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Architectural Design Layout and its Implication for Wayfinding in Abuja Hospital Environment

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Wayfinding refers to one's ability to know where he or she is (origin), how to get to the place (path) and recognising the destination on getting there. Teaching hospitals are large scale, complicated healthcare facilities. As a result of their serviceable organisations' complexity and architectural configuration, it has exacerbated the wayfinding experience of first time unfamiliar users of the hospital environment. Consequently, users' usually have the challenge of navigating to the desired destination with frustration in the hospital environment. The aim of the study is to assess the architectural design layout of the hospital and its implication for wayfinding. The study was carried outin the General out Patients Department (GOPD) at the University of Abuja Teaching Hospital (UATH), Gwagwalada-Abuja, Nigeria. The study approach was qualitative method which involves participant's observation and interview. Data was elicited from non- participant structured observation protocol to assess architectural features present in the hospital buildings. The wayfinding task executed by 15 participants was observed and interviewed Purposive sampling technique was used in the selection of the respondents. The main finding was the use of architectural differentiations in terms of height and shape, trees, and open core circulation system as landmarks in the hospital. In wayfinding behaviour, the study revealed that the users' search, select and use information by stopping, looking around and asking for direction in order to effectively navigate to the desired destination. The implication of this behaviour was discussed. Therefore, it is recommended that in hospital designs, architects should ensure that floor plan complexity and hierarchical decision are reduced, and several changes in direction at decision points are avoided for effective wayfinding performance.

Keywords: Architectural design layout, Teaching hospital, implications, wayfinding performance

Introduction

Wayfinding is referred to as one's ability to know where he or she is (origin), how to get to the place (path) and recognising the destination on getting there (Lin *et al.*, 2014). In a complex teaching hospital, wayfinding performance could be quite a challenging task in terms of disorientation for unfamiliar users of the environment that has to search for destinations (Samah *et al.*, 2013).

The challenge of wayfinding task impacts negatively on the patients in form of disorientation, anxiety, frustration, and stress for those visiting the hospital for the first time (Mustikawati *et al.*, 2017).In addition, the problem associated with inefficient wayfinding design needs for first time users with varied knowledge of the environment lead to confusion and being lost (Paul, 2013). The confusion and lost is because the environment is unfamiliar to the users and they lack experience and understanding of the setting in addition to insufficient wayfinding information to ease navigation (Hashim & Said, 2013). Consequently, it is expected that architectural design features should provide sufficient cue and information to ease wayfinding performance. As such, wayfinding is significant in hospital design as a vital consideration in the quality of

spatial disposition and the usability of the space that affect the quality of care in the hospitals (Samah *et al.,* 2013).

In Nigeria, there have been reported incidences of wayfinding challenges in complex public buildings, especially in emergency situations to rapidly evacuate people from the building (Babatunde *et al*., 2014; Maina & Umar, 2015). Similarly, Kahnge (2011) asserted that healthcare givers and visitors had difficulties in locating the various sections of Ahmadu Bello University Teaching Hospital (ABUTH), Zaria in Kaduna State of Nigeria. In Abuja University Teaching Hospital (AUTH), the evolution and the development of the hospital in phases since 1992 when it was established with the addition of new buildings affects the original design for circulation system which exacerbates wayfinding performance.

A lot of scholars, such as Baskaya *et al*.(2004); Pati *et al*.(2015) and Paul, (2013), have investigated the problems connected to wayfinding in unfamiliar complex teaching hospitals and had been extensively discussed (Ullas & Aju, 2014). However, there is a paucity of research on the architectural design and its implication in wayfinding in providing information for spatial legibility in the hospital wayfinding process (Mustikawati *et al.,* 2017). Thus, architectural legibility is the extent to which the designed features of the environment help people in creating an effective mental image of the spatial relationships within a building, and the subsequent ease of wayfinding within the environment (Dehghan *et al.,* 2012).
The aim of the study is to identify the role of architectural elements in hospital design layout and its implication for wayfinding performance in a hospital environment. The users' experience of the hospital environment is a functional relationship between the user and the environment (Hashim & Said, 2013). This is to suggest the problem of users missing their way to the desired destination is due to insufficient information need provided by cue which architectural elements tries to address in the hospital environment (Farr *et al.,* 2012). Thus, the success of wayfinding performance depends on the environmental cues which architectural attributes have a role in its identification and the spatial legibility (Mustikawati *et al.,* 2017).

