Environmental Technology & Science Journal
Vol. 10 Issue 2 December 2019

Impact of Landmarks on Route Direction in Hospital Wayfinding at University of Ilorin Teaching Hospital in Kwara State, Nigeria

Ahmed, S[1], Olagunju, R.E[2], Zubairu, S.N[3], Akande, O.K[4]
[1,2,3,4]Department of Architecture, Federal University of Technology, Minna

Wayfindng is the task of navigating unfamiliar environment from an origin, for a purpose, with the goal to reach a desired destination. Local landmarks which serve as environmental cues during hospital wayfinding are usually used on the route to reduce navigational errors and facilitate improved wayfinding. This research examines the impact of landmarks on route direction for successful hospital wayfinding. This was achieved using a case study approach with survey questionnaire, interview and observation as instruments. The study was carried out at the University of Ilorin Teaching Hospital, Ilorin, Kwara State of Nigeria. Photographs were also taken in the Out-patients Departments (GOPD). A sample size of 86 respondents was used for the survey questionnaire, and 16 were interviewed in the study. The main findings showed that landmark information is important in hospital wayfinding on route direction with particular significance of local landmarks along the route that support orientation. This implies that local landmarks should be used at the appropriate decision points along the navigation path to improve route direction in hospital wayfinding design. This research contributes to the understanding on the use of landmarks on route direction in hospital wayfinding. The study recommends that local landmarks should be designed and placed at a clear distance before the decision points where user's need to use the landmark information for wayfinding.

Key words: Hospital, landmarks, orientation, route direction, wayfinding

Introduction

Local landmarks which serve as environmental cues are usually created during wayfinding on the route to reduce errors and facilitate improved wayfinding (Lee *et al.,* 2006). The need for users immediate self-update is decisive for wayfinding in an unfamiliar environment, even with the aid of maps (Sharma *et al.,* 2017). Teachng hospital is usually a large and complex environment due to operational needs and demand (Brunye *et al.,* 2018). As such, wayfinding in a teaching hospital is usually a difficult task for unfamiliar users visiting the hospital for the first time (Mustikawati *et al.,* 2017). The wayfinding difficulty is exacerbated by the complexity of the building layout, evolving spaces over time, which are being regularly reconfigured, extended and spaces renamed (Hughes *et al.,* 2017). Consequently, this causes confusion, being lost and stress to users during wayfinding (Brunye *et al.,* 2018). However, there is limited understanding on the users behaviour and the chronological processes that help quantify the impact of landmarks on route direction in wayfinding in a new hospital environment (Dalton *et al.,* 2019).

The study of Sharma *et al.* (2017) showed the influence of landmarks on wayfinding using experimentation and electroencephalogram (EEG) analysis, using landmark-devoid (LM-) and landmark-enriched conditions along the route for the participants to undertake wayfinding. In Furthermore, the study revealed that participants took less time and committed fewer errors in navigating the maze in the landmark-enriched (LM+) condition. However, there is limited understanding on the impact of landmarks on route direction in hospital wayfinding

based on user's behaviour during navigation. The purpose of this study is to assess the impact of landmarks on route direction in hospital wayfinding based on users behaviour.

Use of local landmarks in navigation

Human wayfinding refers to the process that takes place when people orient themselves and navigate through space. There are theories that attempt to elucidate how people find their ways in the physical world, such as what people require to find their ways, how they communicate directions, and how people's verbal and visual abilities influence wayfinding (Bala, 2016). Furthermore, wayfinding behaviour can be described as a purposeful, directed and motivated movement from an origin to a desired and precise far-away destination (Brunye *et al.*, 2018). For effective wayfinding, the users' need visual environmental cues such as landmarks to find their way and communicate directions. As such, landmarks are visual entities and prominent features within the environment that define locality, serve as a navigational aid and are used as a reference points to communicate route directions (Epstein & Vass, 2014).

