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Rooke, Clementinah Ndhlovu, Tzortzopoulos, Patricia, Koskela, Lauri and Rooke, John

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WAYFINDING: EMBEDDING KNOWLEDGE IN HOSPITAL ENVIRONMENTS¹

C.N. Rooke² P. Tzortzopoulos³ L. J. Koskela⁴ and J.A Rooke⁵

ABSTRACT

The traditional use of signs has failed to overcome the problem of wayfinding in hospitals. As wayfinding problems are clearly linked to healthcare outcomes there is need to find a more integrated approach to solving the problem. In this paper it is shown that it is possible to embed forms of knowledge that make it easier for people to find their way with little need for signs. Evidence from literature and from fieldwork supports this assertion. Methods used for our research included direct observation, analysis of photographs and discussion with members of staff and other users of the setting.

KEYWORDS: architecture, wayfinding, artefacts, knowledge ethn methodology.

Introduction

Finding one's way in a complex built environment such as a hospital can be challenging. The traditional use of signs has failed to overcome this problem of wayfinding. An existing hospital environment will be studied in order to establish why it is that people visiting the hospital or departments get lost. The aim of the first phase of the research is to establish the methodological basis of wayfinding practices employed in the setting. In the second phase strategies for improvement of accessibility and usability of hospital environments are proposed. In this paper we aim to establish whether wayfinding in hospital environments can be improved without exclusively relying on signs. We start by briefly exploring the history and meaning of the term wayfinding. This is followed by a review of literature on wayfinding

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² Postgraduate Researcher (PhD): Research Institute for Built and Human Environment. The university of Salford: c.n.rooke@pgr.salford.ac.uk or clementinahn@yahoo.co.uk

³Academic Research Fellow Research Institute for Built and Human Environment. The university of Salford: P.Tzortzopoulos@salford.ac.uk

⁴ Professor: Research Institute for Built and Human Environment. The university of Salford: L.J.Koskela@salford.ac.uk

⁵Research Fellow: Research Institute for Built and Human Environment. The university of Salford: jalfro@eml.cc

in hospital environments. We then discuss and analyse the findings of the first phase of our research which seeks to identify aspects of the physical environment which impact either positively or negatively on people's ability to find their way in and around this setting. The section concludes with a comparison of our findings to those of the literature review. The conclusion sums up the main points and makes suggestions for future work.

Wayfinding

1.1. A brief history and meaning of wayfinding

The term wayfinding was first used by Lynch (1960) where he referred to maps, street numbers, and directional signs etc. as "way-finding" devices. His work, which is seen by many as being pivotal in how we understand environments, was based on the concept of *spatial orientation* and its prerequisite the *cognitive map*. Arthur and Passini (1992). In the 1970s cognitive researchers such as Kaplan (1982) and Downs and Stea (1973) developed the concept of wayfinding by showing that in order to understand how people find their way, there is a need to first understand the underlying process. In the late 70s Romedi Passini (1984), an architect and environmental psychologist first articulated wayfinding as a spatial problem-solving exercise in which he described wayfinding as a process during which people must solve a wide variety of problems in architectural and urban spaces that involve both decision making and decision executing. According to Brandon (2008) Passini's work was recognized as being seminal in explaining many of the issues which graphic designers had been dealing with for many years and that it gave designers the structure for describing what the design of wayfinding systems entailed. In some cases, he further asserts, it ratified the intuition of designers about good wayfinding design and in others it corrected faulty notions and at its best, it has seen the development of a common language by which designers and clients can discuss wayfinding needs and solutions.

From what has been highlighted in this section one can follow the emergence of the concept of wayfinding. The three phases that the concept has developed through since the first time the word was used by Lynch can be seen. There is also an acknowledgement of the significance of the work Lynch and that of Passini in wayfinding design and theory in

general. Today, most literature on wayfinding in complex environments is inundated with several wayfinding principles most of which appear to attach a lot of importance on the historic development of wayfinding. However, Muhlhausen (2006) highlights a 'current misunderstanding that wayfinding is essentially the same as signage' and argues that Lynch's referral to maps, street numbers, directional signs etc. as "way-finding" devices may have contributed to the emergence of this narrow view. Whilst acknowledging the important role played by signage in wayfinding, he asserts that wayfinding used to navigate unfamiliar environments, doesn't rely exclusively on signs.