Literature Review

Lynch (1960) was one of the early scholars that officially referred to wayfinding as the consistent use of sensory cues from the external environment. This description influenced the concept of spatial orientation and cognitive mapping being used to express wayfinding (Arthur & Passini, 1992). It was asserted that wayfinding is one's ability to find his way without getting lost (Pati *et al.* 2015). This explanation on wayfinding has evolved over the years, depending on the perspective of the research field.

The framework of the wayfinding process involves decision making (plan of action), decision execution (putting the plan into appropriate behaviour correctly) and information processing which involves the use of environmental perception, cognition and cognitive mapping to accomplish the wayfinding task that flows in a psychological pattern based on visual perception (Mustikawati *et al.,* 2017; Ullas & Aju, 2014). Some empirical studies had emphasised the importance of architectural information for wayfinding in hospital such as identification of landmarks (distinctive reference point and places), direct visual access from the entrance to the desired destination, and simple circulation routes to reduce decision points, was identified as supportive architectural design features in hospitals (Passini *et al.,* 1998; Marquardt *et al.,* 2011). Also, an environmental cue, such as signage was stated to facilitate the legibility of environment when architectural design features were not sufficient to provide the necessary information for wayfinding (Marquardt *et al.,* 2011).However, some studies asserted that monotonous, repetitive architectural features such as long, undifferentiated double corridors and change of direction in the circulation system interfere with users'

orientation (Marquardt *et al.*, 2011). This implies that the layout of circulation system was the most distinctive variation in the floor plan typologies in terms of the number of directional changes in the hospital which impedes wayfinding.

In addition, it was argued that the circulation space should be a well-structured path that is continuous and have a clear beginning up to the end in the progressive movement (Arthur & Passini, 1992; Marquardt *et al.*, 2011).Besides, a well-structured path allows the navigator to maintain orientation with respect to the next landmark along the path and the distance to the desired destination (Hashim & Said, 2013). This implies that limited choice should be made available to the navigator to avoid detours and branching off from the main path. Lynch (1960) identified path as an important element in wayfinding development.

Development of Wayfinding

The early studies on human wayfinding started with the works of Lynch (1960) the 'Image of the City', where he divided the contents of the city into five elements used in environmental information to make cognitive map and make sense of the city. The elements identified includes paths such as street or walkways for navigation, edges that serves as boundaries such as shores, railroad, walls and edges of the development. Others are nodes such as junctions, a crossing or convergence of paths which an observer travels. Also included are district, which represent medium to large section of the city, and a landmark which is the physical reference point such as mountains, water body, buildings and signs. These elements are connected with the perception of space and wayfinding in the urban environment (Karimi & Emami, 2015).

Subsequently, Weisman (1982), identified four classes of environmental variables that influence the ease of wayfinding performance within the built environments, namely, (1) Visual access, (2) the degree of architectural differentiation, (3) plan configuration, and (4) the use of signs and room numbers to provide identification or directional information. In addition, Arthur and Passini (1992) assessed the component of architecture and wayfinding in the circulation pattern with a view to construe environmental cues. Thus, this study is anchored on the theories of Lynch (1960), which described environmental legibility in the context of architecture as the ease to form a clear mental image that allows its users to find their way within it.Therefore, it is important to look at empirical research in hospital wayfinding.

One of the earliest research in hospital facilities was on the 'Design that Cares' by Carpman, Grant and Simmons (1986) in which it was contended that a harmonized wayfinding arrangement is required in healthcare facilities in order to ease wayfinding challenges that cause stress experienced by users (Mustikawati *et al*., 2017). The work of Baskaya *et al.* (2004) identified some environmental attributes that influence navigation. The study showed that floor plan, building layout and environmental cues should be properly considered in the initial plan of hospitals. The findings reveal that plan configuration correlates with wayfinding performance.

In addition, several studies underscore the importance of user's characteristics such as the aging population, the visually impaired and people with dementia (Rousek & Hallbeck, 2011; Marquardt, 2011). Consequently, the study identified some design attributes that produced wayfinding issues which include signage, path, lighting and flooring. As such, it was argued that these issues impacted negatively on the participants, which involve tripping off to getting lost in the environment. These challenges were asserted to be found in Nigeria hospital environment (Kahnge, 2011).Accordingly, there is high awareness on the part of the contemporary hospital designers to implement multiple design strategies to improve wayfinding (Devlin, 2014).However, there are limited researches that clarify which of the design strategies to prioritise and compromise due to project

cost limit in terms of the way environmental cues are processed and used (Pati *et al.*, 2015). Consequently, the role of architectural design in hospital wayfinding performance is significant.