In addition, Brunye *et al.* (2018) argued that landmarks are the most influential cue that individuals first used to learn a new space by acquiring knowledge of specific landmarks, followed by knowledge of the routes between landmarks. Therefore, the landmark saliency of a feature does not depend on its individual attributes, but on the peculiarity to attributes of close features. These features are stored in memory as a formation that is based on locations in space and which help in developing route knowledge (Risko & Gilbert, 2016). However, less attention has been given to the problem of understanding how landmarks influence performance in navigation tasks and its implications in the design of public buildings such as hospital environment. Wayfinding in hospital is critical towards saving life. Also, the meanings and understanding of these landmarks to unfamiliar user are still unclear.

Furthermore, landmarks are entities that are useful for navigation because they are unchanging in space and they can either be distinct objects or extended topographical features such as mountains or water body (Epstein & Vass, 2014). Consequently, it needs a perceiving subject to use (and qualify) a distinct feature as a landmark. In the context of route directions, it is the experiences of relevant distinct features along a route which make these distinct features landmarks. Several authors classify landmarks in route directions according to their relation to the route (Krukar *et al.*, 2017). For instance, the distinct features along a route are referred to as local landmarks while the external ones with reference to a route are global landmarks (Brunye *et al.*, 2018). People use landmarks preferably at decision points of the routes and communicate route directions by using landmarks (Daniel & Denis 1998; Michon & Denis, 2001).

The purpose of route directions is to enable a wayfinder to find a route from their current location to their destination. Virtually all existing studies investigate turn-by-turn directions: such as the route directions of a procedural and in sequential form (Weng *et al.*, 2017). The study by Duckham *et al.* (2010), in human turn-by-turn route directions revealed that people used landmarks and not numerical references to distances or turning angles. Daniel and Denis (1998) demonstrated that 85 % of human route direction elements are related to landmarks such as either an action linked to a landmark (cross the park) and a reference to a landmark (in front of you is a bridge). The 85% mentioned in their study also includes a description of the landmark (it's a stone bridge) while only about 15% of human route direction elements are not related to landmarks. This implies that landmarks are constituted in different narrative forms but are important to route direction- giving for successful wayfinding. The references to landmarks in these directions are used for anchoring a

navigation action to a location (if the referred landmark is located at a decision point), and providing confirmation that the user is going the right way (if the referred landmark is located along a route segment).

The study by Tom and Denis (2004) showed that landmarks lead to shorter learning times, better recall in route description tasks, and better response in wayfinding tasks. In addition, the study by Richter (2008) on the selection of landmarks for enriching the turn-by-turn instructions on the route provided the spatial and structural context of the selection process. Consequently, the study revealed that landmarks improve the quality of route directions in terms of their cognitive ergonomics (how easy the route instructions are for a human to understand, remember, and use). However, there is no universally accepted mechanism for including landmarks in route directions (Ishikawa & Nakamura, 2012). The quality of route directions can depend on the number, type, or quality of references to landmarks, and the way references to landmarks is selected in the context of the route (Dalton *et al.*, 2019). Therefore, there is the need to assess the impact of landmarks on route direction in hospital wayfinding in order to understand the mechanism for including local landmarks in route direction for effective wayfinding.

Research Methodology

The research design employed is a descriptive research and interpretive case study approach was engaged in conducting the empirical investigation of impact of landmarks on route direction in hospital wayfinding within its natural real life context. This case study approach is qualitative in nature with survey method being used for data collection and analysed mainly through qualitative methods with small quantitative component. In addition, the selection criteria for the study site was based on the size of the hospital of 525 bed capacity and of equal capacity with other teaching hospitals in Nigeria.

The population for this study is defined as all adult outpatients who entered the General Outpatients Department (GOPD) for medication during the sampling time frame. Furthermore, the participants in the survey and interview were selected using simple random sampling and purposive sampling strategies respectively. This sampling techniques were used to gain a rich understanding of the complex wayfinding processes and experiences of the participants. In addition, the selected participants were unfamiliar users and visiting the hospital for the first time and at most twice in the last one year. Cosequently, the participants in the study were chosen according to their familiarity with the research environments, levels of education, and wayfinding experience.

