

Wayfinding Implementations: An Evidence-Based Design Approach to Redesign College Building

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Abstract:

Designing and building easily navigable and memorable environments is the one of the main roles of interior designers. Wayfinding is defined as the ability to navigate through a space without feeling lost. Interior designers are responsible for incorporating principles of the wayfinding in the built environment to improve occupants' experience. The main purpose of this paper are; 1) to write overview of wayfinding implications related to interior design and architecture that improves building users' navigation in the built environment, 2) to employ the wayfinding elements to an institution building. The aim of this project to help new students and visitors reach their destinations easily without being lost. A qualitative research analysis, thematic approach, is used to review credible scholarly journal articles and books with the relation of occupants' behavior and wayfinding elements. Also, a case study is conducted in an institution building to find out wayfinding issues and redesigned the building through employing an evidence-based design approach. This paper explored a verity of techniques that interior designers and architects should use when designing new buildings.

Keywords:

Wayfinding, Evidence-Based Design, Occupants Behavior, Interior Design

Paper received 10th September 2021, Accepted 16th November 2021, Published 1st of January 2022

1. Introduction

One of the main environmental behavior problems that people face daily when visiting poorly designed environment is wayfinding. Building easily navigable environments improves occupants' experiences and their attitudes toward a building. Interior designers are responsible for incorporating wayfinding applications in their designs. The application of these principles helps new visitors travel easily through an interior, enhancing their experience of the building and reducing stress. Kopec (2006) noted that designing difficult navigable environment would increase the stress level among the building occupants.

Several environmental behavior theoretical frameworks should be considered when implementing wayfinding approach in the built environment, including Kaplan and Kaplan preference framework, spatial cognition and Lynch's elements of legibility. Also, there are several design elements can be used to help people find their ways in the built environment, such as color, lighting, maps, signs, numbering and architectural planning.

Designing effective wayfinding system in the built environment would reduce human stress, which would help both patients and new visitors in healthcare environment to navigate easily in this stressful environment. Navigation issues have been associated with exhaustion, high blood pressure,

headaches, and increased physical exertion, with patients in healthcare (Carpman & Grant, 2001). Likewise, designing an affective wayfinding system in school campus would lower the stress and frustration levels for new students and visitors. The incorporation of wayfinding elements into the building design has likely improved the experience. Humans would be able to identify where they are within the building and navigate to their intended destinations without getting lost.

2. Objective

The objective of this paper is to explore wayfinding implications that can be used in the built environment through an evidence-based design approach by reviewing journal articles discussing wayfinding solutions in the built environment. This study documented wayfinding implications related to interior design and architecture that improves building users' navigation in the built environment. Also, all data collected were used as a guide in employing the wayfinding applications to an institution building.

3. Research Question

What wayfinding applications can be used to support human directions in the built environment?

4. Research Methodology

A qualitative research approach was adopted for the study. The methodology of conducting research for the literature review involves the thematic approach, in which credible scholarly journal

articles and books written were reviewed with the relation of occupants' behavior and wayfinding in mind. A pictorial case study, digital photography, was conducted in the Human Sciences Building at Texas Tech University in the United States to find out the wayfinding issues existed in the building. The researcher recorded the wayfinding issues by his camera to document the wayfinding corners as report by the literature.

5. Findings

Information retrieved from scholarly journal articles and books indicate a correlation of wayfinding applications and human behavior, which in some cases influences the occupants' behavior in the built environment, as described below:

5.1 Color and Wayfinding

Color is a powerful tool in the process of wayfinding that helps people to successfully navigate through an environment (Kopec, 2006). Color is a useful design element for wayfinding, spatial orientation, and space definition in children's environments (Read, 2003). In their study, Bounds, Perritt, Darville and Salmi (2012) investigated the effectiveness of the use of colors in helping building occupants to navigate to their destinations in a complex healthcare environment. The findings of the study reveal that almost seventy percent (70%) of the participants found the color coding is a helpful-way for reaching their destinations. Floor and wall colors were more effective in wayfinding than signage; almost half of the participants (50%) had the ability to recall the correct color corridor (Bounds et al., 2012).