Constructs for assessment of wayfinding: The constructs used in the context of this study are spatial legibility, influences and usefulness of the attributes in wayfinding in the hospital studied. Spatial Legibility is the extent to which the designed features of the environment are clear, simple, coherent, understandable and organisable that assists hospital users in generating an effective picture-like perception of the spatial relationships within a building, and the subsequent ease of wayfinding within the environment (Koseoglu & Onder, 2011). However, these concepts used in describing spatial legibility are characteristics of space which are easier and faster to acquire spatial knowledge, but cannot be used to assess legibility (Dehghan, Moradi & Memariyan, 2012). In order to assess spatial legibility, some parameters have been identified which can be used to evaluate the variables. For instance, variables like layout complexity and important landmark are assessed based on their degree of been complex and been recognisable as such(Pati *et al.,* 2015). This is to infer that the visual access from the entrance to the destination and the distinctiveness of the physical properties, such as landmarks, of the hospital environment are significant for effective wayfinding. Accordingly, these parameters will enable hospital user to remember important places and influence wayfinding performance in the design of space.

The influence of a designed space in wayfinding is the extent to which the built environment inspires, stimulate, effect and encourage movement of hospital users to locate the desired destinations with ease in the facility (Marquardt, 2011). The parameters used to assess these concepts are distinctiveness, complexity, affordance, accuracy and visibility of the environmental cues (Paul, 2013). Accordingly, each of this dimensions are used to assess the specific design elements that influence the ease of wayfinding in order to determine the quality of space in wayfinding (Marquardt, 2011).These parameters have been used to measure the architectural design attributes.

The next construct is the usefulness of any place legibility system which is referred to as the extent to which patients and visitors see the information in the environmental cues, which may positively or negatively affect the ease of wayfinding (Ullas & Aju, 2014). For instance, architectural cues such as signs may be difficult to read if they are mounted too high, located behind another sign, and poor colour combination (Paul, 2013). However, it should be noted that no matter how good, legible or clearly worded the cue or sign is, if the information is not available where it is needed, the cue's or sign's usefulness is considerably reduced (Ullas & Aju, 2014). Accordingly, for the effective usefulness of cues, signs and numbering, these should be made simple, consistent, flexible and visible (Pual, 2013). The constructs such as spatial legibility, influences, and usefulness was used in assessing the variables listed in the observation schedule for evaluating the effectiveness of wayfinding performance design indicators.

Method

The wayfinding methodological concepts involve the use of case study as a specific research strategy to investigate a phenomenon in real context so as to understand the dynamics of wayfinding processes (Rooke, 2012). This approach employs multi-level data collection method which includes interviews, observations, reports and archival data analysis (Lechman, 2014).Some studies have employed qualitative case studies in hospital wayfinding to explore, explain and describe wayfinding processes (Lu, 2011; Colfelt, 2012; Hughes*et al*., 2015) while others used observational technique of data collection (Khan, 2014). Accordingly, this study employed participants' observation and interview for an in-depth understanding of the contextual and holistic functional relationship between the users' and the hospital environment using conceptual

categories that guide the research and data analysis (Hashim & Said, 2013; Lechman, 2014). Hence, it is for this reason of contextual understanding of the environment that interview and non-participant observation was adopted to observe the behaviour of the wayfinder and the setting for rich and directly observed data collection in the fieldwork. This technique was used for the assessment of the architectural design layout of the hospital buildings and its implications for wayfinding at the University of Abuja Teaching Hospital, Abuja, Nigeria in the General Out-Patient Department (GOPD). Consequently, wayfinding observation schedule on hospital design indicators was adopted from the previous studies (Khan, 2014; Paul, 2013)to identify the variables used for the assessment of the effectiveness of the wayfinding performance in the hospital. These variables include conspicuousness of building entrance, visual access from the entrance, maps (accessibility of wayfinding information at entry point), signs, display of bill boards, horizontal circulation (pathways), vertical circulation (stairs/elevators), adequacy of lighting in the circulation space, open core circulation system, floor plan configuration, building shape, and symmetry of the building layout. Also, constructs used for the assessment of wayfinding were spatial legibility, influences on the quality of designed space and the usefulness of place legibility system which was used in structuring the items in the observations schedule (Paul, 2013).

