopping has become closely connected with leisure activities in Turkey, giving women an opportunity to take a break from their daily routines and letting them become more familiar with the malls they use most often. Malls provide everybody, particularly women, with a safe and controlled environment in which they can relax alone, with their friends, or with their children. However, everybody needs a clearer understanding of the spaces in which their activities take place. This study has pointed out such a need even for familiar users. It may be asserted that certain aspects of interior space design such as space design quality, signage, landmarks, floor plan configuration, and maps may combine with individual characteristics such as familiarity, preferences, habits, and so forth to form an overall means of wayfinding and orientation. Thus, to provide a healthy and successful milieu to all users, importance should be given to the notion of space quality from the wayfinding point of view, taking it into consideration in the early steps of design. Hirtle and Sorrows (1998) address the importance of constructing a tool that allows individuals of different cognitive abilities to avail themselves of the information necessary for wayfinding and orientation. On a practical level, environmental graphic designers and architects need to work together as wayfinding designers. Architecture should not be considered as one element and signage quite another; the roles should be complementary.

APPENDIX
The Questionnaire Form

KARUM FEMALE ❑ MALE ❑

PART I:

1. How often do you visit this building?
   Regularly ❑ Sometimes ❑ Rarely ❑
2. When was the last time you visited this building?
   Less than a week ❑ Between a week and a month ❑ More than a month ❑
3. Usually, how much of the building do you get around in each visit?
   A few shops ❑ A certain floor ❑ All or almost all ❑
4. Every time I turn a corner, I know which direction I am facing.
   Always ❑ Sometimes ❑ Never ❑
5. I know which direction I am facing within the building, without thinking about it.
   Always ❑ Sometimes ❑ Never ❑
6. I keep in mind which direction of the building I entered from.
   Always ❑ Sometimes ❑ Never ❑
7. I think about my location within the building (north, south, east, west).
   Always ❑ Sometimes ❑ Never ❑
8. It is difficult for me to understand the direction I am facing in the building.
   Always ❑ Sometimes ❑ Never ❑
9. I can imagine what is outside the building in the direction I am facing within the building.
   Always ❑ Sometimes ❑ Never ❑
10. What is the most "lost" you have ever become in this building?
    Never ❑ Just momentarily disoriented ❑ Totally lost ❑
11. How do you find this building in terms of "wayfinding"?
    Easy ❑ Medium ❑ Difficult ❑
12. How confident would you be in giving directions to a person who is a stranger to this building?
    Very confident ❑ Medium ❑ Not at all confident ❑

PART II:

1. Signs pointing out paths that go to different parts of the building that can be easily perceived are useful to me.

   A. GENERALLY:
   Always ❑ Sometimes ❑ Never ❑

   B. IN KARUM:
   Sufficient ❑ Insufficient ❑ Do not exist ❑

2. A You-Are-Here map showing my location within the building with an arrow is useful to me.

   A. GENERALLY:
   Always ❑ Sometimes ❑ Never ❑

   B. IN KARUM:
   Sufficient ❑ Insufficient ❑ Do not exist ❑

3. Signs showing different parts of the building and clearly written door numbers are useful to me.

   A. GENERALLY:
   Always ❑ Sometimes ❑ Never ❑

   B. IN KARUM:
   Sufficient ❑ Insufficient ❑ Do not exist ❑

4. The presence of someone to give directions is useful to me.

   A. GENERALLY:
   Always ❑ Sometimes ❑ Never ❑

   B. IN KARUM:
   Sufficient ❑ Insufficient ❑ Do not exist ❑

PART III:

1. I notice if there is symmetry or a certain system in the building configuration.

   A. GENERALLY:
   Always ❑ Sometimes ❑ Never ❑

   B. IN KARUM:
   Sufficient ❑ Insufficient ❑ Do not exist ❑

2. I notice if all corridors intersect with acute angles or not.

   A. GENERALLY:
   Always ❑ Sometimes ❑ Never ❑

   B. IN KARUM:
   Sufficient ❑ Insufficient ❑ Do not exist ❑

3. I notice if all corridors are organized according to a certain system or not.

A. GENERALLY:
Always ❑ Sometimes ❑ Never ❑

B. IN KARUM:
Sufficient ❑ Insufficient ❑ Do not exist ❑

4. I pay attention to "landmarks."

A. GENERALLY:
Always ❑ Sometimes ❑ Never ❑

B. IN KARUM:
Sufficient ❑ Insufficient ❑ Do not exist ❑

5. I pay attention to changes in the lighting system.

A. GENERALLY:
Always ❑ Sometimes ❑ Never ❑

B. IN KARUM:
Sufficient ❑ Insufficient ❑ Do not exist ❑

PART IV:

CORRECT ❑

INCORRECT ❑

CLOSE ❑

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