The various definitions of the term wayfinding that can be found in literature are based on the three key processes involved in spatial problem-solving first identified by Passini (1984); information processing, decision making or planning and decision execution. For example, Modulex (2007), the signmakers, describe wayfinding as;

'... the name given to the art and science which allow us to put the right information in the right place in order to provide the user with an easy journey through a possibly difficult environment' (<http://www.modulex.com>)

Brandon (2008), an architect and designer describes it as

'... the process of using spatial and environmental information to find our way in the built environment' (www.kellybrandondesign.com)

Lastly, in the DOH document offering guidance for improving wayfinding in healthcare settings, wayfinding is described as problem-solving processes people go through to find their way around an environment (DOH, 2005). This document by Miller fully acknowledges the work of Arthur and Passini (1992) where it refers to information processing, decision making and decision execution as the 'three key processes in the wayfinding process' (p.14)

It is clear from what has been highlighted so far that wayfinding is about prioritising the needs of the users of a setting. The challenge for designers therefore is in finding the best way of establishing or assessing the needs of the users of a setting. Several suggestions have been put forward over the years. Passini (1984) asserts that the users should be observed in action. The DOH (2005) guidance document suggests that information can be obtained from users

through the use of a questionnaire survey. In this paper we argue for a direct observation approach which we describe in more detail under the case study section below. In the meantime, we will review literature on wayfinding in healthcare environments.

1.2. Wayfinding in hospital environments.

There appears to be a large body of literature which has explored how people find their way through hospitals (Baskaya et al., 2004; Brown et al, 1997; Butler et al., 1993; Carpman & Grant, 1993; Carpman et al., 1983, 1984; Grover, 1971; Haq & Zimring, 2003; Huelat (2007), Levine et al., 1984; Nelson-Shulman, 1983-84; Passini et al 1995; Peponis et al., 1990; Schneider and Taylor, 1999; Weisman, 1981; Wright et al., 1993; Zimring, 1990, DOH (2005). It ought to be noted, however, that a large percentage of these studies are based on the work carried out in United States of America (USA) hospitals. As such it is tempting to speculate whether the findings of these studies are applicable to the hospitals in the United Kingdom (UK). However, such an exercise is likely to be uneventful since the general principles that apply to good wayfinding derive from the same sources (Lynch (1960), Passini (1984) or Arthur and Passini (1992). Besides, the Department of Health (DOH) (2005) guidance document for UK healthcare settings fully acknowledges these sources. Below we look at the specific details of some of these studies.

Carpman and Grant (1993) point out that any good wayfinding system should go beyond mere signage and the use of colour codes to differentiate various hospital areas. They call for an integration of coordinated elements, such as visible and easy-to-understand signs and numbers; clear and consistent verbal directions; consistent and clear paper, mail-out, and electronic information; and legible physical settings. This view is fully endorsed by the DOH (2005) who broadly classifies the coordinated elements (Carpman and Grant, 1993) under people factors, environmental factors and informational factors (pre-visit, on route, on site and locational).

Ulrich et al (2008) emphasise the importance of carefully considering the signs and cues that lead to the hospital, especially to the parking lot because they are the patient's first point of contact with the hospital. Several other studies highlight the importance of informational handouts, information desks, you-are-here maps, directories, and signage (Carpman, et al, 1983; Levine, et al 1984; Nelson-Shulman, 1983-84; Wright, et al, 1993). Nelson-Shulman, (1983-84) found that patients who have the benefit of an information system are more self-reliant and make fewer demands on staff. Wright et al. (1993) found that a combination of hand held maps and wall signs helped users reach their destination quicker than those who used only wall signs. Carpman et al., (1984) suggest that directional signs should be placed at or before every major intersection, at major destinations, and where a single environmental cue or a series of such cues (e.g., changes in flooring material) convey the message that the individual is moving from one area into another.

Other studies (Haq & Zimring, 2003., Peponis et al. 1990) highlight specific characteristics of the overall structure of the system of rooms and corridors that affect the paths people take. Peponis et al. (1990), for example, found that people tend to have predictable paths when they explore and find their way in hospitals. However, these are often not the most direct paths or the routes that are designated as the main paths, but rather the routes that are the most accessible to all of the other paths in the hospital. Baskaya, et al (2004) found that people got lost less frequently in a hospital where the entrance is next to the main hallway. The studies by Werner and Schindler, (2004) and Ruddle and Peruch, (2004) looked at properties of building layout that facilitate or impede movement. The former found that environments with perpendicular intersecting hallways gave better wayfinding performance than those with angled intersections. The latter, came to the conclusion that well-designed signs are likely to be quite ineffective in a building that is highly complicated and does not provide simple cues that enable natural movement.

