Title: Designing and Publishing Indoor Maps for Patients and Visitors in an Academic Teaching Hospital

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Project: Designing and Publishing Indoor Maps for Patients and Visitors in an Academic Teaching Hospital.

Abstract

Introduction. This project aims to improve the service user experience by designing and publishing an accessible indoor map in an academic teaching hospital. On a daily basis approximately 600 service users will be disoriented in the hospital resulting in 18 hours/day staff time spent helping patients find their way. 84% (n=109) of staff categorised indoor maps as a service improvement. Patients who get lost can feel anxiety, shame and even panic. Maps can improve patient autonomy. Internationally hospitals develop a wayfinding strategy to co-ordinate information received by service users.

Initiation. Volunteer-run project survey (n=175) showed 84% of disoriented patients would have liked a map. Up to 18 hours/day staff time is invested in re-orientating approximately 600 patients daily.

Planning. Analysis of service user locations included signs, directions, and kiosk locations. Tool choice was Adobe Illustrator CS6 (Adobe, 2014) to create paper maps. Maps available in leaflet form, on the reverse of a letter or as a kiosk ticket. Implementation. The map was endorsed by senior management and published on the hospital website. Development time was 80 hours but project was cost neutral. Adopting maps will cost €1700 annually (1c/letter).

Evaluation. MAPQUAL quality framework gave a medium-high map quality score, issues identified with signage accuracy (69%) affecting map clarity, usefulness and availability through patient letters.
**Conclusion.** The HSE Change Model\(^3\) supports developing innovation projects but mainstreaming may require further research where change disrupts processes. Irish hospitals should develop wayfinding strategies to deliver information consistency across hospital groups for service users.


\(^3\) [www.heeland.ie](http://www.heeland.ie) – The Change Hub, 2014.
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1 Introduction

1.1 Project Introduction

This project will lead an exploration into indoor maps for service users in a complex hospital setting. Service users are: patients and their visitors, suppliers, staff visitors and new recruits.

A patient or visitor to the hospital may be anxious or stressed about their attendance and they may become more easily lost and even late for their appointment. A good indoor map contributes to the existing directions and reduces the difficulty the visitor experiences in finding their way. The visitor is supported in the form of written hospital signs, written and verbal directions, and landmark placement. For the visitor to experience consistent directions through these formats, several hospital departments must collaborate to develop a consistent message. Well-oriented patients and visitors experience greater satisfaction and autonomy.

A map is a schematic representation of the environment, designed for a particular purpose. A map designer considers topology, semantics, syntax (including existing hospital signs and directions), and cognitive clarity but may not weigh all these aspects equally in serving the primary purpose of the map (Nossum, 2010).

1.2 Aim and Objectives

The aim of this project is to design a tool to improve the patient experience by putting service users at the center of directions. The project objectives were to:
• Design a comprehensive indoor map prototype(s) by January 2015
• Evaluate the usefulness and usability of the map by February 2015
• Publish the map through existing communication channels (paper and Hospital website) by March 2015

1.3 Organisational Context

The map is for an Irish Academic Teaching Hospital which has 2000 patients attending the hospital daily in outpatients, day ward, inpatients, emergency departments and for diagnostic services. There is also an unmeasured number of patient visitors, suppliers, students and new employees who have to navigate around the campus.

The Hospital campus is one location, set on a sloping terrain, bounded by railings. The campus has a perimeter of 1.3 kilometers. There is one main structure, with four signposted entrances. The slope of the terrain results in ground floor entrances on two different indoor levels. Inside the building there are four levels (0, 1, 2, 3) accessed by two sets of elevators. The floor size decreases significantly on level two and three. The person looking at the building from the public car park, does not necessarily see the gradual site slope, but will see a long, flat building with one central raised area.

The ground floor, main Hospital Street is 350 meters long with 35 radiating corridors, each containing one or more departments. The outpatient department is the most complex. It contains three parallel
and three perpendicular corridors, resulting in four entrances with nine four-way decision points. Emerging from the Outpatient Department onto the Hospital Street to find, for example, the X-ray Department, often results in disorientation and wrong turns.

On each of the three upper levels, the Hospital Street is considerably shorter. At one end of the street, a longer perpendicular path is revealed as it is walked. This corridor houses a further 20 destinations (mostly wards) over three levels. The patient has no concept of this corridor on the ground floor as the corresponding corridor does not have publicly accessible departments.

Patients and visitors find their way using hospital signage which has locations written in English with arrow symbols. The lettering is a white sans serif font on a dark green background. The signs are ceiling hung along the Hospital Street, occurring at 50m intervals. The ceiling signs have columns and rows, the first sign at the Hospital entrance has five columns of six rows of signs, thirty departments are named in total. The location of a sign in the ceiling hung block is not standardised each time a signage block is presented: the department name may change position and the sign may be omitted at some decision points. In order to overcome these limitations, home grown signs occur. These are also inconsistent and often unclear. The Hospital is a complex building to navigate.
For the patient preparing to attend the Hospital, instructions are provided by letter, on one of a variety of hospital templates. Additional information is carried on the Hospital website, including an outline map with the four main entrances are marked.

When a patient attends as an outpatient, they use their appointment details to check themselves in at a self-service kiosk. They receive a small printed ticket with directions to a waiting destination. Visitors ask for directions at the Hospital reception. If a patient or visitor subsequently becomes lost after consulting the signage, directions are asked from staff. Staff must travel along the same corridors as patients to get to their work locations.

1.4 Project Rationale

There is evidence that service users experience increased levels of stress, shame and even panic associated with being lost and potentially late for appointments (Talbot 1993, Carpman 1986, Baker et al, 1996, Sadler et al, 2008, Ulrich et al, 2008, Bjorngaard 2010). Having received directions, and subsequently become lost, patients and visitors blame themselves for poor ability to follow directions rather than providing feedback to the hospital or making a complaint (Campos Andrade et al, 2013).

In the author’s organisation staff show compassion towards service users who become lost coupled with frustration towards the
organisation that it occurs so frequently. The author saw the opportunity to develop an indoor map as a potential solution to this problem as no indoor map was available. When staff were surveyed, over 100 respondents identified a map as a service improvement.

1.5 Organisational impact and expected outcomes

A map supports service users to find their way, this gives them a sense that the organisation cares enough about them which will increase their ability to cope in the hospital and increase their level of satisfaction (Campos Andrade et al, 2013).

A secondary benefit is for staff. Greater autonomy among patients with increased satisfaction will benefit staff in many ways. Staff will receive patients who are less distressed and will themselves be less distressed by finding disoriented, stressed patients. It will enable staff to work with fewer interruptions. One study estimates lost patients and visitors cause losses in productivity equating to 4500 hours per annum in a 600 bed hospital (Zimring, 1983). Additionally new staff who receive a map will experience the same sense of care, find their way more quickly in the building and be better informed to help patients who inevitably become disoriented.

For the project to be a success, the hospital map must be recognised as a valid, good quality communication, it must be endorsed at corporate level and supported by senior managers.
This project concludes with production of an accessible, flexible, low cost map for use on the reverse of patient letters, a map leaflet covering the whole hospital and a specialised route map printed on self-service kiosk tickets.

1.6 Student role

Project manager.

1.7 Potential Threats

The main threats to the project were that the map design would not be fit for patient use; that there would be insufficient time or prioritisation in wayfinding to undertake the necessary changes to improve it and that lack of prioritisation would extend to including a map with patient letters. These risks formed a project risk log (Appendix A).
2 Literature Review

2.1 Introduction

The initial idea for this change project was to introduce a mobile navigation app for patients visiting the Hospital in which the author works. A detailed indoor map was required, but was not available. The definition of maps can become quite abstract, for the purposes of this project, an indoor map is a graphic representation or schematisation of the landscape for a purpose. This project explores the creation of an indoor map to understand the issues associated with disorientation.

This literature review discusses indoor hospital maps for patients and visitors through five themes. The first theme explores government provision of wayfinding tools (tools to help a person find their way) for public buildings in the UK, Australia and America. In these countries, maps are issued by service user engagement departments and are considered a wayfinding tool. Irish departments issuing hospital wayfinding tools will be reviewed, along with the Hospital information underpinning maps and maps published in other hospitals.

The second theme of the literature review will explore indoor mapmaking and mapmaking tools for creating paper and digital maps. The academic disciplines involved in making maps include architects, geographers, cartographers, designers and computer scientists; their contribution to the field of indoor mapmaking will be reviewed.
The third theme is the user experience of navigating complex buildings. This section considers the effect of maps on navigation in a complex building.

The fourth theme covers the work of behaviour theorists in understanding how patients become oriented in a complex building and the value of maps in creating schemas is elucidated. The last theme evaluates the impact of disorientation on patients and their satisfaction, alongside the impact of patient disorientation on staff.