The investigation (Osman, 2004) has two significant outcomes. Right off the bat, it demonstrates that the organizing of space through shading helps kids at school age and grown-ups in a similar way to discover their way around. This is as opposed to the significance of milestones in formative spatial comprehension explore, where it has been appeared more youthful youngsters depend more on their essence than more established ones and grown-ups. Besides, shading has an effect on the wayfinding execution and on a portion of the wayfinding techniques utilized, yet not on the procurement of spatial information. This records for a separation in wayfinding conduct and spatial learning and requests another, progressively logical, viewpoint on spatial cognizance improvement.

Ranagel (2011) demonstrates that soft colors and low saturation were favored by subjects as increasingly satisfactory for medical clinics situations, when they convey sensations as calm, hygiene and peaceful.

Therefore, colors play an important role not only in

helping people to navigate, but also improving their cognitive maps as shown in figure: 1. Color coding is one of the main tools for new visitors in clinic environment helped them to navigate a symmetrical plan easily (Baskaya, Wilson, & Özcan, 2004).

Cool and warm colors have different impressions for wayfinding. Hidayetoglu et al. (2012) found that spaces painted with cool colors were seen easily navigable, while spaces with warm color were more attractive and memorable (Hidayetoglu, et al., 2012). Thus, warm color can be used as a tool for wayfinding in buildings as shown in figure: 2. Also, the researchers found as the brightness level in the space increased, the space was more positively perceived. Regarding the color temperature, participants perceived the temperature of neutral white color more positively than other color temperatures (Hidayetoglu et al., 2012).

5.2 Lighting and Wayfinding

According to the literature, lighting is one of the major tools used to help people navigate in an interior environment. Blake et al. (2012) examined differences in the navigation decisions people make based on different wayfinding elements. They concluded that signage played a role in the navigational decision-making process, yet lighted paths were preferred (Blake et al., 2012). Therefore, maximizing the lighting intensity in the major corridor would make occupants flow in that path as shown in figure: 3. This refers to the concept phototropism, which is the composition of lighting sources that helps to move building users from one space to another (Michel, 1995). Hence, a well-lighted reception area and reception desk would help to orientating visitors who are unfamiliar with the building. The appropriate luminance ratio of scallops to background is 1:3 (Michel, 1995). As people drawn to brightness, interior designers should use phototropism to direct people's attention to focal points or vertical surfaces.

Light is a standout amongst the most significant physical elements impacting the perception of a space, and it might likewise influence performance of wayfinding. Light is an energy that enables individuals to encounter the visual world, accordingly it influences the performance of visual. In addition, light considerably affects how individuals see the physical characteristics of a space; it likewise gives significance and feeling to that space (Knez, 2001). Lighting, as a controlled use of light, can change the human recognition in various ways.

Egan and Olgyay clarified (2002) the visual experience as a combination of seeing and deciphering the environment with a wide range of signage. Past research in the literature detailed that

lighting has a significant effects on a space perception, evaluation of space, emotional reactions and preferences, physiological and psychological comfort (Fleischer et al., 2001; Manav, 2007; Manav & Küçükdoğu, 2006; Manav & Yener, 1999; Odabaşoğlu & Olguntürk, 2015). In this way, lighting should be considered an fundamental design component, along with form, color and texture, and like those elements, as a critical supporter to spatial compositions.