Research Setting:

The University of Abuja Teaching Hospital was commissioned in 1992 by the Federal Capital Development Authority and in 1993 it was taken over by the Federal Government as a specialist hospital. In 2006, it was approved as a teaching hospital. The hospital has a bed capacity of 338.A professional architect in the hospital was interviewed and said:

'As a result of the evolution in development of the specialist hospital in phases and when it was upgraded to teaching hospital, the expansion of the circulation network was affected due to the addition of new buildings which consequently affects wayfinding in the hospital'. (p.1)

The hospital's layout is shown in Figure 1 and the study area in Figure 2. The layout of the hospital consists of all the buildings, road network and the parking lots in the hospital environment. It has its main entrance at the north eastern part of the site, the staff quarters at the south-eastern part (purple colour) and the circled part is the study area.

The study area consists of the General Outpatient Department (GOPD's), the National Health Insurance Scheme (NHIS) building complex, Accident and Emergency (A & E), Radiology (X-Ray) department, and the Laboratory unit. The NHIS accommodates the GOPD and Pharmacy section (see Figure 2).

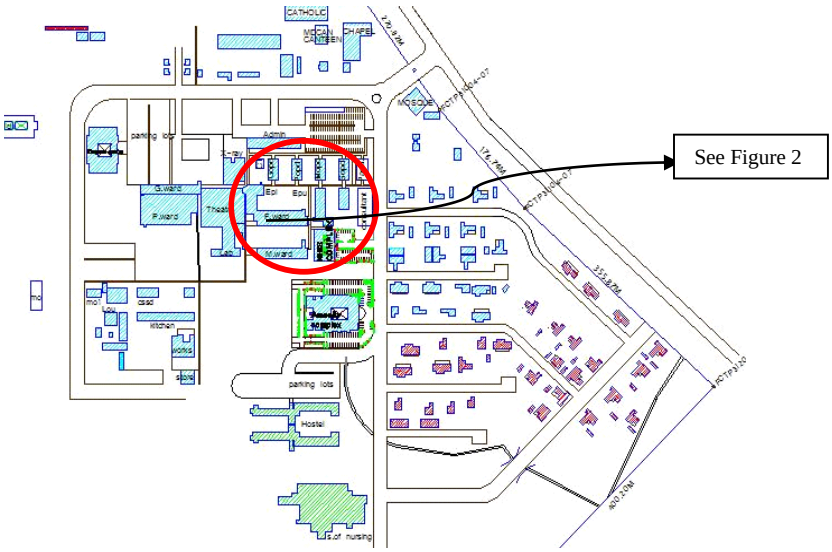

Figure 1: The layout of the hospital

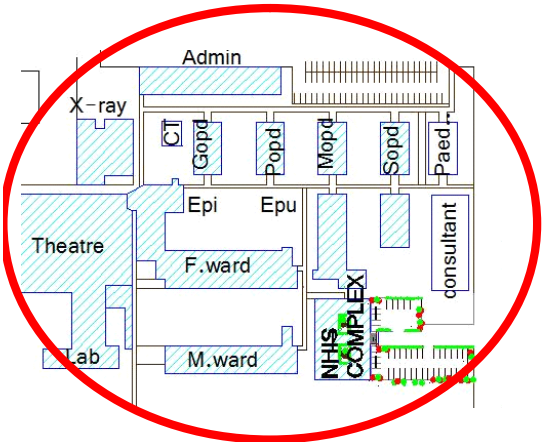

Figure 2: the study area within the hospital

Respondents to the study

Fifteen participants were observed which comprised of 8 males and 7 females with an age range of between 20 and 55 years. The participants were new patients who were unfamiliar with the hospital setting. This is because at the GOPD there was usually health talk to patients in which the researcher participated. It was mentioned by the senior nurse officer who delivered the health talk that the patients at the GOPD were new and were there to purchase new record cards.

Data collection procedure

Ethical approval to gain access into the hospital to conduct research was obtained from the University Health Research Ethics Committee. The approval enabled the researchers to obtain permission for the study at the various units visited for the research. The study was carried out from 27th December, 2017 to 5th January, 2018. The hospital site plan, floor plan (GOPD) was obtained and photographs of selected departments were taken. An informed consent of all patients who entered the GOPD was taken by the principal investigator before the observation of the patients' behaviour in wayfinding situations. However, some patients declined participation because they were not emotionally stable to participate. Thus, purposive sampling technique was used in

the selection of the patients. Each patient contacted was observed without instruction as he moved to the next destination after the consultation at the GOPD. The selected destinations for observation from GOPD were Accident and Emergency (A & E), Laboratory complex, Radiology and Pharmacy because they are all closely related in terms of medical procedure. The variables used for the spatial attributes of hospital users' route were number of directional changes, distance from GOPD entrance, Signage on the wall and landmarks used by patients.