2.2 Search strategy

The published scientific literature and grey literature were searched separately on each of the five themes identified. The databases searched included Emerald, Health Business Elite, PsychInfo, Ovid Medline, Science Direct and Web of Science. The journals *Cartography* and *Geographic Information Science*, *Environment and Behaviour* and *Health Facilities Management* were also searched.

Map development was searched using the keywords indoor maps, map quality criteria, hospital environments, spatial awareness, spatial knowledge, cognitive perception, spatial decision making and exploratory behaviour. The effect of disorientation on patients was searched using keywords: patient satisfaction, evidence-based design, disorientation, patient experience and wayfinding. The theme of wayfinding was searched using the keywords wayfinding strategies,
hospital environments, cognitive maps, spatial navigation and spatial
decision-making. Some referenced literature exists as conference
proceedings and these articles were found using Google Scholar. The
websites of authors who have taken an interest in public design were
searched for their published literature, or were contacted directly. Irish
hospital websites and the Health Service Executive (HSE) website was
searched for literature relating to wayfinding and maps.

2.3 Review of themes

2.3.1 Indoor maps and Public Healthcare Buildings

In the UK, the NHS estates department has published a wayfinding
document, bringing together: finding the hospital car park; finding the
hospital entrance from the car park; direction giving in reception;
directions within letters; signage design; how to locate landmarks; what
maps are required; how to place them; and how to use colour and
design to point the way (DoH, 2006).

In Australia, the Department of Human Services, which serves the
needs of people accessing government departments, has also
published wayfinding guidelines. These guidelines identify maps as part
of the signage system (State of Victoria, 2011). In the United States, the
Hospital Information and Management Systems Society (HIMSS), has
published a patient engagement framework. The framework identifies
five stages for patient engagement: inform me, engage me, empower
me, partner with me and support me. ‘Inform me’ describes an informed
patient as one who has access to directions, maps and directories (HIMSS, 2014).

In Ireland, the role of the HSE estates department is to provide policies, protocols, advice and project management for new building development to local estates offices and non-HSE agencies (HSE, 2013). A search across the HSE website for the keyword ‘wayfinding’ brings the user to patient advocacy liaison services and the role of volunteers. A search of the HSE website for the term ‘maps’ yields no relevant hits. The estates department has refreshed its signage manual but it contains no reference to maps (HSE, 2014). The last page of the manual shows a site map for an existing HSE hospital but it is called a directory listing and displays no other labels, departments, or locations. This map does not appear on the relevant hospital’s website.

The Irish National Healthcare Charter describes what a patient can expect from the health service under eight headings: access; dignity and respect; safe and effective services; communication and information; participation; privacy; and improving health and accountability. Under the heading ‘Access’ it states: "you can expect clear information on appointment dates, times and locations" (DoH, 2012, p.6). The Health Information and Quality Authority (HIQA) sets standards for Hospitals to ensure service users have healthcare that is provided in a physical environment that supports the delivery of care. It states service users can expect to "receive healthcare in surroundings
that are laid out in a way that is easy … to enter and get around safely” (HIQA, 2012, p55).

HIQA have identified wayfinding issues in some of their reports. In response, similar to HSE estates department, some hospitals are linking wayfinding to volunteer support (Connolly, 2014). A review, conducted by the author of the websites of Irish academic teaching hospitals and larger HSE sites, found that no hospital website publishes an indoor map covering each floor or level. St James’s Hospital website supports an interactive bird’s-eye view sitemap with arrows pointing the way to building roof tops. (St James Hospital, 2015).

The information supporting wayfinding in Irish hospital computer systems is unstructured. For instance, the national electronic patient administration system (PAS) has a list of clinics and wards but no database field for either physical locations or directions. As a consequence, the hospital cannot run a report of hospital locations from this national system. The national PAS also produces appointment letters from templates, as unstructured text and so it is not possible to extract this direction information easily. There is no system for signage, from which a directory listing could be produced. Self-service kiosk systems maintain a list of directions and locations and so physical destinations and directions can be listed out for the first time, however destinations are for waiting areas that are unsigned. Additionally, hospital directions are often given by staff without training (Carpman &
Grant, 1993) and the directions can lack clarity or standardisation (DoH, 2006).

2.3.2 Indoor Mapmaking Tools and Map Styles

When designing an indoor map, the design tool has a strong influence on the outcome. People are used to seeing simplified architectural drawings as floor plans (Figure 1) on building walls whose purpose is to provide an instant understanding of the nearest exit. Computer aided design (CAD) systems are tools which produce architectural drawings and can also be used to simplify the drawings for use as floor plans but this step requires knowledge, surveying skill and time (Mijksenaar, 2003, Puikkonen et al, 2009, Lorenz 2013).

![Figure 1: Architectural Drawing Example](image)
Internet-based online map software tools provide an opportunity for an organisation to produce an online indoor map from a simplified floorplan. The floorplan is loaded onto the building outline in the existing geographical map and labels are applied as required. These steps can be undertaken for each floor of the building (Figure 2).

Figure 2: Indoor map of St Georges Hospital showing two floor levels (Google Earth, 2014).
There are a number of other PC-based illustration tools that enable a user to design a map and the designer enjoys a greater freedom than with CAD tools (Figure 3).

Figure 3: British Natural History Museum indoor map, 2015.

All maps are schematised versions of a landscape and it is the mapmaker who chooses how to depict a landscape, according to the purpose of the map (MacEachren, 2004). With an outdoor map navigation is an aim and so maps are spatially veridical: space is accurately scaled on the map such that distance can be verified using a map and compass. The accuracy of these maps for navigation is successful despite increasing the scale of roads relative to other features in order to highlight the road (Klippel et al, 2005). With a different type of map, such as an underground or tube map, spatial validity is sacrificed for design clarity. The aim of the map is still
navigation but the user does not have to measure the distance and so this is not depicted by the mapmaker.

When evaluating the use of indoor maps, researchers make a number of measurements of a user’s progress in navigating to a destination. Wayfinding performance (Li & Klippel, 2014) can be measured by the speed with which a user reaches a destination, the economy of their route, the number of stops a person makes to check their progress and the number of times a route is retraced (Weisman, 1981, Peponis et al, 1990, O’Neill, 1991, Butler et al, 1993, Talbot et al, 1993, Devlin and Berstein, 1997, Meilinger, 2006, Hölscher et al, 2007, Li & Klippel, 2014, Nossum, 2010).

In one study comparing map schematisations in a complicated conference building, 20 conference participants were more effective at finding destinations using a tube style map versus a floorplan (Figure 4, Meilinger et al, 2007). Conversely, a study comparing map schematisations in a complex hospital building, 30 science students were no more effective with a tube style map than a floorplan (Nossum, 2010). Both studies used a small number of literate participants so it is not possible to draw conclusions for a hospital map. The literature search did not identify any studies using a patient cohort to assess indoor map quality.
Figure 4: Comparison of a floorplan and route schematisation (Meilinger et al, 2007)
2.3.2.1 Indoor Navigation Tools

If the map has an interactive element further map styles are possible. Satellite navigation makes possible interactive egocentric or eye-level views of the landscape, based on a virtual map of the environment that reveals the route as the patient moves (Figure 5, Virtual reality navigation system in Kanazawa University Hospital, 2015).

Figure 5: Kanazawa University Hospital virtual reality navigation system (2015).

Another type of interaction is one where the patient clicks through a picture or instruction list (Figure 6) and the way is revealed.

As the user navigates the landscape successfully, they develop a reliance on the navigation tool at the cost of developing an overview or
survey knowledge of the building (Klippel, 2005, Meng & Reichenbacher, 2005, Willis et al, 2009). This reduces the cognitive load of wayfinding on the patient which may be beneficial in a stressful environment like a complex a hospital. The literature is inconclusive concerning the best approach to digital map type and design (Baus et al, 2003).

For interactive navigation, location information is provided automatically with either a global positioning system (GPS) or with calibrated wireless or Bluetooth sensors throughout an organisation (Hung, 2014, Wright, 2014). In this case, the map and phone will automatically update the map location against an anticipated route. There are issues with GPS navigation in complex buildings as the signal strength can be affected by the building features with the effect that the automatic update cannot occur as the user travels (Baus et al, 2003) and disorientation can result if there are issues with signal strength, reliability or calibration accuracy (Baus et al, 2003). Wireless or Bluetooth connectivity does not presently permit reliable, cost effective, accurate indoor navigation apps that can be
deployed as real-time hospital navigation aids (Gotlib, Gnat, & Marciniak, 2012).

Alternative navigation options exist. Radio frequency identification (RFID) tags transmit their location to mobile devices (Chang et al, 2010), but RFID-tagging a large building is expensive. Low cost quick response codes (QR codes) have also been used to send location updates for users (Gotlib, Gnat & Marciniak, 2013). The use of QR codes requires that the service user has a smartphone with internet access and a QR reader app. Lastly, virtual environments have been built using gaming software but studies showing route knowledge does not readily transfer from virtual to real experience (Richardson et al, 1999, Meilinger, 2008).