5.3 Signs, Maps and Numbering System

Some of the main principles of the wayfinding are the numbering, maps and signage. Padgitt and Hund (2012) found paths containing cardinal directions received low effectiveness ratings, while route directions containing left-right descriptors and landmarks had higher effective ratings. Map locations in the built environment influence human directions. Maps are an effective component to help people navigate an environment, especially when they match the structure and orientation of the environment (Kopec, 2006). Maps that include graphic representations, color keys, and name lists help people locate their targets. A study conducted by Richter and Klippel (2002), examined the location of maps within an environment where they can efficiently function as a wayfinding support location. The study revealed several results that supports the functionality of the map as a wayfinding tool for people navigation. Placing maps at the entrances where people make decisions is helpful for people to travel to their destinations, aligning maps along with the interior environment to help building occupants easily locate themselves and their destinations. Also, a location of maps is near to landmarks or asymmetrical parts of the interiors to make the location of maps clear.

Signage is an important form of environmental communication for enhancing the environmental legibility. In their study, Rousek and Hallbeck (2011) examined the color contrast and complexity of signs in a healthcare setting among participants with both impaired and normal vision. The study found that several aspects contributed to comprehending signage for people with or without visual impairments, including color contrasts, orientations and complexities. Signage with consistent representation of human figures was most identifiable; the highly preferred color for signage among people was red, black and white signs (Rousek & Hallbeck, 2011). Tzeng and Huang (2009) found that directional of signage has the greatest influence of wayfinding performance. Findlay and Southwell (2004) conducted a study in the U.K. Forest recreational parks to find out the wayfinding problems that the visitor faces. The researchers found that the location and information

of the signage are the major issues that face new visitors (Findlay & Southwell, 2004). Thus, signage is one of the most important contributions in improving human directions.

5.4 Spatial & Floor Plan

The interior architecture and the spatial design influence human navigation in the built environment. In his study, Abu-Ghazze (1996) analyzed spatial orientation and wayfinding issues for freshmen students at the King Saud University campus and related those issues to Lynch's elements of legibility. Abu-Ghazze found that the degree of differentiation, visual access, and layout complexity affect wayfinding behaviors. The author also found that signs, maps, and interior design characteristics are useful wayfinding elements in the interior environment.

Spatial complexity influences new visitors to sense of navigation in the built environment. O'Neill (1991) examined the influence on wayfinding of floor layout complexity and several types of signage in five buildings on a university campus. The study revealed that as the plan increased in complexity, wayfinding performance decreased. Also, in their study, Baskaya, Wilson, and Özcan (2004) found that participants could not structure a sense of direction in areas that didn't differ from others because of a lack of landmarks. The asymmetrical floor plan was easier to remember than the symmetrical layout. Also, lack of differentiation affected new visitors' spatial orientation and wayfinding.

Several architectural and design features play an important role in wayfinding performance, helping occupants move through and comprehend the environment. Design elements contribute to wayfinding include signs, architectural features, maps, and interior elements, such as artwork, display boards, information counters (Pati, Harvey Jr, Willis & Pati, 2015). One of the main architectural elements is the architectural delineation which separates one area from another by architectural features such as walls, partitions, and ceiling heights (Kopec, 2006). Mall and airport designs commonly employ numbering and signage systems as mechanisms of wayfinding. Communication by signs and numbers enhances environmental legibility; words, symbols, numbers, and arrow directions help identify locations (Kopec, 2006).

5.5 Lynch's Elements of Legibility

In his book, *The Image of the City*, Lynch (1960) introduced urban planning elements of legibility that contribute to design, including paths, nodes, districts, landmarks and edges. An interior designer should consider these elements in the built environment. Paths are streets, sidewalks, trails,

and other channels in which people travel. Edges in the interior environment are the boundaries or breaks of continuity, such as walls and shorelines. Districts are regions that have characteristics or purposes, such as office and classroom regions, or private, semi-private, and public regions. Landmarks are easily seen and identified elements within an environment as shown in figure: 4. They help occupants when navigating and locating themselves. When an environment is designed to be easily legible, it is easily imaged, and then it furnishes cognitive support to the idea of a social community and gives a feeling of security to the people.

6. Discussion & Implementation

This study aims to integrate wayfinding elements through an evidence-based design shaped by a Texas Tech University theme and implemented in the human sciences building to help new visitors and students easily reach their destinations. The human sciences building at Texas Tech University has many wayfinding issues. The purpose of this study is to implement wayfinding principles through evidence-based design.