Based on the information from record and information unitof the hospitl, the monthly average outpatients that attended the GOPD were 500 for the teaching hospital. As such, a simple random sampling technique was used to select a sample size of 86 for the survey and purposive sampling for the interview of 16 respondents. This was achieved in accordance with the published table from the study of Bartlett *et al.* (2001) for sample frame of 500, continuous data, with 0.05 margin of error and t = 1.65. Consequently, a total number of 100 self administered survey questionnaire was managed in the hospital to give room for errors and omissions. The returned survey questionnaire gave sample size of 86 respondents representing 86% response rate. This sample size was considered appropriate based on published tables from studies (Bartlett *et al.*, 2001; Sing & Masuku, 2014). The sample size of between 10 -15 has been established to be adequate to give a saturation point for qualitative interview and 5-10 observational studies (Mason, 2010). The informed consent form was read and signed by the participants before administering the questionnaire.

The interview took place at the general outpatient departments. The interview was conducted in English which is the official language of Nigeria. The minimum time for

the interview session and audio recording was 30 minutes and the maximum of 40 minutes for each interview. There were twelve questions about patients' wayfinding experience covering major themes which consisted of environmental attributes, architectural design attributes, and wayfinding experience attributes during wayfinding in the hospital environment. There were 16 respondents interviewed for the study. The saturation point was reached when there was repetitive information on the emergence of further interview that were not expected to give additional information (Mason, 2010). As such, saturation point was attained at 12 interviews and 10 observations.

Study Area

The study area is in Ilorin the capital of Kwara State. It is located in north-central Nigria. It is bounded by Republic of Benin to the west and by the Nigerian States of Niger to the north, Kogi to the east, and Ekiti, Osun, and Oyo to the south. Ilorin is on $8^0 30^{`}$N latitude and $4^0 33^{`}$E longitude. As of the 2006 census, Ilorin has a population of 814,192. The major languages are Yoruba and English languages. The University of Ilorin Teaching Hospital is located in Ilorin town; the hospital has a bed capacity of 500.

Data collection and Analysis

The analysis of the survey questionnaire and interview on the impact of landmarks on route direction for hospital wayfinding in the University of Ilorin Teaching Hospitals, Ilorin was based on the opinion of the respondents. Accordingly, a four - point Likert scale questionnaire that ranges from strongly disagree (1) to strongly agree (4) was used in all the questions, which was considered adequate in the study by Pornel & Saldana (2013). The responses for each item were combined to generate a composite score of a set of items for different participants (Joshi, 2015). This was to ascertain the participants' degree of agreement around an issue. As a result, an interpretation scheme of a 4-point Likert scale to measure opinion was quantitative as devised by Pornel and Saldana (2013) and ranked according to the weighted mean value (WMV).