Comparing various types of map i.e. floor plans, tube maps, route maps or navigation tools, the literature review was inconclusive about the most effective map style for helping users to find their way. Additionally it showed that personal choice is not a predictor of effectiveness (Meilinger et al, 2007).

The literature relating to navigation tools for particular impairments is not addressed here, because of space constraints. The literature review was inconclusive about map design tools, partly because the tool was often not identified in the studies.
2.3.2.2 Map Purpose

When embarking on designing a map, understanding the purpose of the map for the organisation will enable decision making about inclusion or exclusion of information (Krygier & Wood, 2004, Klippel et al., 2010, Montello, 2010, Lorenz, 2013). For example, an indoor patient or visitor map can justifiably exclude the private places of a building to discourage curiosity (Carpman & Grant, 1993, Ulrich, 2008), although this may limit the map for employees or suppliers.

2.3.2.3 Map Formats

People use the term ‘map’ to describe a variety of map formats. A personal paper map serves the person in all locations, a ‘you-are-here’ map enables the user to orientate themselves in one place in the environment. A concourse map enables initial orientation and survey knowledge to be established. A map published on the organisation’s website may be printed as a static map; or it may be an interactive map with zoom characteristics and/or route discovery functions (Warren et al, 1992, O’Neill, 2003, Klippel et al, 2010). The same ‘map’ may not work in each medium (Carpman & Grant, 1993, Meilinger et al, 2007, Ulrich et al, 2008).

Maps may also contain one or many designs, for example, a map containing an inset showing a portion of the map in greater detail. ‘Positioning map’ is a term used to describe both a whole environment and also show detailed insets, sometimes layering insets one on another. (Carpman, 1993, DoH, 2006, Genon et al, 2008). ‘Focus maps’
is a term that has been used to describe maps which draw the user’s attention to specific details, such as a route, while other details are faded or out of focus (Zipf & Richter, 2002).

While ‘hospital map’ is a readily understood concept, there are a variety of map formats implicit in this term. People do not distinguish between map formats when they refer to maps but for the map designer each format is potentially a new design.

The literature search was inconclusive in a number of areas. For instance, it is not clear whether different map formats address different problems in a complex environment (Liben et al, 2008). No guidelines were found about which format of map is the most appropriate to use for any given purpose, or how to develop a map series using different formats. However, the map’s purpose is key to making these decisions.

2.3.2.4 Map Design

Maps should be satisfactory for people to look at and should not overwhelm them with information (Talbot et al, 1993, Krygier & Wood, 2004, MacEachren, 2004). It is necessary to simplify design where possible in designing a good map (Weisman 1981, Talbot, 1993, Mijksenaar, 2003, MacEachren, 2004, ESRI 2012). Colours should be kept to a minimum and contrasted with each other to be easy to see. Colour intensity should be used to direct focus and colour fading to reduce focus. Pattern and texture follows similar rules. Font style should be consistent, distinguishable from the background and font size can be

The depiction of objects, such as seating, although not commonly used in outdoor maps, may be crucial to include on an indoor map as a landmark for location recognition (Lorenz et al, 2013). The design of objects, landmarks or corridors must be recognisable and should be simplified by minimising junctions, angles, strokes and patterns (Mijksenaar, 2003, Scaifa et al, 2007, Hashim, 2014). Accuracy is a complex concept: for instance, if corridors are emphasised for focus or labels are spread out for clarity, other features will have to be sacrificed (Krygier & Woods, 2004). For paper handout maps it is recommended that the entrance to the building should be at the bottom of the page where possible so that people can easily orientate themselves as they enter the building (ESRI, 2012).

2.3.3 Wayfinding Issues in Complex Buildings

While UK, US and Australian guidelines identify maps as an appropriate wayfinding tool, they do not give an indication of the criteria used to decide if a map is necessary. It is known that the greatest negative impact on a person’s ability to find their way to their destination is the complexity of the building (Li & Klippel, 2014). Building complexity, building legibility or environmental legibility are categorisations of buildings that are large; have many floors (Nossum, 2013); or where the floor plans of upper levels do not reflect the floor plans below (Carlson et al, 2010); or where the boundary of the building is beyond the visual
horizon. Complexity is increased where the external terrain slopes and ground-level entrances are on different floor levels, or where a building is asymmetrical or has undergone additional and different types of development (Butler et al, 1993, Baskaya et al, 2003, Meilinger, 2008, Rooke & Tzortzopoulos, 2010, Li & Klippel, 2014). Indoor maps can serve to improve wayfinding in these type of complex settings (Wright et al, 1993, Hölscher et al, 2007, Ulrich et al, 2008). Maps can bring clarity where the building is characterised as complex.

Understanding how people find their way is essential when deciding what information to put on maps. When people travel to new unknown destinations they must be able to identify their starting point, know the direction to go in and be able to recognise that they have arrived at their destination (DoH, 2006, Downs & Stea, 2011, Jeffrey, 2011). Good signage is the most frequently used wayfinding aid and enables users to identify their destination (Butler et al, 1993). However, maps and good signage used together provide better wayfinding accuracy (Hölscher et al, 2007). It is critical therefore that indoor maps present labels that are consistent with the building signage (Carpman & Grant, 1993, DoH, 2006, Ulrich 2008, HIMSS, 2014).

In a complex environment with many visitors, effective decision making becomes an important consideration for wayfinding design at busy decision points. While too much information can be overwhelming (Talbot, 1993), the best type of design to be used for the fastest route discovery is still not fully understood (Downs & Stea, 2011). There are
two ways to navigate decision points quickly: when decisions are known in advance or when the decision is confirmed quickly. Decision making slows down with high volumes of information (Carpman & Grant, 1993, Wright et al, 1993, Hölscher et al, 2007), with poorly understood symbols (Hashim et al, 2014), when people have to translate information, for example with the use of map legends (Devlin & Bernstein, 1997), or when the intersections or crossroads are not simple right angle turns (Klippel et al, 2005).

2.3.4 How Patients Interact with Navigation

Each mapmaking discipline debates the value of map types (floor plans, outdoor maps, navigation tools) by observing map reader’s use of the map. In social science and psychology the debate moves to how the cognitive and spatial mechanisms people create to find their way in a complex environment are impacted by a physical map. As building complexity increases, a person’s ability to create a cognitive map and their spatial decision making becomes more onerous (Figure 7). If maps
can improve the development of cognitive maps and can improve route or survey knowledge, then it can be concluded that maps can significantly help people to navigate complex environments.

People continuously take personal account of the layout, space and features of a building they can see, to build an internal cognitive map on which they begin to construct a route (Moeser, 1988, Kueh, 2008, Downs & Stea, 2011). The cognitive map is constructed using the existing wayfinding services, such as signage (Thorndyke and Hayes-Roth, 1982, Richardson et al, 1999, Garling & Golledge, 2000) and maps (Moeser, 1988). Cognitive maps reside in the people’s working memory but are limited by memory capacity. Information is increasingly simplified the greater the area visualised. Cognitive maps are incomplete: they prioritise some information over other information (Hölscher et al, 2007, Meilinger, 2008); they are built more effectively by some people than others (Moeser, 1988, Carlson et al, 2010); and may not improve, despite repeated exposure, for some people (Moeser, 1988). The accuracy of cognitive maps can be improved by exploring physical

![Figure 7: Factors affecting wayfinding in buildings. Carlson et al, (2010).](image-url)
maps but if a new physical map conflicts with a pre-existing cognitive map, the physical map may be ignored (Moeser, 1988). This suggests that introducing a map in a hospital would be of most benefit to people new to the building, however, the literature search yielded no research in this area.

Spatial strategies to find a way through space manifest in two ways: route based, where people remember landmarks and instructions, or survey based, where people remember a high level overview of an environment (Hölscher et al, 2006, Carlson et al, 2010). Signage has a low cognitive overhead making it the preferred wayfinding aid, signage enables route knowledge to be created (Hölscher et al, 2007). Maps can supplement existing route knowledge in complex settings (Willis et al, 2009) and also improve survey knowledge (Munzer et al, 2006). A study with 36 undergraduates in a university setting, compared map use with two signage conditions: old and inadequate versus new and effective. Map consultation increased with the old and inadequate signage condition. Additionally, with the new and effective signage condition, when signage and maps were consulted together, novice users performed as well as experienced users (Hölscher et al, 2007).

It is interesting to note that map researchers have not chosen hospital environments as their area of study, despite the fact that hospitals are often complex buildings with a wider variety of service users than is described in the research in review. There is a paucity of published research about the use of maps with patient cohorts or hospital staff.
Two studies were identified, the first showed volunteers had a preference for maps to supplement signs in a two story outpatient setting (Wright et al, 1993) and the second compared nurses who were either new to or experienced in a complex building. It showed the use of a map helped nurses new to a complex building create better survey knowledge than nurses who also had a map but relied on previously learned route knowledge (Moeser, 1988).