6.1 Design Concept

Wayfinding approach is integrated into the human sciences building through a wide variety of applications. The major purpose of the project is not only to make new visitors and student navigate easily, but also to improve their experiences with and attitudes toward the building. The design

focuses on cognitive mapping concept which improving the end-users' memory of the built environment.

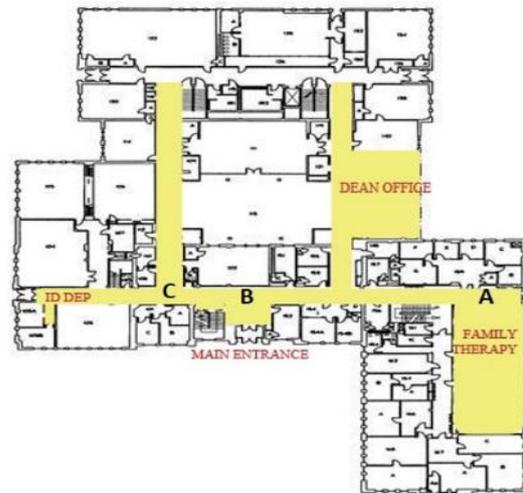


Figure 1: 1st floor plan of the Human Sciences building.

The scope of the project was focused on the first floor of the building, which contained the department of design offices, family and addiction services department and the main entrance of the building shown in figure 1.

6.2 Wayfinding issues

In the case of study conducted in the building, the researcher found several navigation issues, which are categorized based on their location at table 1:

Table 1: Navigation issues based on their location

Area	Wayfinding issues	Wayfinding applications
Family and Addiction Services Department	<ul style="list-style-type: none"> ○ Not identifiable (vague) area. ○ No signage 	<ul style="list-style-type: none"> ○ Signage placed at node. ○ The entrance is glassed and demarked. ○ Cove light installed to illustrate the parameter of the department. ○ The wall is covered by brick texture which represents Texas Tech University identity.
Main Entrance	<ul style="list-style-type: none"> ○ Map is not strategically located. ○ Lack of directions and signs. ○ Dead main entrance area. ○ lack of landmarks 	<ul style="list-style-type: none"> ○ Architectural delineation & Branded area. ○ information desk area as a tool for wayfinding. ○ Desk is design by wavy lines ○ Increased lighting intensity (Phototropism) ○ Red color improves environmental memory ○ Water fountain (landmark)
Interior Design Department node	<ul style="list-style-type: none"> ○ Lack of demarcation. ○ Lack of directions and signs. ○ Lack of differentiation in wall and flooring colors. 	<ul style="list-style-type: none"> ○ Installing Interior Design sign (Demarcation) at the intersection. ○ installing directional signage. ○ Different wall colors ○ Emphasizing edges, nodes, and paths. ○ Installing vertical and horizontal lighting (differentiation).

The researcher suggested suitable designs which solve all issue that found it. Figures 2, 3 and 4

show the difference between the current place and the researcher proposed designs.



Figure 2: a). The current Family and Addisction Services department design. b). The proposed design of the department.