The relationship between wayfinding problems and health outcomes is highlighted by Carpman and Grant, (2001) and Huelat (2007). The former point to the the stress related problems linked to wayfinding in complex hospital environments such as raised blood pressure, headaches, increased physical exertion, and fatigue. The latter likens good

wayfinding with good patient flow, and asserts that applying simple organizational, architectural and graphic principles not only reduces patient stress and anxiety, but can lead to improved health. A study by Zimring (1990) goes as far as calculating the hidden costs of direction-giving by people other than information staff. The study found the cost was more than \$220,000 per year, a cost equivalent to more than 4,500 staff hours or two full-time positions. Needless to point out that the lost hours could be better spent delivering a better healthcare service to the patients.

From these studies two basic themes emerge; first a clear emphasis on the need for integrated wayfinding systems and second the relationship between wayfinding problems and health outcomes.

Our research takes a through-life knowledge management approach to wayfinding, based on a tri-partite conception of knowledge (Rooke et al 2008). We assume that any wayfinding strategy should utilise all three aspects of knowledge: encoded information; social practice; and the physical properties of artefacts. Thus, the concepts of information and social practice, conventionally applied in knowledge management, are supplemented with a conception of physical objects and environments as knowledge carrying entities which are constituted, recognised and used in the course of social practices. This tri-partite approach highlights the value of physical (including among others visual and tactile) properties of artefacts in the preservation of knowledge through subsequent stages of the life-cycle of a building and its transfer from artefact to user. The idea of coordinating elements (Carpman and Grant, 1995) can be likened to the management of a flow of knowledge through the hospital environment to the user of the setting.

Evidence from literature suggests that such legible physical settings (Carpman and Grant's 2001,) or architectural wayfinding communication (Arthur and Passini 1992) is possible. According to the latter it is possible to create built environments that provide a great variety of wayfinding cues which allow an intuitive performance of certain tasks without the need for explicit instructions. The entrance to a building, for example, is embedded with

knowledge that makes it possible for us to recognise it as an entrance, even if it has no entrance sign on it. The stairs and the lifts clearly communicate what they are without recourse to verbal or written instruction. The strategic placement of written and graphic information in agreement with the physical properties of environments makes a complex environment easier to navigate (Ruddle and Peruch's 2004). In the next section we consider whether our case study hospital has the potential to improve communication with its users, through the better use of knowledge embedded in its physical properties.

Case study: A local NHS Foundation Trust

The aim of our current research on wayfinding at a local NHS Foundation Trust is to establish whether its existing wayfinding problems can be solved by embedding knowledge in the physical properties the environment. The research is in two overlapping phases; the first phase has studied the existing environment in order to establish how it is that people visiting the hospital or departments find their way and why it is they get lost. The outcome of the first phase, a report which describes the good and bad practices in wayfinding as currently identified at the hospital site has been submitted to the hospital's redevelopment team for consideration. The second research phase will focus on proposing strategies to improve wayfinding across the hospital, both in the existing and new buildings. Such strategies will be developed through action research, drawing on existing good practice taken from the literature, as well as an analysis of specific problems at the hospital site, identified through the fieldwork. Successful completion of this project should help improve the accessibility and usability of the hospital environment, which in turn impacts positively on service delivery and customer experience, as has been highlighted above.

1.3. Methodology

An ethnomethodologically informed approach has been adopted, which uses participant observation in order to establish the methods which visitors to the hospital actually use in finding their way around. Drawing principally on the researcher's own experience of attempting to navigate the hospital site, the resulting account seeks to conform to the requirement of Unique Adequacy. This requires: (1) that the researcher must know what any

member of a research setting would ordinarily know about that setting; and (2) that in reporting that setting, theoretical formulations that are not used by members of the setting in the social production of that setting should not be used (Rooke & Kagioglou 2007).

As stated above, the principle method of research was for the researcher to reflect upon and report her own attempts to navigate the hospital site (Francis & Hester 2004). Data was collected in ten separate visits spread over a period of two months. The objective of each visit was to find a specific department e.g. dermatology, radiology, maternity, outpatients department etc. chosen at random and previously unknown to the researcher. In undertaking these journeys, the researcher was a visitor to the hospital who was unfamiliar with the hospital lay-out. As such, she was in an analogous position to any other visitor to the setting, whether patient, visitor, or new staff member. This approach clearly has its limitations, with each visit familiarity with the site layout increases and the researcher's natural sensitivity to way-finding problems is consequently diminished. However, these initial experiences have proved a rich source of data which surveys, interviews or other methods would have missed.