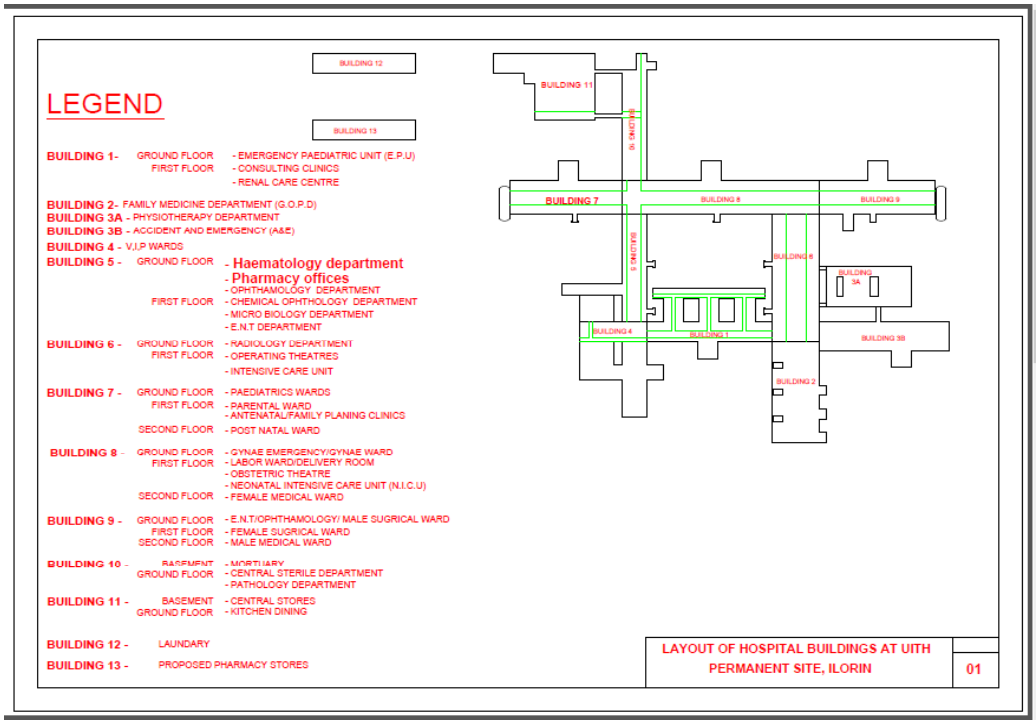

Figure 1: Layout of University of Ilorin Teaching Hospital Buildings, Ilorin
Source: Works Dept., UITH,Ilorin

An inductive content analysis was used to analyse the interview data. The content analysis was used to establish categories and then count the number of instances those categories were used in a particular item or text (Smith & Firth, 2011). Furthermore, the unit of analysis was the interview text about the impact of landmarks on route direction in hospital wayfinding. In addition, the analysis focused attention to the manifest meaning while noting the latent meaning as supportive evidence in the interpretation.

Results and Discussion

Survey questionnaire result

The analysis of the survey questionnaire for users' on the impct of landmarks on hospital wayfinding in the teaching hospital was based on the opinion of the respondents. Furthermore, the Mean Values were calculated by dividing the weighted sum by the total number of respondents (sample size = 86) as shown in Table 1. Each of the items were further synthesised by ranking the mean and its interpretation.

Use of signage in hospitals

Table 1 revealed that the majority of the respondents' ranked signage as the first influential attributes to wayfinding performance and agreed relative to the statement that signage and room number can greatly lead one to the desired destination in the hospital. The data suggest that signage and room numbers were highly used by the respondents as landmarks in directing users' to the desired destination in the hospital with a mean value of 3.22. The reason for the high use of signage could be because majority (77%) of the respondents had formal education and could read the signs. This supports the findings of other studies that the signs were noticed and read by the majority of the users because of literacy (Arthur & Passini, 1992; Lewis, 2010). Consequently, it implies that the signs were placed in a good location and the information was perceived at, or just before, a decision point.

Table 1: Users' response on environmental factor for wayfinding

Item	WS	WMV	Ranking	Interpretation
B15: Useful information from signage	69	3.22	1st	Agree
B10: Useful information from an important building	68	3.16	2nd	Agree
B16: Grouping of related department useful to wayfinding	67	3.13	3rd	Agree
B14: Useful information from junction	66	3.07	4th	Agree
B11: Useful information from passage	65	3.04	5th	Agree
B2: Use important building to find direction	64	2.97	6th	Agree
B18: Differences in building design influences finding a destination	63	2.94	7th	Agree
B13: Useful information from area	62	2.90	8th	Agree
B12: Useful information from path boundary	61	2.85	9th	Agree
B6: Map to direct	60	2.80	10th	Agree
B5: Imagine layout of building to get to department	59	2.79	11th	Agree
B1: Use verbal direction	58	2.74	12th	Agree
B8: Building arrangement was difficult to understand	57	2.69	13th	Agree
B17: Similar building influences in finding a location	57	2.69	13th	Agree
B7: See direct from entrance to important building and destination	57	2.69	13th	Agree
B9: Building plan shape is difficult to understand	56	2.65	16th	Agree
B3: Use trees to recognise direction	55	2.34	17th	Disagree
B4: Use important shrubs to identify direction	53	2.31	18th	Disagree
Aggregate	61	2.83		Agree

*WS (Weighted Sum); WMV (Weighted Mean Value)

Use of important building as landmark for wayfinding

Table 1 show that the use of important buildings as a landmark was ranked the second significantly influential variable for wayfinding performance in the hospital environment. The majority of the respondents (79%) agreed that the information such as cues derived from buildings as landmark were used to find direction to the desired location in the hospital relative to the mean score of 3.16. This suggests that some buildings were conspicuous in terms of size, shape, height, and colour that differentiate the building from other surrounding buildings (See Figure 1). In addition, the buildings serve as landmarks to identify and remember locations or confirm direction to destinations. This supports the findings from previous studies, that landmarks, improve wayfinding when used as reference points, to confirm route decision and destination points (Gangaputa, 2017; Sharma *et al.*, 2017).