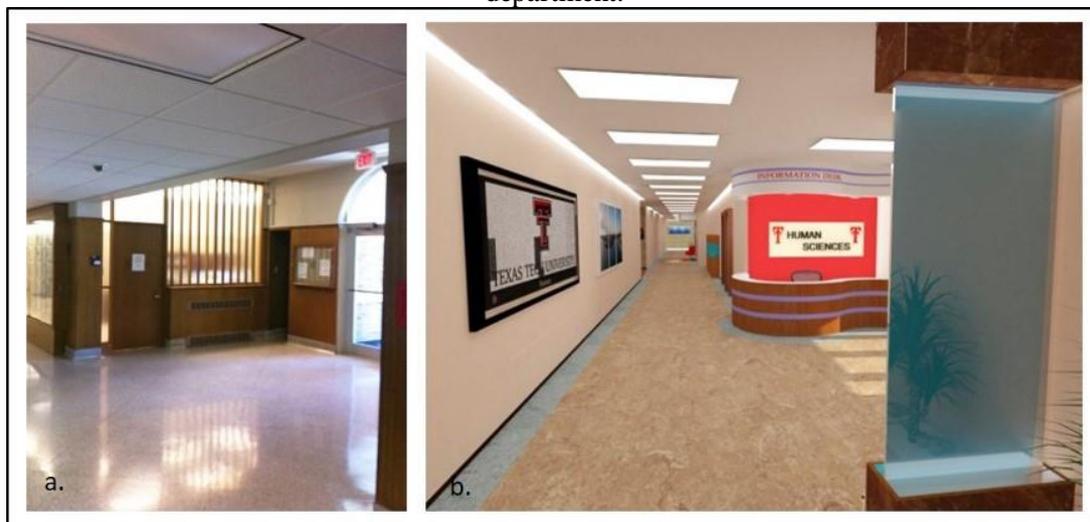


Figure 3: a) The current main entrance of the building. b) The proposed main entrance design.



Figure 4: a) The current intersection of the Interior Design department. b) The proposed designed.

7. Recommendations

The recommendations extracted from this study are summarized as follows:

- The signage system should be redesigning in incremental buildings, also must be tested to check its efficiency and accuracy.
- One of the main issues at the human sciences

building at TTU is being incremental building, meaning more additions being built so the researcher recommended use of a signage system rather than current disconnected signs in the building environment.

- The information desk at the main entrance should be considered by interior designers and

architects not only as place for building directions, but also as main landmark in the building.

- Wayfinding is a comprehensive approach in the built environment, the researcher recommended use of other wayfinding applications not only signage system, such as color coding, lighting techniques, architectural delineation, Lynch's elements of legibility in the design.
- Interior designers and architects should consider designing symmetrical spatial layouts of the building, this is more important in the case of incremental building as more additions being built, spatial configuration of the building is being messed up.
- Improving cognitive mapping of the end-users should be highly considered by interior designers and engineers when designing and constructing the building, this would help end-users to store and recall information on spatial environment to navigate easily without feeling lost.
- Color coding has made a significant impact on orienting people in the built environment. Color coding technique should be used to differentiate specific zone within one floor, this will aid people orientation and navigation in the built environment.
- Cool colors have important orientation merits also warm colors are more attractive and therefore provide orientation.
- Orientation preferences also increased with increased brightness level. Building with low brightness levels should be taken into consideration as they might be negatively perceived. Utilizing color and light merits is significant in wayfinding and building readability.

8. Conclusion

To conclude, a lot of factors contribute to enhance the performance of wayfinding in the built environment. Designing a space with appropriate navigation techniques improves the experience and attitudes of the building end-users. Incorporation of wayfinding elements into the building design has likely improved the experience of not only new visitors who visit once but also freshmen students new to the school. Both visitors and students are now able to identify where they are within the building and navigate to their intended destinations without getting lost.

References

1. Abu-Ghazzeh, T. (1996). Movement and the wayfinding in the King Saud University Built Environment: A Look at Freshmen Orientation and Environmental Information.