There is a paucity of published research about service users with known memory or literacy issues, where the effectiveness of signs and directions would be reduced. The studies considering the effect of gender on map use were inconclusive and are not discussed.

2.3.5 Benefits to Patients, Staff & Hospitals of Good Wayfinding

Maps enable patients to experience greater self-reliance in getting to a destination, greater autonomy on arrival at the destination (Ulrich et al, 2008) and enable people to arrive to an appointment feeling less stressed (Nelson-Schulman, 1983, Bjorngaard, 2010). Patient-expressed satisfaction rises when patients feel the organisation cares enough to organise services, maintain services and provides accessible services (Talbot et al, 1998, Harris et al, 2003, Department of Health 2006, Fornara et al, 2006, Sadler et al, 2008, Campos-Andrade et al, 2013,). An additional benefit arises when patients attend hospital with another person who will also benefit from, and talk about, the perceived service levels (McKinnon et al, 1998, Department of Health, 2006). In contrast patients who experience ambiguous wayfinding services or
become disoriented can feel increased stress (Carpman 1986, Sadler et al, 2008, Ulrich et al, 2008, Bjorngaard 2010), shame (Baker et al, 1996) and even panic (Talbot 1993). Stress or anxiety can lead to a reduction in cognitive capability and wayfinding competence (Kallai et al, 2009, Klippel et al, 2005) which suggests patients need a map to both find their appointment and to leave the building.

Patients who cannot find their way, assume they are at fault and do not complain (Department of Health, 2006, Rooke & Tzortzopoulos, 2010). In Ireland, it is not possible to gather information about wayfinding difficulty, as no public reporting facility exists. In the author’s setting of an academic teaching hospital, a review of the hospital feedback facility and hospital risk register revealed a small percentage of comments about wrong signage, poor directions and map requests.

Patients who become disoriented ask for help. This will often be from hospital staff. The literature referencing staff impact cites disoriented service users cause increased stress among staff and reduced productivity (Carpman, 1986, Sadler et al, 2008). One study put losses relating to orientation interruptions for a 600 bed unit at two whole time equivalent staff (Zimring, 1981).

Large Irish hospitals are complex buildings. Patients and staff would all benefit from the introduction of indoor maps. The evidence to support this will not come from the patient or the staff but from the evidence that maps enable better wayfinding in complex buildings.
The lack of clear ownership of wayfinding in hospitals and the lack of a HSE wayfinding strategy leaves Irish healthcare trailing behind its neighbours in this patient engagement concept. The introduction of hospital groups, as occurred in the UK, may exacerbate wayfinding problems. The growing tendency to leave the responsibility for provision of wayfinding to a volunteer task force is unlikely to yield leadership which will improve wayfinding in hospital groups.

2.4 Implications for Project

The literature review has confirmed the author’s premise that the building is complex and that maps will assist navigation for patients and staff.

The literature review will inform many decisions including but not limited to map tool selection, choices about map style and format, map delivery mechanism and prioritisation of information to portray on a map. Indoor map development requires software tools, software skills and time to research organisational information including hospital layout, locations, directions and services for patients and visitors.

The lack of ownership of wayfinding responsibility in the organisation and on the wider HSE landscape presents an opportunity for generating interest in this area but it is also a risk that this project will not be considered a high enough priority.
2.5 Summary and Conclusions

In summary, the literature review has revealed that providing good wayfinding in complex buildings such as public hospitals, with maps and directions, is the most basic information need for service users. Without these tools patients will suffer disorientation, stress, shame and even panic.

The literature review has not yielded an adequate description of the impact on staff of patient disorientation. Staff in the author’s organisation regularly complain about re-orienting patients while treating patients with the utmost compassion:

“Today I found two 80 year old ladies all the way up at Technical Services looking for the Falls Clinic. I turned them around and went ahead of them to OPD reception to find the clinic location. I came back to them and brought them to the right place. One of them used a Zimmer frame, they had probably walked 250 meters further than they needed to and they had been in the building for an hour before finding their clinic. I was 20 minutes helping them before I got to my desk.” Administrator, 2015

In the author’s experience staff are not reluctant to help patients, on the contrary, it is because they care they feel the organisation’s lack of care with this basic need acutely: service users must be supported by the organisation to access services.
When patients use a map to successfully find their way to their appointment, it is possible to measure the productivity savings for staff, but the real impact is that the focus of both the patient and the clinician remains wholly on the purpose of the visit.

The sections that follow will describe, in section 3, a project to design and introduce a map into an Academic Teaching Hospital for patients and visitors and in section 4, an evidence based evaluation of the project. Section 5 will conclude and discuss the project.
3 Methodology

3.1 Introduction

Service users regularly become lost in the author’s Hospital and Hospital staff re-orient them as they travel between meetings. Reorientation is a regular point of discussion: compassionate staff see the need to help each patient as they find them but do not have insight into what is causing disorientation. This project will research, design, validate and publish an indoor hospital map as a way of improving the patient and staff experience. As this will be the first Irish indoor hospital map, it is an innovative project; part of the project will be convince staff at all levels of the need to improve the patient experience and promote the map as a useful tool to do this.

This section examines three organisational development (OD) methodologies and appraises their applicability to the current project proposal. The methodologies are: Coghlan and Brannick’s Action Research Method (2009), the Senior and Swailes Organisational Development Method (2010) and the HSE Change Model (2014). The HSE Change Model has been selected to implement this project based on the categorisation of this project as a “hard” project using the Senior and Swailes project categorisation tool described in Section 3.2.2.

The HSE Change Model and associated tools will be discussed and demonstrated through the project lifecycle to survey the patients, the staff and the site; to learn a new software tool and trial map layouts and
formats; to trial the map with staff and patients; and to launch and publicise the map in the Hospital with no budget. The challenges innovation projects present to the HSE Change Model will be discussed.

The section concludes with a summary of the project lifecycle to design and publish an indoor map using the HSE Change Model. In section 4, the project will be evaluated.

3.2 Critical Review of Approaches to Organisational Development

Three approaches to OD (Action Research Model, Organisational Development Model and HSE Change Model) will be examined in turn, including a brief overview of how the model would be applied to the project to implement a hospital map.
3.2.1 Action Learning Model of Change

The Coghlan and Brannick (2010) Action Learning Model of change enables a practitioner to work on a theory about content, process or premise through a continuous evaluation and development lifecycle (Figure 8). The practitioner constructs a context and purpose after which there are four steps to the lifecycle: construct or select the project, plan the actions, take actions and evaluate actions. These steps are taken on an iterative basis. The model has two types of reflective practice and they are to reflect on each step of the lifecycle (construct, plan, take action and evaluate) and to reflect on reflections. This latter reflection is described as meta-learning in the Action Learning Model and can contribute to the development of the theoretical base or purpose of the project.

![Figure 8. The Meta Learning Cycle of Action Research (Coghlan and Brannick, 2010)](image)

The “constructing” step consists of the practitioner identifying a number of questions relating to the change, the contribution this research will make to theory and the rationale underpinning research in this area.
The “planning action” step focuses on the vision of an implemented solution and what should change on the journey to achieving that state. The “taking action” step is the change that occurs. The “evaluation” stage consists of the practitioner, and on occasion the project team, reflecting on each of the previous steps: constructing, planning and taking actions in order to learn from the experience and to improve future planned steps.

In the case of developing a hospital map, the practitioner would construct a frame for the project, for example, by asking how can hospital staff collaborate to enable the service user to locate their appointment destination in the most efficient manner? This would lead the practitioner to consider the actions to be taken that are associated with creating a map (for example, to gather information to create a map), the actions to be researched (for example, what is the best map design?) and the research design for each action (for example a trial of where the map should be used). The actions may involve group work to consider the perspective; the desired outcome; and after the action, to consider the actual outcome for the service user.

The Action Learning Methodology offers the organisation the ability to focus resources on their area of interest and enables them to learn through reflection to consider areas beyond their initial focus. It is therefore less useful in a situation where team members are making different changes from each other or where they are dispersed geographically.
3.2.2 Organisational Development Model

The Senior and Swailes Organisational Development Model is a five step model (Senior and Swailes, 2010). The steps are to: diagnose the current situation (1a) and develop a vision for change (1b); to gain commitment to the vision (2); to develop an action plan (3); to implement the change (4) and to assess and reinforce the change (5) (Figure 9).

![Organisational Change Model](image)

Figure 9. The Organisational Change Model (Senior & Swailes, 2010 p.328)

The diagnosis of the current situation categorises the project as either a “hard and difficult” or “soft and messy” project. It is defined by a rating scale that evaluates: timescale, resources, objectives, perception of the problem, interest in the problem, control levels and source of the problem which can be located internally or externally (TROPICS). The practitioner can use TROPICS to categorise the project as either a “hard and difficult” project which may benefit from a project management type method such as the HSE Change Model (HSE,
2014), or a “soft and messy” project which may benefit from a method such as Kotter’s (1996) eight step model of change.