Interview result

The interview transcripts were analysed using content analysis such that the emerging themes from the data were identified and counted for the frequency (Gale *et al.*, 2013). The matrix table was used to organise the data into key issues and themes and was used to identify commonalities and differences in the data (Li, 2016). Subsequently, the interpretation focuses on the relationships between different parts of the summarised data, thereby seeking to draw descriptive conclusion clustered around the themes (Miles *et al.*, 2014).

Important features used in hospital wayfinding

The respondents were asked of the most important features used in hospital wayfinding that serves as environmental cues. Table 2 shows the analysis of their responses and the emergence of the core concept in the interview.

Furthermore, the interview data found that signage was used as the main landmark at decision points in hospital wayfinding. This result corroborates the findings of other researches that textual signage, directional signs, and bold graphics used as landmarks at decision points have been shown to positively improve wayfinding performance (Tzeng & Huang, 2009; Brunye *et al.*, 2018). This infers that textual and graphic signage should be with pictographs to improve wayfinding performance in the hospitals (See Figure 2). As such, signs should be consistently clear in terms of meaning and understanding to all users, and be translated into main local languages of the community or region.

Figure 1: Maternity wards (UITH, Ilorin)

Table 2: Important features in wayfinding

Theoretical framework: Identifying themes	**Indexing: coding and merging similar issues**	**Charting: Data abstraction and summary**	**Mapping and Interpretation**
Theme: Landmarks *Signs and symbols (9) *ATM stand, overhead tank and parking lot (3) *Names boldly written at the entrance (1) *Use trees as landmark (1) *Flowers as important features (1) *Height of the building (1)	(A) Signs/names/ symbol = signage **(9)*** (B) ATM stand, overhead tank and parking lot **(3)*** (C) Use trees as landmark **(1)*** (D) Flowers as important features **(1)***	(A) Signage **(9)*** (R1, R16) (B) ATM stand, overhead tank **(3)*** (C) Trees and flowers **(2)*** (R2, R7) (D) Staircase **(2)***	The major landmarks used were signage. **Core concept:** Signage

*Frequency of count of concepts

Figure 2: Radiology at UITH

Reflections of landmarks and signage in hospital for wayfinding

The findings from both the survey and interview were triangulated in order to discover any similarity and divergence of results. Accordingly, the findings from the survey questionnaire show that differentiated building height was used as a landmark which corroborates the result from the observational studies. However, there was a divergent finding from the interview which revealed that signage was used as landmark at decision points for wayfinding in the hospitals. Similarly, it was observed in the study site that trees and pictographs were found to be used as landmarks. This implies that local landmark information should be distinctive, memorable and recognizable along the route to support orientation and ease navigation. This suggests that building height, landscape elements, signage and pictographs should be used at decision points along the route and at destinations. This result concurs with the findings of Anacta *et al.* (2017). These features could be used as landmarks for orientation, route confirmation and reassurance during wayfinding. In addition, information needs at the decision-making points such as circulation intersections (nodes) should be recognised for ease of wayfinding. As such, landmarks used as prominent features should be designed to be visible from a distance at decision-making points in the hospital during wayfinding. In addition, the findings from both the survey questionnaire and interview show that signage significantly influenced effective wayfinding in the hospital. This implies that signage should provide sufficient information needs for patients and visitors at both directional and destination points.

Conclusion

This study examined the impact of landmarks on route direction in hospital wayfinding in University of Ilorin Teaching Hospital, Ilorin. The main finding was that landmarks, such as differentiated building height, signage, landscape and pictorgraph, impact on route direction to orient position, confirm route, and recognise destinations. This implies that local landmark information should be distinctive, memorable and recognisable along the route and destinations to support orientation and ease navigation. As such, landmarks should be designed to be visible from a clear distance at decision-making points in the hospital during wayfinding. The current study suggest the importance of landmarks in route direction Thus, it sheds new light on why the presence of landmarks facilitate successful wayfinding.