2. Baskaya, A, Wilson, C. & Özcan, Y. (2004). Wayfinding in an Unfamiliar Environment: Different Spatial Settings of Two Polyclinics. *Journal of Environment and Behavior*. Vol. 36.
3. Blake, S. Hal, J. & Sisse, S. (2012). Using Lighting to Enhance Wayfinding. Retrieved online on Oct. 9th 2016 from <http://andrewd.ces.clemson.edu/courses/cpsc412/fall11/teams/reports/group8.pdf>
4. Bounds, N. Perritt, M. Darville, R. & Salmi, P. (2012). Color's role in wayfinding: the effectiveness of color to aid in wayfinding at a pediatric clinic. Interior Design Educator Council Conference, Baltimore, Maryland.
5. Carpmann, J., & Grant, M. A. (2001). *Design that cares*. San Francisco, CA: Jossey-Bass.
6. Egan, M.D., & Olgyay, V. (2002). *Architectural Lighting* (2nd ed.). Boston: McGraw-Hill.
7. Findlay, C. & Southwell, K. (2004). 'I just followed my nose': understanding visitor wayfinding and information needs at forest recreation sites. *Managing Leisure*, 9(4), 227, doi:10.1080/1360671042000317261
8. Fleischer, S., Krueger, H. & Schierz, C. (2001). Effect of Brightness Distribution and Light Colors on Office Staff: Results of the 'Lighting Harmony' Project. The 9th European Lighting Conference "Lux Europa 2001", 77-80, Reykjavik.
9. Hidayetoglu, L. Yildirim, K. Akalin, A.(2012). The effects of color and light on indoor wayfinding and the evaluation of the perceived environment, *Journal of Environmental Psychology*, Volume 32, Issue 1, March 2012, Pages 50-58, ISSN 0272-4944, 10.1016/j.jenvp.2011.09.001.
10. Jansen-Osmann, P., & Wiedenbauer, G. (2004). Wayfinding performance in and the spatial knowledge of a color-coded building for adults and children. *Spatial cognition and computation*, 4(4), 337-358.
11. Knez, I. (2001). Effects of color of light on nonvisual psychological processes. *Journal of Environmental Psychology*, 21, 201-208.
12. Kopec, D. (2006). *Environmental Psychology for Design*. First Edition. Fairchild Publisher, New York, USA.
13. Lynch, K. (1960). *The Image of the City*. MIT Press, Cambridge, USA.
14. Manav, B. & Küçükdoğu, M.Ş. (2006). The impact of illuminance and color temperature on performances at offices. *Journal of Istanbul Technical University*, 5, 1-25.

15. Manav, B. & Yener, C., (1999). Effects of different lighting arrangements on space perception. *Architectural Science Review*, 42, 43-47.
16. Manav, B. (2007). An Experimental Study on the Appraisal of the Visual Environment at Offices in Relation to Color Temperature and Illuminance. *Building and Environment*, 42, 979-983.
17. Michel, L. (1995). *Light: The Shape of Space*. John Wiley & Sons. USA
18. O'Neill, M.J. (1991). Effects of signage and floor plan configuration on wayfinding accuracy. *Environment and Behavior*, 23, 553-574.
19. Odabaşoğlu, S., & Olguntürk, N. (2015). Effects of colored lighting on the perception of interior spaces. *Perceptual and Motor Skills*, 120 (1), 1-19.
20. Padgitt, A. Hund, A. (2012). How good are these directions? Determining direction quality and wayfinding efficiency. 32(2), pp. 164-172.
21. Pati, D. Harvey, T. Willis, S. & Pati, S. (2015). Identifying Elements of the Health Care Environment That Contribute to Wayfinding. *Health Environments Research & Design Journal*, 8(3), 44-67.
22. Rangel, M., & Mont'Alvão, C. (2011, September). Color and wayfinding: a research in a hospital environment. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*(Vol. 55, No. 1, pp. 575-578). Sage CA: Los Angeles, CA: SAGE Publications.
23. Read, M. A. (2003). Use of color in child care environments: Application of color for wayfinding and space definition in Alabama child care environments. *Early Childhood Education Journal*, 30(4), 233-239.
24. Rousek, J. b. & Hallbeck, M. S. (2011). Improving and analyzing signage within a healthcare setting. *Applied Ergonomics*, Vol. 42, Pp. 771-784.
25. Tzeng, S. & Huang, J, (2009). Spatial Forms and Signage in Wayfinding Decision Points for Hospital Outpatient Services, *Journal of Asian Architecture and Building Engineering*. Retrieved from https://www.jstage.jst.go.jp/article/jaabe/8/2/8_2_453/_pdf