In step one the team works together to “diagnose the current situation” and “develop a vision for change”. This relies on the project manager developing a dialogue within a good communication network, where shared vision can develop alongside issues of concern. This is a method that enables the project manager to build relationships with the team as they work together to envision the future.

The “developing an action plan” step leverages those relationships to achieve a set of agreed and planned actions. Each planned action has an implementer, a supporter and a stakeholder. In this way the planned actions have greater buy-in and are more likely to be achieved.

The step to “implement the change” focuses on short term wins that are communicated throughout the team. During this stage the project manager is involved in reassessing and restructuring the actions in the plan that did not have the desired impact. They also assimilate new information that is discovered and affects the project vision and may go back to gain buy in or adjust the vision.

The last step in the cycle is to “assess and reinforce change” by tackling the ongoing issues of work allocation, rewards for successful implementation and the redrawing of job descriptions following the
project. This change methodology can be a continuous development as the new environment becomes the present state (step 1a)

In the case of developing a hospital map, by applying the TROPICS tool, the project would be defined as a “hard and difficult” project as it has an established timeline, clear objectives and clear control. Vision would be developed across the group of people who would consider using a map in their daily work with service users or being involved with contributing to the work of creating a map. In this method the project manager would share early map ideas and listen to issues. The team would agree a project plan to create a map. Once the map was created, the project manager would consider how to deploy the map through existing organisational structures.

This change methodology relies on collaboration between the project stakeholders both in defining the vision and implementing the change. It harnesses the power of people to bring one another along a journey towards a vision and depends on close collaboration. This methodology is less applicable where there are clearly defined independent work streams that are loosely coupled.
3.2.3 HSE Change Model

The HSE Change Model (2014) has four stages: initiation, planning, implementation and mainstreaming (Figure 10) which are described in turn, indicating their sub-stages.

During the initiation stage the project manager “prepares to lead the change” by identifying the value of the project, the objectives and outcomes of the change, the beneficiary of the change, the readiness of the organisation to accept change, the opportunities that support introducing the change and the impact of the change on the organisation.

![Diagram of HSE Change Model](image)

Figure 10. The HSE Change Model (2014)

The project manager planning a change considers has three components: “building commitment”, “determining the details of the change” and “developing an implementation plan”. “Building the commitment” requires engagement with stakeholders and
communicating the change to the organisation. “Determining the detail of the change” explores the gap between the current situation and the stakeholder vision to see what steps need to be taken to reduce the gap. The project team draws these steps into a coherent plan by “developing an implementation plan”.

The implementation stage puts the change into action. The agreed planned steps are undertaken, change is communicated to the key stakeholders to sustain momentum while the steps of the plan are completed. This stage is about the team and the stakeholders working to deliver on the plan, managing the project issues and managing project risks.

Having implemented the project, the last stage is to mainstream. The HSE Change Model provides tools to enable the project manager to be confident the change has become the “way we do our business” or is permanently embedded in the organisational structures. The project manager celebrates success, supports the integration and links-in with the decision-making processes. This stage also includes “evaluation and learning” which is: the removal of redundant work practices from the organisation; setting up a continuous improvement cycle; and identifying transferable learnings for future projects.

To undertake the Hospital map project with this model, the practitioner would engage with the stakeholders who oversee the environment through which the service user moves and persuade them of the value
of a map (initiation). They would analyse the information and skills for the design (planning), create and evaluate a map with staff and service users (implementation). They would publicise the map and make it accessible to the staff population to enable them to embed the map in organisational processes (mainstreaming).

This OD methodology is suitable where there are tight deadlines, where there are clearly defined deliverables or where the project team is dispersed and does not need to meet together.

3.3 Rationale for OD Model Selection

The OD model chosen for this project is the HSE Change Model. Analysing the proposed project with the TROPICS tool indicates the project is a “hard and difficult” rather than a “soft and messy” project (Senior and Swailes, 2010): it has a preset timeline, clear objectives and a dispersed team that do not need to meet together to agree a vision. “Hard and difficult” projects are most suited to the HSE Change Model as they are projects that enable dispersed teams working on different tasks. The HSE Change Model has a toolbox with a range of tools and a flexible approach to their use that will suit this project. This project will need detailed planning to assimilate all the information, issue log management during map design and decision tree tools to aid with the decision making around which type of mapmaking tool to use.
The next section describes the creation and implementation of an indoor hospital map using the HSE Change Model stages: Initiation, Planning, Implementation and Mainstreaming.
3.4 Project Implementation with HSE Change Model

3.4.1 Initiation Stage

During the initiation stage the project manager “prepares to lead the change” by: identifying the value, objectives and outcomes of the change, the beneficiaries of change, the readiness of the organisation to accept change, the opportunities that support introducing the change and the impact of the change on the organisation (HSE, 2014).

The project proposal (Section 1) was the first step in initiating this project. It established the value of the work, identifying both a sponsor and an agreed set of objectives. The project was expected to be of benefit to patients, visitors and staff. The benefit was quantified firstly with an online survey seeking out the extent of staff interest in an indoor map. 84% of staff (n=109) thought introducing a map was a service improvement, with the majority of respondents feeling it would improve the patient experience.

In order to determine the potential extent of the benefit, a questionnaire was designed by the author and administered by transition-year volunteers with patients to find about experience of disorientation. 175 service users were surveyed (9% of daily footfall in the Hospital). 28% had become disoriented during their visit, with the majority of service users (57%) endorsing the view that a map would help them find their way. Of the 47 service users who became disoriented, 84% would have
liked a map to help them. Of note, 47% (n=128) of the service users who had not been disoriented would also have liked a map.

As there are approximately 2000 patients attending the Hospital each day, extrapolating from the sample surveyed, 560 (28%) of these patients become disoriented during their visit. A conservative estimate of the time it takes to reorient a user is two minutes, which translates into 18 hours of staff time per day spent redirecting service users. This is consistent with research by Zimring (1981).

The survey results were persuasive in convincing the Chief Operations Officer (COO) to become the Project Sponsor. The aim of the initiation phase was to start communicating the levels of disorientation experienced by service users to prepare them to make changes to improve the situation.

3.4.2 Planning Stage

Planning a change using the HSE Change Model requires “building commitment”, “determining the details of the change” and “developing an implementation plan”. “Building the commitment” requires engagement with stakeholders and communicating the change to the organisation. A stakeholder analysis was undertaken by the author to establish who the possible actors were in the project setting and this was developed into a communication matrix (Appendix B) to enable the communication tasks to be added to the detailed plan. The types of communication were regular face to face project updates with team
members, formal sponsor feedback meetings plus a blog-type update using the Hospital’s electronic general noticeboard with the wider Hospital staff population.

The survey of patients and their disorientation informed the creation of a project vision. This was used with stakeholders to achieve commitment to reduce the number of disoriented patients. To request help in the form of embedding a map in patient letters, the author successfully sought agreement from the COO to pitch the project vision at the regular Business Managers meeting.

“Determining the detail of change” explores the gap between the current situation and the project manager’s vision to see what steps need to be taken. The information to be gathered included discovering any current hospital maps, finding the hospital services, reviewing the list of locations which service users are directed to by signage, self check-in kiosks and by reception, providing patient information and deciding a map medium and a mapmaking tool. These information gathering steps will be described in turn.

**Discovering the current hospital maps**

The author investigated the architectural maps available in the Estates Department map room, on the CAD system, in the Human Resources Department and with the Fire Officer to understand what building diagrams were available. The map room contains approximately 40
maps which are 1.5m² illustrating building services. The CAD system has a variety of maps for past and planned building projects, but no single building plan. The Human Resources department had a building outline map amplifying a small number of departments. The Fire Officer had a series of fire escape maps with fire exits amplified on them.

Each diagram or map was designed for a different purpose and was not suitable to be the basis of an indoor hospital map. The existing diagrams did not cover the full building outline or all service user locations. The author started to look for the list of services that would be needed on an indoor map.

Finding the hospital services

No list of hospital services could be found so the author surveyed the Outpatient Department to discover services including toilets and disability toilets, breastfeeding rooms, baby changing rooms, lifts, stairs, café facilities and seating areas.

Listing service user locations - signage

For a map to be effective it has to guide the service user effectively to a location. The location has to be signed along the route and at the destination. All locations a service user would be directed to had to be found. As service users depend on signage, this was the first source of location information.
A signage review was undertaken (Appendix C) by making a note of all official Hospital signs including ceiling-hung and wall-based signs (DoH, 2006). There are approximately 300 ceiling hanging signs to guide service users. Three departments were named inconsistently along the Hospital Street. 13 departments are added on the ceiling signage along the Hospital Street after the main entrance directory listing. Taking the signs as a whole population, 88 references were missing from ceiling hung signs. During the signage review, locations were discovered that had no hospital sign and several waiting areas were discovered marked with temporary signs which were locations for the self check-in kiosks.