Furthermore, 27 attributes of the architectural elements (See Tables 1-3) were considered as design indicators of the hospital units which was adopted from the studies of Paul, (2013) and Khan, (2014) in the observation schedule and assessed on its spatial legibility, influences of the design space and usefulness of the place legibility system on the effectiveness of wayfinding performance.

In addition, patients' travel behaviour was based on the number of stops, number of looking around, number of asking for direction and the spatial legibility of destination from the GOPD entrance. Verbal protocol was conducted inform of interview by asking the respondents to think aloud what they see, what they look for as cue, and the action taken while they completed the navigation. The verbal protocol is a data gathering method often used in process tracing in human factor research (Mustikawati *et al*., 2017). The protocols were recorded by a voice recorder, and then transcribed into written form. The transcripts were coded and categorised into identified wayfinding behaviour.

Data Analysis

The research assesses the effectiveness of wayfinding performance in the hospital by exploring the role of architectural cues in the ease of wayfinding performance. In the analysis, the observation of the physical setting, those of patients' route, the patients' behaviour and site plan analysis were done. The analysis was mainly descriptive for all the observations. The observation of the physical setting was analysed using domain analysis of spaces. This involves a systematic identification of the components of the observed spaces for navigation in the hospital (Parke & Griffiths, 2008). Hence, the authors' used observation schedule in the assessment of the setting by ticking the observed variables used by patients. It was used for the spatial legibility of the variables (see Table 1) which were assessed on being legible, not legible, and not available. Legibility implies whether the variable was recognised or not by patients during navigation. Similarly, the variables (see Table 2) on the influences of the design space in wayfinding were assessed on being influential, not influential, and not available. Also, the variables on usefulness of place legibility in wayfinding (see Table 3) were assessed on being useful, not useful, and not available.

In addition, the spatial attributes of patients' route were observed by the researcher in the various destination areas selected. The number of directional change in patient's route was counted and the distances of the route of entry to destinations were measured. Besides, the signage on the walls was described in term of the information it provided on its legibility level (identification of direction and destination) of wayfinding. The type of landmark provided was described (see Table 2). The users travel behaviour was described in terms of number of stops, looking around, asking for direction, and the number of backtracking within the navigation.

Observation of the Physical Setting

The site plan in conjunction with the physical observation of the buildings was done and recorded in tables 1-3. The researchers observed that the circulation spaces (pathways) in both the horizontal and vertical cues were legible. The GOPD has a central open core circulation system with stair case dividing the courtyard into two, which makes circulation legible (See Figure 3, NHIS complex). The floor plan configuration is symmetrical, the building plan shape and building layout were legible (see Figure 3). However, the building entrance was not conspicuous which makes

visual access not to be legible (Authors' observation, see Plate 1). Furthermore, most of the lighting points in the corridors (circulation space) were not working and consequently not legible (Authors' observation). In addition, maps and display boards were not provided at the entrance which would have assisted patients in finding their directional routes (See Table 1, and authors' field observation).The spatial legibility was based on beinglegible, not legible and not available, the items on the influences of design space were on influences, not influence and not available; and the usefulness of place legibility was on useful, not useful and not available.

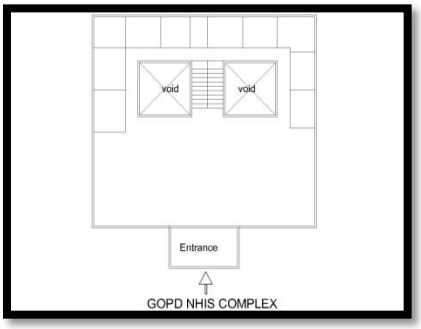

Figure 3: GOPD ComplexPlate I: GOPD ComplexPlate II: Radiology Dept.

Table 1: Wayfinding observation schedule on spatial legibility

S/No	Hospital design indicators for wayfinding	Legible	Not Legible	Not Available
1	Conspicuousness of Building entrance		*	
2	Visual access from the entrance		*	
3	Maps: Accessibility of this information at entry point			*
4	Signs: Ditto	*		
5	Display of bill boards			*
6	Horizontal circulation (pathways)		*	
7	Vertical circulation (stairs/elevators)	*		
8	Adequacy of lighting in the circulation space		*	
9	open core circulation system	*		
10	floor plan configuration	*		
11	Building shape	*		
12	Symmetry of the building layout	*		

Table 2: Wayfinding observation schedule onInfluences of design space

S/No	Hospital design indicators for wayfinding	Influence	Not Influence	Not Available
1	Architectural differentiation	*		
2	Floor finishes		*	
3	Important visible building form		*	
4	Important visible plants	*		
5	Important visible water body such as fountain (landmark)			*
6	Number of corridor intersections (nodes) at decision points	*		
7	Room numbers for destination identification	*		
8	Edges (clear building boundaries)	*		
9	Districts (recognizable and common character of buildings as reference point)	*		