Signage used as landmark in hospitals should be made clear, bold, and consistent in design. It should provide sufficient information needs for wayfinders at each decision-making point for direction finding and destination recognition. Such information should also be translated into the local languages and supported with pictographs for the meaning and the understanding to be made easy for both literate and those who could not read. In outpatient spaces, orientation signage is the most important in wayfinding design. The correctness and location of orientation signage should be carefully considered during design. Future studies is to explore how patients could integrate landmark knowledge on the route knowledge; and to investigate whether the presence of landmarks permits an individual to change between strategy, reflecting individual differences.

References

Anacta, V. J. A., Schwering, A., Li, R. & Muenzer, S. (2017). Orientation information in wayfinding Instructions. *Springer*, *Geojournal*, 82, 567-583. [Retrieved on 28/8/2019] from Doi: 10.1007/s10708-016-9703-5.

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

Bala, H. A. (2016). Landmarks in Urban Space as Signs. *Current Urban Studies*, 4, 409-429 [Retrieved on 23/8/2019] from https://www.scirp.org/journl/cus

Bartlett, J.E., Kotrlik, J. W. & Higgins, C. C. (2001). Organisational Research: Determining Appropriate Sample Size in Survey Research. .*Information Technology, Learning, and Performance Journal. 19 (1).* Spring

Brunye, T. T., Gardony, A. L., Holmes, A., & Taylor, H. A. (2018). Spatial decision dynamics during wayfinding: Intersections prompt the decision-making process. *Springer, Cognitive research:Pinciples and implications*, 3,13. Retrieved on 23/8/2019 from https:doi.org/10.11186/s41235.018.0098.3

Creswell, J.W. (2012). *Educational Research: Planning, Conducting, Evaluating Quantitative and Qualitative Research*: Boston, U.S.A: Pearson Education Edward Brothers. 4th ed. Retrieved on December 14, 2015http://www.pearsonhighered.com

Dalton, R. C., Holscher, C., & Montello, D. R. (2019). Wayfinding as a Social Activity. *Frontier in Psychology,10(142), 1-14.* https://doi:10.3389/fpsyg.2019.00142.

Daniel, M. P. & Denis, M. (1998). Spatial descriptions as navigational aids: a cognitive analysis of route directions. *Kognitionswissenschaft*, 7, 45–52.

Duckham, M., Winter, S., & Robinson, M. (2010). Including Landmarks in Routing Instructions. Journal of Location Based Services 4(1):28–52.

Epstein, R. A., & Vass, L. K. (2014). Neural systems for landmark-based wayfinding in humans. *Philosophy Transport Research Social. Biological Science* 369, 20120533. doi: 10.1098/rstb.2012.0533

Gale, N. K., Heath, G., Cameron, E., Rashid, S. & Redwood S. (2013).

Using the framework method for the analysis of qualitative data in multi-disciplinary health research. BMC Medical Research Methodology, 13,117 doi: 10.1186/1471-2288-13-117.

Gangaputra, R. (2017). Indoor Landmark and Indoor Wayfinding: The Indoor Landmark Identification Issue. Master's thesis, Technische Universitat Munchen. Retrieved on 10/3/2019 from www.cartographymaster.eu/wp-content/thesis/2017

Graneheim, U. H. & Lundman, B. (2004). Qualitative content analysis in nursing research: Concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today*, 24.105-112. Retrieved on April 19, 2017 from ELSEVIER: int.elsevierhealth.com/journal/nedt

Hughes, N., Pinchin, J., Brown, M., & Shaw, D., (2017). Navigating in Large Hospitals. In: 6th International Conference on Indoor Positioning and Indoor Navigation, Alberta, Canada. Retrieved on 25/2/2018 from www.eprints.nottingham.ac.uk/35695/1/Navigating

Ishikawa, T. & Nakamura, U. (2012). Landmark selection in the environment: Relationships with object characteristics and sense of direction. *Spatial Cognition & Computation: An Interdisciplinary Journal*, 12(1), 1–22.