Listing service user locations - self check-in kiosk directions
For patients attending outpatient clinics there are self check-in kiosks which provide tickets with printed directions to general waiting areas. To understand where the waiting locations were, the author analysed the kiosk application data. There was a list of 431 clinics with directions to 13 discrete waiting locations. Each location was checked physically, which uncovered issues such as missing destination signs.

Listing service user locations - other locations
There are 300 service user letter templates and no mechanism exists to determine which templates are in regular use. The information sent to patients by letter was not reviewed due to time constraints.
To overcome this and to identify locations missing from signage, the hospital reception staff agreed to keep a log of directions over two mornings. 264 directions were given out for 60 locations. Three locations neither signed not covered by kiosk locations were the Admissions Office, the Discharge Lounge, and the Security Department.

Adding missing signs and temporary signs to the review of hospital signs (n=433) reveals that Hospital signage is 69% accurate, with sign omission (24%) accounting for the largest issue facing patients (Figure 11).

![Figure 11: Hospital legibility](image)

Deciding a map format

The original aspiration had been to make a navigation app for service users. The results of the service user survey indicated that they do not consult the hospital website before attending the hospital, so it was the first insight into the needs of the patient population. The author explored the app development opportunities with the local college, and although the college offered the development app idea to their students, no
student took up the challenge. It was also becoming clear that assimilating the information to populate a map was a large task, so app development was suspended in favour of a printed map.

The first map was produced on paper by tracing a building outline from Google maps (Google Earth, 2015). Outlines of each floor of the building were interpreted by the author looking at the building from all perspectives (inside and outside) and tracing the appropriate building sections. The services were placed on the building outline and it became apparent that this approach was not going to support the level of detail required (Appendix D). Additionally the volume of location and service information meant a variety of layouts would need to be trialled. The author decided to review the software applications available for mapmaking.

*Deciding a mapmaking tool*

Geographical information systems software is used in mapmaking, but this would have required the purchase of a new software license. The Hospital was already licensed to use CAD software, Adobe Illustration software and Microsoft Office software and each of these tools had capabilities for mapmaking. To help make a decision about which tool to use, a decision tree diagram (Mindtools, 2015) was used to describe the factors influencing whether to choose new or existing software, whether funding was needed, whether floor plans were necessary to use the tool, whether the author had access to the software, and
whether it was capable of supporting the complexity required for a map. The options were drawn out (SimpleMind, 2014) and the conclusion was that Adobe Illustration software (CS6) was the most effective map development tool for the author to use to design a hospital map (Appendix E).

Providing patient information
Travel time was measured by timing a patient who travelled from the main entrance to the Dining Room, observing signs at each decision point. The author walked from the bus stop to the main entrance of the Hospital to measure the distance in time.

These activities completed the investigation for the planning stage. “Developing an implementation plan” draws steps into a coherent plan, the author formulated the steps into a plan and a Gantt chart was drawn up for the project (Appendix F). It covers the high level project initiation, planning, implementation and mainstreaming stages of the project.

3.4.3 Implementation Stage
The Implementation stage puts the change into action by taking the agreed planned steps, communicating changes with the key stakeholders and sustaining momentum while the steps of the plan are completed (HSE, 2014). This process is about the team and the stakeholders working to deliver on the plan, in this case it is learning a new software tool, creating a map design, trialling the map and evaluating the map. This stage is also about managing project issues,
developing and dealing with project risks and sustaining momentum through communication. Each of these aspects of project management will be covered in turn.

Learning a new software tool

While the license for the software existed in the Hospital, there were no known users of the application. The author learned the functionality of the new illustration tool by following book-based exercises (Wood, 2014). The learning was phased over the duration of the design and chapters were prioritised according to the need of the author in tackling a new aspect of the design. The chapters took approximately 45 minutes per chapter to undertake the exercises supplied with the book. There were 10 relevant chapters.

Creating a map design

There were two parallel activities in map design, firstly to get the service user locations onto a map in a legible way, and secondly to decide how to arrange the aspects of the building to fit onto a page. Reading about both map design (MacEachren, 2004 and Krygier and Wood, 2004) and illustration (Wood, 2014) informed the design choices. All locations service users are directed to were included, but as service users are directed to waiting areas in the Outpatient Area, no individual outpatient clinic names were used.
Trifold leaflets are the Hospital’s preferred patient information print format and are often used in maps, such as those for museums (British Natural History Museum, 2015). The advantage of a folded leaflet is the page is broken into a number of panels that segment the information. It was clear from the early outline map that the information could not all fit on one side of an A4 page. Additionally the map needed two levels of detail: ward or department locations/areas and in the outpatient department, waiting area locations/services. The design of the map became separated into three areas: the Hospital Street, the upper levels and the outpatient department including main entrance. Lastly, the reader has to be able to link their own entry into the building with their location on the map, generally starting either at the top left of the page or from the bottom of the page (Krygier and Wood, 2004), this was difficult to manage on one page as well as including all the location and service details. Finally a simple map emerged in December 2014 which contained all locations for service users plus the first illustration of directions for getting to the Hospital. It was a one-page, double-sided, trifold map leaflet (Appendix G).

*Map trialling*

During the implementation of the map the new automatic enveloping options available in the Post Room were reviewed to ensure a map could be sent to patients. The Post Room offers a bifold automatic enveloping service while the Hospital leaflet design is largely trifold. This coupled with feedback from patients and reception staff about the
complexity of a whole Hospital map led to a re-arrangement of the map segments into a one-page design that can be tailored to highlight each department. The map leaflet became the map master for a series of three specialist one-page maps in January 2015. Each map shows how to get to the Hospital plus an inset of one of: the Outpatient Department (Appendix H), the Departments on the Hospital Street (Appendix I) and the Departments or Wards of the upper levels (Appendix J).

A one-page map can be inserted into letter templates. Where letter templates are not accessible for the service provider, maps can be printed, turned over, and appointment letters can be printed on the front. This makes it possible to use the Post Room enveloping service; the service has agreed to print letters on map paper if requested to do so.

Additionally, based on feedback, the kiosk supplier was contacted about support for maps. Although they have not undertaken this work, they agreed to a trial and will print a route map, after the written directions, on a kiosk ticket in one clinic (Appendix K). This raises the question of whether a kiosk (route) map or an appointment (survey) map is better for service users. This should be the subject of further research as the literature search did not provide information to guide this decision.
Map evaluation

The desk evaluation of the map was undertaken using MAPQUAL and the physical evaluation was with 15 new staff who undertook dry runs using the map to find locations new to them, before sending the map to 174 service users. Evaluation is covered in detail in Section 4.

The costs of map production is part of the evaluation of an effective map, and so a costing exercise was carried out by the author. There is an estimated 80 hours invested in learning the tool and designing and trialling the map. There were no other associated costs. A folding map leaflet costs 8c to print internally on card. The map is printed on card, to prevent the ink from bleeding through to the reverse of the page which would reduce readability (HSE & National Adult Literacy Association, 2011). A black and white, one-page map on the reverse of an appointment letter costs 1c to print per letter, widespread adoption would result in a cost of €1700 annually. There are no additional postage charges. The estimated potential saving is 18 hours/day of staff time spent reorienting patients. The map project is a cost neutral project with a low ongoing revenue costs.

Managing project issues

Throughout implementation the author was communicating with a variety of staff offering services that linked to the map. An issue log was developed to track issues from a range of sources including services that would supply maps, services that would print them, staff that would
implement maps into letters and staff feedback while trying to use a map (Appendix L). Where appropriate, changes were made to the map and staff raising issues were provided with an update.

*Developing and dealing with project risks*

One aspect of sustaining momentum was to mitigate risks identified by the author on the risk log (Appendix A). During the project the risk log was regularly reviewed and risk mitigation steps were taken. For example, one potential risk was the concern that the map would be of sufficient quality to be useful. A number of pitfalls had to be avoided. To mitigate this risk, the author researched map development guidelines, evaluated the map with a quality framework (MAPQUAL, described in the next section) and consulted with a cartographer in Ordnance Survey of Ireland and a graphic artist associated with the Hospital to obtain an independent, unbiased review of the map design and content.

*Sustaining momentum through communication*

The author met the Project Sponsor regularly. When the map evaluation was completed the Project Sponsor brought the map to the CEO for sign off. The CEO approved the map for submission to the Executive Management Team (EMT) for formal adoption and dissemination across the Hospital.

During the implementation stage, ongoing communication with the people who had filled in surveys, undertaken map trials, provided
directions, or were stakeholders took the form of verbal feedback, progress reports and blog-style posts on the Hospital electronic general notice board including reporting graphical survey results for staff surveys.