Table 3: Wayfinding observation schedule on usefulness of place legibility

S/No	Hospital design indicators for wayfinding	Useful	Not Useful	Not Available
1	Wall colour strips			*
2	Furniture (seats) in waiting area	*		
3	Functional clusters (shops, ATM, wards)	*		
4	Artwork (sculpture or paintings)			*
5	Directional signs to destination			*
6	Identification of destination signs	*		

Furthermore, the researchers observed that the GOPD was a storey building adjacent to other out patients departments, such as the paediatric outpatients department (POPD), the medical out patients departments (MOPD), and surgical outpatients department (SOPD), that were bungalow buildings. A respondent interviewed said: '*'I use the height of the building to know the GOPD...'*(P-02).Consequently, the architectural differentiations significantly influence the effectiveness and ease of wayfinding in the hospital. Another respondent said: *'fine flowers (shrubs) are planted in front of the laboratory which I use to know where I am going because no arrow to direct me to the place*. .' (P-06).This trees were used as visible landmarks, edges and different zones were clearly demarcated which influences wayfinding because they could be used as reference points. However, there were no directional cues such as directional signs at corridor intersections where patients take decisions as to which route to follow (See P-06). This could cause confusion on which route to take. In addition, rooms were clearly numbered and labelled. The cluster of functions, such as shops, ATMs, banks and seating arrangements, as well as location signs were useful in the ease of wayfinding performance in the hospital. This is because patients see many people around these facilities which assist them in recognising the direction and identification of places in the hospital (see Plate II).

Spatial attributes of patients' route

The number of directional changes from the main entrance to the GOPD, and other areas located within the entry level range between 1 and 2. Also, the signage on the walls was clear, consistent and legible (Authors' observation). One of the respondents said: 'I use the tree in front of the building to direct me to the GOPD building.' P08. This implies that the tree used as landscape elements constitutes the main landmark in the GOPD. However, there were no directional signs at the decision points (See Table 4).

Table 4: Spatial attributes of patients' route

	GOPD	Accident & Emergency (A&E)	Laboratory	Radiology	Pharmacy
Number of directional change	2	1	2	1	2
Distance from entry	10m	5m	100m	30m	40m
No. of Signage on walls from origin to destination	1	1 (not bold enough)	1	1	1
No & type of Landmarks	10 nos. of Treess & shrubs	0	5 nos. of Trees & shrubs	0	2 nos. of Trees & shrubs

Patients wayfinding behaviour

In this study, the respondents were new patients that were not familiar with the spatial layout of the buildings visited. Thus, the researchers observed the movement pattern of the participant sas he or she attempts to locate the desired destination and such wayfinding behaviour was recorded in Table 5. This includes the number of stops, the number of looking around, the number of asking for directions which were counted by the researchers and recorded in accordance to gender.

The stop behaviour includes the number of stops which ranged between 1 and 2 amongst the participants. The number of stops by female respondents was generally 2 times while the male stopped 1 time before reaching their various destinations. Also, where the participant stopped was identified as decision points. The decision points are the place where cues and information have to be perceived. It was observed that participants looked around to scrutinise the information by understanding the visual content of the cues to ensure been on the right path that could potentially direct them to their destinations. Again, all the participants asked for direction once before reaching their destinations. Similarly, only one participant turned back. The following expressions imply turning back: *'It seemed I took the wrong route' (P02).'mmm.Let me go back, this not the right way' (P04).* All these show the wayfinding behaviour of unfamiliar participant in the hospital environment. This implies that wayfinding is an act of spatial problem solving.

Table 5: Hospital users' travel behaviour

	GOPD		A&E		Laboratory		Radiology		Pharmacy	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
No. of stops	1	2	1	1	1	2	1	2	1	1
No. of looking around	2	1	2	2	2	2	1	1	1	1
No. of asking for direction	1	1	1	1	1	1	1	1	1	1
No. of backtracking	0	0	1	0	0	1	0	0	0	0

Discussion

Based on the researchers' on-site observation of the physical setting, the major findings shows that6 out of 12, which represent 50%, of the architectural attributes on spatial legibility were observed to be legible (See Table 1).Such attributes include signs, vertical circulation (stairs), open core circulation system; floor plan configuration, building shape, and building layout were observed to be legible. This means that the designed space was not difficult to navigate. Also, 6 out of the 9 items observed, which represent 67%, influences the movement pattern in the hospital environment (See Table 2). The attributes includes architectural differentiation, corridor intersections (nodes), landmarks and destination identification. This means that these attributes that influences wayfinding were simple to understand and recognisable by the users which ease wayfinding performance. This is significant as the architectural elements influence, the decisions users made during navigation in wayfinding situations. Hence, make hospital a friendly environment to the users. These findings corroborate that of Paul (2013) on spatial legibility, influences of space legibility and usefulness of place legibility on wayfinding, though, in a different context.