In addition, the researcher observed how people made sense of the hospital environment. Photographs were also taken. These direct observation methods were supplemented by conversations with other visitors to the hospital and with members of staff and hospital voluntary workers.

In the early stages of the fieldwork the researcher was keen to clarify ethical issues surrounding the exposure to such data. The hospital's redevelopment team, however, made it clear that as long as personal information was not accessed, there were no ethical concerns. Although the researcher was granted permission to move around the site freely taking photographs, observing and talking to people, the need to demonstrate sensitivity to ethical issues around the welfare of patients was strongly emphasised by the hospital authorities. This became an issue when it came to the taking of photographs of the environment as great care was taken to ensure that no patients or visitors were photographed. This resulted in most photos being taken during the weekends or later hours of the day when the environment is quieter.

1.4. Findings

Although it is clear that some effort has been made to create an integrated wayfinding system such as that emphasised earlier (Carpman and Grant, 1995., DOH, 2005), the current system falls short of solving the wayfinding problems experienced by the users of the setting. The current system makes use of staff, volunteers, graphical information such as signs and colour. The aspects of the environment which have a positive impact on wayfinding include, big clear signs strategically positioned for users of the setting to identify from a good distance, recognisable pictograms and people. The negative aspects include misleading and/or ambiguous signs, inconsistent use of colour or too much use of it and information overload or lack of it at key decision making points.

The observable confusion and frustration of users of the environment at certain decision making points is enough to trigger a voluntary offer of help from staff or more competent users of the setting. The confusion is evident in their behaviour; looking lost and anxious, a frustrated muttering to themselves or an open expression of their frustration. When staff stop to offer help, an immediate sense of relief can be observed. However, the relief is quickly replaced by more frustration and/or anxiety when one realises that they now have an added task of recalling the verbal instructions. Remarks such as '*Can't make sense of all that*' or '*That helps!*' followed by rolling of the eyes and a tilting back of the head can be heard and seen.

Overall, the complexity of the interiors of the buildings makes it difficult for users to navigate between floors and departments. There is lack of clarity in the definition of pedestrian pathways internally as there is that of prominent landmarks for people to notice, remember and recognise. An example of such confusion is where the user is met with a **ground floor** sign on the wall clearly announcing arrival but is presented with two doors and no further clue as to which door they should use to get out. The lack of clarity in internal pedestrian pathways has resulted in what can be viewed as an unsafe practice; that of leaving doors open in order to aid wayfinding (see pics 1&3). Unfortunately some of these doors appear to be fire doors which by law should be kept closed all the time.

However, as our aim is establish whether this environment can be embedded with knowledge in such a way that the use of signs is minimal it is important that we pay attention to the aspects that impact negatively on its physical legibility. Below we look at how users are misled or confused by the poor embedding of graphical information such as signs and colour in the physical properties of the environment. We use photographs to illustrate our points where necessary and comment on the confusion experienced by an older user of the setting.