3.4.4 Mainstreaming Stage

Having implemented the project, the last stage of the HSE Change Model is to mainstream. The HSE Change Model provides tools to enable the project manager to be confident the change has become the “way we do our business” or is permanently embedded in the organisational structures. The tools are to celebrate success, support the integration by linking-in with the decision-making process. This stage also includes “evaluation and learning” which is: the removal of redundant work practices from the organisation; setting up a continuous improvement cycle; and to identify transferable learnings for future projects.

Celebrate success

The EMT endorsed the use of maps and the author’s advertising campaign in March 2015. The published maps were made available on the Hospital website (Appendix M). The maps were advertised to staff on the Hospital’s electronic general notice board, on the electronic staff newsletter and the Hospital Facebook page (Appendix N), in the atrium with volunteers, outside the canteen and the lecture theatre. The author won a place to present the map project orally to staff at the Clinical Audit and Quality Improvement Day in April 2015.
Link in with the decision-making process

The intention of the advertising campaign was to make maps accessible for all service providers to add to their work flow. The maps were deployed in a flexible way to enable users to insert them into templates or print letters onto map paper. No “decision-making” mechanism exists to ensure that each service uses a map.

Remove redundant working practices

There were no redundant work practices identified during this project.

Set up a continuous improvement cycle

The location and naming of services will change over time in the organisation. To enable updates to the map, the author created a new email address (maps@amnch.ie) and published it on the maps. This facility will allow staff to notify the author of any changes needed on maps.

Identify transferable learnings for future projects

The maps is deeply embedded in the Hospital structures and provides a visualisation to the organisation of those structures. Factors that may contribute to disorientation in the Hospital are signage accuracy (69%) which arises from inconsistency between signage, kiosk locations and letters, as well as from incomplete signage.
The HSE Change Model effectively supported the design and publishing of an indoor map as an innovation project. Further research may be needed to support mainstreaming innovation projects which may disrupt rather than dovetail with decision-making.

### 3.5 Summary and Conclusion

In this section three potential organisation development methodologies have been briefly reviewed and the rationale for selecting a model has been outlined. Using the TROPICS tool (Senior and Swailes, 2010) the project was defined as a “hard and difficult” project rather than a “soft and messy” project. This project utilised a project team that worked on different tasks with a defined timeline which together with the project categorisation led to choice of the HSE Change Model (HSE, 2014) as the change methodology.

The HSE Change Model provided the methodology to lead a successful change management project to deliver the project aim to design and publish a hospital map within the timeframe. Project initiation, planning, implementation and mainstreaming stages were completed with an internal and external project team comprising voluntary input from staff, volunteers, external experts and patients involved in surveys, trials and evaluation of maps.

During the initiation stage 84% of staff surveyed by volunteers supported maps as a service improvement. Furthermore, 84% of
service users who had become disoriented indicated they would have liked a map to help them. Extrapolating from the number of surveyed patients and using an approximation of the time it takes to reorient a patient, lead to the project having a potential saving 18 hours of staff time per day spent reorienting these patients. This information was shared with senior stakeholders to persuade them of need for a map and to challenge staff to improve patient directions.

During the planning stage, a stakeholder analysis was used to create a communication plan. A project plan was developed and included discovery that there were no current hospital maps, eight types of hospital services were located, 433 signs were documented and found to be 69% accurate, existing mapmaking tools were assessed and an Adobe Illustrator (Adobe, 2014) was selected to design a paper-based map.

During the implementation stage, new software was learned, a master map leaflet was designed covering 92 service user locations and the whole campus. It was trialled with service users leading to the development of a series of specialised one-page maps which can fit on an appointment letter. A trial of kiosk route maps compared to letter survey maps was required and is underway. Evaluation of the map is described in the next section. The total project cost for widespread adoption of maps is €1700 annually (1c/letter). Momentum on the project was sustained with stakeholders using the communication, issue
and risk logs. A top-down and bottom-up approach was taken to engage staff to gain buy-in to use maps.

The mainstreaming section described adoption and endorsement of the map by the EMT, the publicity plan to launch the map and map publication on the Hospital website. The map project was celebrated by presenting it orally at the Clinical Audit and Quality Improvement day. The map advertises a continuous improvement cycle. The lessons learnt were that the map reflects the Hospital’s organisation of locations and that collaboration is requires for service user location information to be consistent. The HSE Change Model was an appropriate choice of change methodology but innovation projects may require a different approach to mainstreaming than service improvement projects because they may disrupt existing decision-making structures.
4 Evaluation

4.1 Introduction

Healthcare evaluation is defined as a mechanism for determining whether a healthcare change achieves its stated objectives (Lazenbatt, 2002). Healthcare change managers must prove the worth of projects using evaluation throughout the project lifecycle (WHO, 2013). Evaluation methods must be theoretically based to be an effective measure of the project or service aims.

In this section this project evaluation will be contextualised with a summary of the significance of healthcare evaluation in supporting project implementation. The indoor map project will be evaluated by assessing the quality and usefulness of the map using a quality framework including qualitative questionnaires. Evaluation methods, results and dissemination will be described, concluding with a summary and findings.

4.2 Significance of Healthcare Evaluation

Managers of change projects must be able to use evaluation evidence to demonstrate the value of their projects to organisations. The most effective way to achieve good evaluation is for project managers and evaluators to collaborate at the project design stage, so that the evaluation methods are known at the outset of the project (WHO, 2013). This builds in the capability to achieve the project aims (Lazenbatt, 2002). In addition, the skill, time and quality of the evaluators should be
balanced with the skill, time and quality of the project staff (Ovretveit, 2003).

There are a range of evaluation frameworks, methods and tools. Evaluation can be set in a management or quality framework and within the framework evaluation aims can be either summative, formative or knowledge based (Canadian Institute of Health Research, 2012). Summative evaluators design questions to ascertain whether the outcome of a project is sufficient to enable it to continue. Formative evaluators use tools to seek information to improve or develop a project. In the case of a knowledge based evaluation, the evaluator seeks to build information to understand how to evaluate new work (Canadian Institute of Health Research, 2012). Further benefits of evaluation is its use as a feedback loop for improving the effectiveness of change (WHO, 2013) and means of improving communication (McSherry & Pearce, 2007).

This evaluation will use a quality framework called MAPQUAL (Nossum & Krogstie, 2009) to evaluate the map and includes both formative evaluations and qualitative questionnaires.

### 4.3 Project Evaluation

#### 4.3.1 Aims

The objectives of this project were to design a comprehensive map that is useful to patients; that staff find useable and that is published through
existing channels (paper and the Hospital website). The map will be evaluated using the MAPQUAL framework for evaluating maps as a type of model (Figure 12, Nossum & Krogstie, 2009).

![Figure 12 MAPQUAL Quality Framework (Nossum & Krogstie, 2009)](image)

### 4.3.2 Methods and Measures

The model has seven elements through which to evaluate the map. The evaluator must assess if the knowledge of the building is conveyed (social actor explicit knowledge), if the service user can use the map (social actor interpretation and language extension), if the map is available and accessible (map externalisation), if the map represents the hospital (map goals, map domain) and if the map is recognisable electronically (technical actor interpretation).

Each element of the model will be described along with the method used to evaluate the map.
**Social Actor Explicit Knowledge and Language Extension**

The evaluation of social actor explicit knowledge ascertains whether the service user recognises the hospital from the map. The evaluation of this element was carried out with 15 staff members who were selected for trial based on their admission of not knowing a particular location in the Hospital. Their involvement was voluntary. They were given a map and asked to verbalise their understanding of the map. Then each volunteer was observed using the map to find new locations. The author walked with staff noting any difficulties or hesitations they experienced in using the map. On completion the author administered a questionnaire to survey their understanding of map elements (Appendix O).

The map was also trialled with 174 patients who received a copy of the map and simple questionnaire in the post just prior to attending for their new appointment (Appendix P). It was not possible to trial a kiosk route map during the timeframe of the project.

**Social Actor Interpretation**

The evaluation of social actor interpretation is whether the service user can use the map. This was ascertained as described above. Staff members were observed finding new locations to see if they took any wrong turns.
**Map externalisation**

Map externalisation is indicated by the availability and accessibility of the map. The measure is twofold. Firstly, the evaluation checks if the map is available and this is measured by the external evidence on the Hospital website or in reception (Appendix M), secondly it asks whether patients have a copy of the map.

**Map Domain and Map Goals**

The map domain relates to whether the map represents the Hospital and the map goals relate to whether the map supports the objectives of the Hospital. The evaluation of map domain is measured by the coverage of the Hospital site by the map and the evaluation of map goals relates to the link between the map and the Hospital objectives.

**Technical Actor Interpretation**

The technical actor interpretation relates to whether the map is available in electronic tools. This is evaluated by the accessibility of the map in an alternative technology media.
4.3.3 Results

A summary of findings is described in this section (Table 1), along with an evaluation of map quality.