Furthermore, the researcher's on-site observation of the spatial patient's route in the building layout shows that the circulation system was generally linear with maximum of two changes in directions and 100m walking distance to the laboratory section. The study shows that prominent trees were used as a reference point (landmark) in the hospital and sign at the Accident and Emergency (A&E) was not bold for patients to notice. This is to suggest that new patients to the hospital are likely to mistaken A & E for GOPD, even though, patients are likely to make less error in wayfinding situations.

The patients' wayfinding behaviour indicates that females had more stops than male while male had more looking around than female. All respondents ask for direction, which means there are inadequate directional signs. In addition, the few stop behaviour executed by the participants in some nodes within the travelled distance inferred that the users stop to search for cue and to examine the information content offered by the cue along the route. Previous study also identified stop behaviour as the most likely produced behaviour in wayfinding (Mustikawati *et al.*, 2017). Similarly, it can be deduced that the looking around was to reassure the participants on the correctness of the route taken. The asking for direction and backtracking once by the participants inferred that the participant felt rather lost or was not sure about the right direction. The actions were to ensure they were on the right track. It is most supportive when information is provided at the right place to reassure the wayfinder of being in the right way. Therefore, the researcher argued that the building layout was not complex to navigate. Accordingly, the design of the hospital environment was found to be legible for ease of wayfinding.

Conclusion

This study is on architectural design layout and its implication for unfamiliar hospital users. Wayfinding involve the use of cues or information need provided by the building for navigation. As a result of architectural design complexity in teaching hospitals, users often get lost and frustrated in locating the desired destination with ease. The main findings of the study are the architectural differentiation in terms of height as a landmark, and simplicity of the floor plan configuration in terms of shape and layout. Other findings include open core circulation path, and reduced number of turns or changes in direction which plays a major role in the wayfinding experience of the users. However, the most striking revelation was the use of prominent trees as a reference point in the GOPD and laboratory section by some patients.

The research is significant in view of the challenges associated with inefficient wayfinding design needs of patients who lack understanding of the setting. Cue-searching is the main activity in wayfinding

provided by architectural design features. Therefore, further research is recommended on how each cue can be related to one another to develop the information needed in wayfinding.

References

Arthur, P.& Passini, R. (1992).*Wayfinding: people, signs and architecture*. New York: McGraw-Hill Ryerson, Toronto.

Baskaya, A., Wilson, C., & Özcan, Y. Z.(2004).Wayfinding in an Unfamiliar Environment Different Spatial Settings of Two Polyclinics. *Environment and Behaviour*, 36(6), 839-867. Retrieved from http://dx.doi.org/10.1177/0013916504 26504265445 on 4/5/2016

Colfelt, S. (2012).*Designing Inclusive Spaces: Wayfinding in Hospital Complexes.* Available from ad.dk/ws/files/35897867/CWUAAT_ 2012_Colfelt_Solvej20111024.pdf. [Retrieved on 20/2/2017]

Dehghan, N., Moradi, M.A.,& Memariyan, G.H. (2012). Comparing the Dimensions of Spatial Legibility with Wayfinding Strategies. *International Research Journal of Applied & Basic Sciences.*2637-2646 Retrieved from www.irjabs.com on 15/1/2017.

Devlin, A.S. (2014). Wayfinding in Healthcare Facilities: Contribution from Environmental Psychology.*Journal of Behavioural Science*. *Industrial Ergonomics*, *41*(5), 447-458.

Downs, R. M. & Stea, D. (1973). Cognitive Maps and Spatial Behaviour.In R. M. Downs & D. Stea (Eds.).*Image and Environment*, (pp.8-26.) Chicago, IL: Aldine Publishing Company.

Farr, A. C., Kleinschmidt, T., Yarlngadda, P.K., &Mengersen, K.(2012).Wayfinding: A Simple Concept, a Complex Process. Taylor & Francis Group. Retrieved from http://doi.org/10.1080/0.1441647.201 2.712555 on 06/12/2016

Gibson, J. J. (2015). *The Ecological Approach to Visual Perception*. Boston, Houghton Mifflin. Classic edition.