Pic1



Pic 2



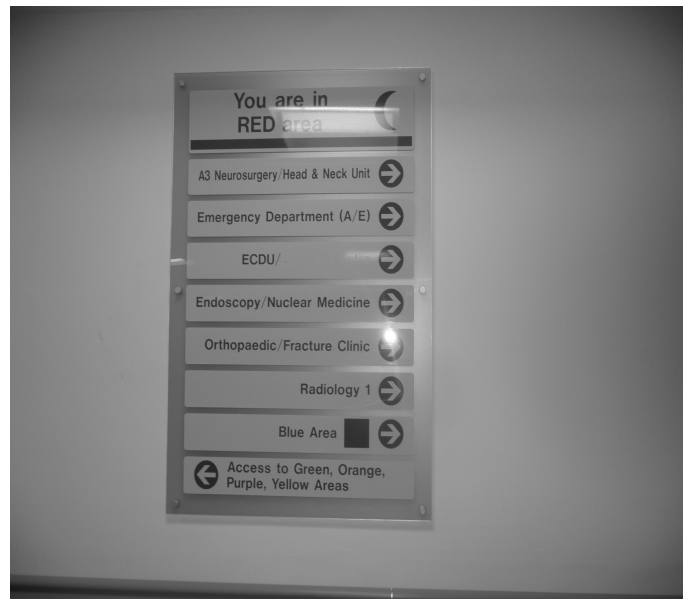
Pic 3



Pic 4



Pic 5



According to the information seen in picture 1, to get to the Gastrointestinal Physiology Research (GPR) department one should go straight ahead through the double doors. At this point of the journey the instruction is clear and is supported by other physical properties around. The open door is a clear invitation to walk through. To the right of the door is another set of double doors with instructions for departments on the next level which are accessible via a flight of stairs. The arrows denoting the direction slant slightly to the right. The arrangement here clearly pays attention to the architectural layout, the physical properties of this part of the environment and a strategic positioning of signs. However, at the end of the corridor that can be seen in the first picture, the user is presented with the double doors seen in pic 2. The sudden appearance of the fire exit sign leaves one certain that the GPR is straight ahead. On opening the door (see pic 3) it becomes clear that the GPR is not straight ahead but on the next floor.

To get to the purple, green, orange and yellow area of the hospital via the red area users must go through a connecting corridor. The directions leading to the corridor can be seen at the bottom of the sign (see pics 4&5) on the wall. Unfortunately, a lot of confusion is created because of where the sign is positioned in relation other physical features of this section. Here

people can be observed walking up to the door seen in pic 4 and trying the handle. If this door could be opened, several people would find themselves heading in the wrong direction no doubt.

The lack of consistency in the use of colour is yet another big challenge for the users of the setting. In some areas it is used on features such as skirting boards and floors so as to aid wayfinding while in others the same technique is used for purely decorative purposes. A good example of the confusion is the section of the hospital that connects the red area to four other areas (purple, yellow, green and orange) via a long corridor. The start of the corridor has a beautiful architectural layout laced with purple and blue trimmings on the floor and skirting boards. Some users think the purple is significant as this is the beginning of the connecting corridor leading to the purple, green, yellow and orange areas. Other examples include skirting boards and finishes painted turquoise in the green area, grey in a blue area, blue in a red area, dark green in an orange area and so forth. However, in some sections of the green area, colour coding appears to have been applied (green in green).

Through direct observation and listening to or being party to several conversations with those lost, it became apparent to the researcher that those not competent in using signs or written information heavily rely on the use colour. An open expression of frustration at the confusion caused by poor embedding of colour can be heard by anyone who stops long enough to listen. One such conversation occurred between two women visiting a hospitalised relative and the researcher. The older of the two women admitted that she uses colour on the floor and not signs *'which I cannot make sense of love'* to find her way. *'They say it is the green area but all the floors are purple...You see I do not read signs me. I look at the floor'* Consistency in the use of colour in this case would have helped this lady, who complained that the time spent getting lost was time she should have spent seeing her relative.

It is possible to say that this setting has a great unrealised potential to guide its users via knowledge embedded in its physical properties. This could be achieved in several ways, some of which are suggested in literature as we have seen above. To begin with, it should be

possible to clarify the confusion created by the poor embedding of graphical information. The benefits of doing so are highlighted by Ruddle and Peruch (2004). Secondly, the environment has plenty of scope for reducing the need for signs by embedding other forms of knowledge. Some artistic landmarks, for example, on the bare walls and long corridors (see pic 4) that characterise the hospital, could help guide all kinds of users including those who cannot read. In the case of the bare walls seen in this picture, bold clear arrows (blue, purple, green, yellow) placed on the curved wall just after the door would perhaps guide most people into the corridor that leads to the other areas. Some cue hanging from the ceiling just at the beginning of the corridor could perhaps be another way.

Conclusion

The aim of this paper is to establish whether hospital environments can be embedded with knowledge in order to improve wayfinding. We started from the premise that the use of signs alone has failed to solve wayfinding problems and uncovered from literature evidence that it is possible to embed other forms of knowledge in the physical properties of the environment. These include the use of prominent landmarks, colour, features of the buildings and environment that allow for an intuitive performance of activities without reliance on signs and the strategic placement graphical information in such a way that it is in agreement with the architectural layout of the environment. Some of the findings of the literature review have been confirmed by our fieldwork; for example the confusion and frustration caused by the poor placement of signs, the advantage of using prominent landmarks or cues and the stress related problems linked to wayfinding in complex environments. However, our empirical work uncovered an important finding which needs careful approach and further analysis before recommending implementation; that of the open fire doors. Although it is clear that the role they currently play in aiding wayfinding is invaluable, great care ought to be taken in ensuring the safety of the inhabitants of this environment in the event of a fire. This important discovery may not have been possible had the researcher opted for alternative methods of research such as semi-structured interviews or surveys.

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