Krukar, J., Schwering, A., Anacta, V. J. (2017). Landmark-Based Navigation in Cognitive Systems. *Springer, Kunstl Intell Journal*, 31 (2), 121-124. DOI:10.1007/s13218-017-0487-7.

Lee, S. A., Shusterman, A., and Spelke, E. S. (2006). Reorientation and landmarkguided search by young children: Evidence for two systems. Psychology Science Journal. 17, 577–582. doi: 10.1111/j.1467-9280.2006.01747.x

Lewis, K. (2010). Wayfinding in Healthcare Environments: A Case Study and Proposed Guidelines. *Graduate dissertation*, Iowa State University. Retrieved on 18/3/2019 from https://lib.dr.iastate.edu/cgi/viewcontent.

Li, N. (2016). Using Framework Analysis in Qualitative Data: *A Brief Guide*, 1-2. Retrieved on 22 March, 2019 from https://nevilleliresearch.weebly.com

Mason, M. (2010). Sample Size and Saturation in PhD Studies Using Qualitative Interviews. *Forum; Qualitative Social Research.FQS 11(3), Art. 8.* Retrieved from http://www.qualitative-research.net/ on February 27, 2017.

Michon, P. E. & Denis, M. (2001). When and Why Are Visual Landmarks Used in Giving Directions? *Spatial Information Theory*, Lecture Notes in Computer Science, 2205. Springer, Berlin, *2205*, 292–305.

Miles, M. B., Huberman, A.M., & Saldana, J. (2014). *Qualitative Data Analysis: A method sourcebook*. (3rd Ed.). SAGE Publication, Inc. Los Angeles, U.S.A. Retrieved on August 10, 2018 from sagepub.com/en-us/nam/qualitative-data-analysis

Mustikawati, T., Yatmo, Y. A. & Atmodiwirjo, P. (2017). Reading the Visual Environment in Healthcare Facilities. *Journal of Environment and Behaviour*. 2(5), 169-175

Pornel, J. B. & Saldana, G. A. (2013). Four Common Misuses of Likert-Scale. *Philippine Journal of Social Science & Humanities*, 18 (2), 12-19.

Richter, K.-F. (2008). Context-Specific Route Directions — Generation of Cognitively Motivated Wayfinding Instructions. DisKi 314 / SFB/TR 8 Monographs Volume 3, 2008.

Risko, E. F. & Gilbert, S. J. (2016). Cognitive Offloading. *Trends in cognitive sciences*, 20(9), 676-688.

Sharma G, Kaushal Y., Chandra S., Singh V., Mittal A. P. & Dutt, V. (2017). Influence of Landmarks on Wayfinding and Brain Connectivity in Immersive Virtual Reality Environment. *Frontiers in Psychology*, 8, 1220. 1-12.doi:10.3389/fpsyg.2017.01220.

Smith, J. & Firth, J. (2011). Qualitative Data Analysis: Application of the Framework Approach. *Nurse Researcher*, 18 (2): 52-62.

Sing, A. S., Masuku, M. B. (2014). Sampling Technique and Determination of Sample Size in Applied Statistics Research: An Overview. *International Journal of Economics, Commerce and Management*, 11, (11), 1-22. http;//ijecm.co.uk/wp-content/uploads/2014/11/21131.pdf

Tom, A. & Denis, M. (2004). Language and spatial cognition: comparing the roles of landmarksand street names in route instructions. *Applied Cognitive Psychology*, 18, 1213–1230.

Tzeng, S.-Y., & Huang, J.-S. (2009). Spatial Forms and Signage in Way_nding Decision Points for Hospital Outpatient Services. *Journal of Asian Architecture and Building Engineering*, 460(4), 453-460.

Weng, M., Xiong, Q., & Kang, M. (2017). Salience Indicators for Landmark Extraction at Large Spatial Scales Based on Spatial Analysis Methods. *ISPRS International Journal of Geo-Information*, 6, 72; 1-16.