Hashim, M. S,& Said, I. (2013).Effectiveness of Wayfinding Towards Spatial Space and Human Behaviour in Theme Park. *Procedia - Social and Behavioural Sciences*, 85, 282 – 295.

Hughes, N., Pinchin, J., Brown, M., &Shaw, D., (2015). 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/Na vigating

Karimi, M. & Emami, A.(2015).Review on Wayfinding Performance by Identification of Key Factors Influence. *Science Journal, 36 (3).*Retrieved from *www.dergi.cuhuriyet.edu.tr/cumuscij/ article/viewFile/5000131084/500012 4979 on 25/1/2018*

Khan, N. (2014).Spatial correlates of Patients' Travel Experience & Satisfaction in Hospital Outpatient Department. Architectural Research Conference. North Carolina, 699-705. ARCC/*The Visibility of Research Open Topics Journal*. Retrieved on 16/10/2016 From www.arcc.journal.org/index.php/repo sitory/article/viewFile/235/184

Koseoglu, E. & Onder, D. E. (2011). Subjective and Objective Dimensions of Spatial Legibility.Procedia-Social and Behavioural Sciences 30, 1191-1195.Published by Elsevier. Retrieved from www.sciencedirect.com on 25/11/2016

Lechman, E. (2014). Case study methodology. Few Conceptual Considerations. *Journal of Management & Economics.* Retrieved on 4/4/2018 from https://zie.pg.edu.p/documents/30328 766/.../REME

Lin, C. H., Chen, C. M., & Lou, Y. C. (2014).Developing Spatial Orientation and Spatial Memory with a Treasure Hunting Game. *Journal of Educational Technology & Society*,

17(3), 79-92.

Lu, Y., & Bozovic-Stamenovic, R. (2009): Cultural Perspective of Wayfinding Behavior:Exploring the socio-spatial variable in three Chinese hospital case studies, *International Journal of Architetural Research., 3, 22 -34.*

Lynch, K. (1960). *The Image of the City.* (Vol. 11). Cambridge MA, MIT press.

Marquardt, G. (2011). Wayfinding for People with Dementia: A Review of the Role of Architectural Design. *HERD: Health Environments Research & Design Journal*, *4*(2), 75-90.

Mustikawati, T., Yatmo, Y. A., Atmodiwirjo, P.(2017).Reading the Visual Environment in Healthcare Facilities. *Journal of Environment and Behaviour.* Retrieved from www.e-iph.co.UK on 11/10/2017

Parke, J. & Griffiths, M. (2008). Participant and Non-participant Observation in Gambling. 1(1):61-74. Published by International Gaming Research Unit, Nottinggham Trent University. Retrieved on 24/5/2018 from www.nottingham.ac.uk/sociology/documents/enquire/...

Pati, D., Harvey, T. E., Willis, D. A., & Pati, S. (2015).Identifying Elements of the Health Care Environment That Contribute to Wayfinding. *HERD: Health Environments Research & Design Journa*l, 8(3), 44-67.

Paul, M. (2013). *Factors that Influence Ease of Wayfinding in a Hospital Setting*. PhD dissertation, University of Missouri-Columbia.

Rousek, J. B., & Hallbeck, M. S. (2011).The use of simulated visual impairment to identify hospital design elements that contribute to wayfinding difficulties. *International Journal of Industrial Ergonomics, 4195), 447-458*

Samah, Z. A., Ibrahim, N., & Amir, J. S. (2013).Translating Quality Care Factors to Quality Space: Design Criteria for an Outpatient Facility. *Procedia-Social and Behavioural Sciences*, 105, 265-272.

Tzeng, S. Y. & Huang, J. S. (2009). Spatial Forms and Signage in Wayfinding Decision Points for Hospital Outpatient Services. *Journal of Asian Architecture and Building Engineering*, 460 (4), 369-460

Ullas, B. & Aju, R. (2014). Wayfinding in Theme Parks. *International Journal of Scientific & Engineering Research*, 5, (7).Retrieved from http://www.ijser.org on 10/9/2017.

Vilar, E., Rebelo, F., Noriega, P., Duarte, E.,&Mayhorn, C.B. **(**2014).Effects of competing environmental variables and signage on the route-choices in simulated everyday and emergency wayfinding. *Ergonomics, 57*, 511–524.

Weisman, J. (1981). Evaluating Architectural Legibility: Way-finding in the Built Environment. *Journal of Environment and Behaviour* 13 (2,) 189-204.