<table>
<thead>
<tr>
<th>Element</th>
<th>Positive aspects</th>
<th>Aspects for improvement</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social actor explicit knowledge</td>
<td>All hospital locations recognisable from the map</td>
<td>Existing hospital signage inadequate causing identification issues</td>
<td>Medium</td>
</tr>
<tr>
<td>Social actor interpretation</td>
<td>Positive trials of people finding destinations</td>
<td>Low volume of feedback from service users</td>
<td>Medium</td>
</tr>
<tr>
<td>Map externalisation</td>
<td>Website access and publicity campaign</td>
<td>Uptake of maps in letter templates is low.</td>
<td>Medium</td>
</tr>
<tr>
<td>Map goals and map domain</td>
<td>Hospital objectives of putting patients first achieved, and cost benefit acceptable.</td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Technical actor interpretation</td>
<td>Map available in technical tools for illustration and for use with kiosks</td>
<td></td>
<td>High</td>
</tr>
</tbody>
</table>

Table 1: Results of MAPQUAL map evaluation

**Social Actor Explicit Knowledge and Language Extension results**

The ability of the service user to recognise the hospital from the map is the social actor explicit knowledge, this has a medium score. While all service user locations are identifiable on the map, the measure deteriorates when users attempt to triangulate their position between the signage and the map and run into signage inaccuracies. Additionally, the variety in Hospital signage adds complexity to the map, making it appear complex (Figure 13). The map may reflect the complexity that the service user experiences.

*Figure 13 Outpatient Signage Types*
Social Actor Interpretation Results

Social actor results relate to whether users can find their way with the map. The map evaluates with medium quality in this element. Results of the 15 staff trials with the map were recorded (Appendix Q). As issues were identified, improvements were made and tested on new staff supporting the notion that evaluation improves effectiveness of change (WHO, 2013). Staff were able to use the map to find their way to areas new to them demonstrating the findings in literature that maps enable novices to appear like be experts in new buildings (Hölscher et al, 2007). Staff comments were noted and were generally positive, including: “I wish I had this map at induction” and “I will feel more confident getting around the building now I have this map”. Staff evaluated the map as high quality.

In the map trial with patients there was a 5% (n=9) response rate from patients, including mixed verbal responses relayed by reception staff. The responses indicated the map had been: “easy”, “useful with no changes necessary”, “unnecessary” or not something in which the patient “was able to take an interest”. The low volume and mixed feedback from the service users brings this aspect of map quality down and should be the subject of further research to establish more detail about from service users about map use.
Map externalisation

Map externalisation measures whether the map is available and accessible for service users. The map scored high on the externalisation element because the map is accessible for service users and is advertised through the Hospital website (Appendix M). The assessment of accessibility from the patient perspective also relates to whether they have a map when they attend. One letter template has been changed to carry a map for new patients, proving the usability of the map in this setting. The result of the evaluation of whether patients have access to a map is therefore reduced to medium quality.

Map Domain and Map Goals

Map domain relates to the coverage of the Hospital by the map and this is high as all known locations a service user attends are marked. The map goals relate to whether the map is linked to the Hospital objectives. This evaluation is also high as the map achieves the stated Hospital objective of putting the patient first (AMNCH, 2013). Linking the map with hospital objectives supports the idea that evaluation improves communication (McSherry & Pearce, 2007).

Technical actor interpretation results

Technical actor interpretation results are high if the map is available in technological tools. The map evaluates with a high score because it is documented in an electronic tool (Appendix R) and has been rendered as a route map for trial with the self check-kiosks (Appendix K). Further
work is necessary to understand if this map can be used with wife navigation to develop a patient navigation app.

The evaluation of the map project using a quality framework results in a map whose quality is medium-high. A map is deeply embedded in and dependent on, the quality of pre-existing organisational structures and processes. In this case the sign accuracy and variety causes issues in both map design and in map clarity; secondly there is no process to ensure a map is placed into a patient letter meaning patients are not yet routinely receiving a map.

The Hospital's indoor map was successfully trialled and is widely available for use. For service users who want to find their way and have access to this map, it has proven usefulness.

4.3.4 Dissemination Plan

The evaluated map series was accepted by the Project Sponsor, and the CEO. The maps and a promotion plan were endorsed by the EMT.

The dissemination of maps was approached from the top-down and the bottom-up. The map series was published on the Hospital website (Appendix M) and launched in the Hospital newsletter and Facebook page (Appendix O). An update was provided on the Hospital electronic noticeboard. The map leaflet is available in Hospital reception areas and given to volunteers. The author presented at the Hospital's annual Clinical Audit and Quality Improvement seminar in April 2015.
4.4 Summary and Conclusion

This section described the rationale for healthcare evaluation and evaluated the indoor map with the MAPQUAL quality model which included trialling the map with 15 new staff and 174 new patients. The process of evaluation enabled better communication about the project and the project aims (McSherry and Pearce, 2007) and provided a feedback loop improving the effectiveness of the change (WHO, 1998).

The map evaluation score was medium-high. The evaluation results were that users were able to recognise the hospital from the map, the map was useable, available to users, reflected the whole campus and reflected hospital goals. Maps are deeply embedded in organisational structures so issues were identified with the accuracy of existing Hospital signage, which may itself be a source of patient disorientation and detracts from map clarity. Integration with letters was achieved but there is no mechanism to ensure a map is used with patient letters so that patients will not automatically receive a map. Staff were able to use the map to find new locations, but service user feedback was low and mixed.

The project evaluation scores high because the objectives were met: a map has been created, the map is published through existing channels and the map is useable by staff and useful for navigation.
As a result of undertaking the project, the author would recommend that signage accuracy is reviewed. It should to incorporate kiosk waiting locations and standard naming. Patient letters should be standardised to signs and include maps. Trials of maps in kiosks and appointment letters should be undertaken to understand what patients find effective.
5 Discussion and Conclusions

5.1 Introduction

The HSE Change Model was used to successfully lead a project to design and publish indoor a hospital map for service users during early 2015. This section concludes the write up of this project by discussing impact of the project on the stakeholders, service and by discussing the impact on the theory of maps, evaluation and change methods.

The project strengths are identified as the leadership of the project and the successful creation and publication of an indoor map. The project was larger than anticipated and the limitations were resource constraints relating to gathering information, survey depth and mapmaking tool investigation.

Three recommendations are made: firstly that more research is undertaken to establish the most effective type of map for the hospital setting; secondly that maps are published for complex hospital buildings and thirdly that a wayfinding strategy is developed for hospital groups to ensure service users receive high quality, consistent information about their attendance.

This paper is concluded with a short summary of the project and its findings.
5.2 Project Impact

5.2.1 Stakeholders

Service users are key stakeholders in this project, but the lead-in times for patient appointments coupled with the project duration make this impact difficult to assess. Patient letters incorporating a map will not be back in the Hospital before June 2015.

The Executive Management Team have endorsed the use of the maps. Top level endorsement is critical to the successful uptake of the maps. A top-down and bottom-up approach has been taken to publicising maps to staff orally, in written form and with printed maps placed in reception. The flexibility of the map mitigates against measuring its uptake, but it is hoped the early adopters will demonstrate the value to others.

The Hospital printing stakeholders have adapted their service and now provide map files for download as well as for printing. This is new ground for them and is working successfully. The Hospital Post Room has also agreed to accept printing tasks that include collating letters and map printing together, which is also a new departure for them.

5.2.2 Practice

Staff who have seen the map have been positive, one service provider commented:
“Last week we sent a mum from the ward to ED three times, each time she came back and could not find it, in the end someone brought her. These maps are excellent, I am getting some printed immediately.” Nurse, 2015

The first letters carrying a map were created in May 2015. The first order for a map was place on the ordering website in May 2015. The induction pack carries a map for all new staff. Reception areas have printed maps available for service users and volunteers have printed maps to give out. Kiosk trials with maps are at the initiation stage. When a map appears on all letters, anyone directing a service user will be able to direct them according to their map.

5.2.3 Theory

A finding in the initiation stage of the project is that patient disorientation has the potential to absorb up 18 hours of staff time on a daily basis, equal to two whole time equivalent staff, a finding which is consistent with the literature (Zimring, 1981).

The literature review identified the paucity of literature to describe the conditions for introducing maps. The information that describes building complexity (Butler et al, 1993, Baskaya et al, 2003, Meilinger, 2008, Rooke & Tzortzopoulos, 2010, Carlson et al, 2010, Nossum, 2013, Li & Klippel, 2014) is incorporated in a checklist (Table 2). It is proposed Hospitals could use this checklist for building complexity as a decision-making tool when considering if they need to create a map.
Having decided a map may be useful, it is unclear from the literature how you establish the service users who would most benefit from a map or establish the type of map they need. This work has identified that new patients and new staff will benefit from a map because they have no pre-existing cognitive schema (Moeser, 1988). Further research in the physical journey a service user takes during an episode of care would inform decisions about who needs a map and what type of map is needed. A patient attending only one location may require a route map where a patient attending multiple services in a hospital may benefit from a survey map.

The literature review did not reveal information about when to develop a map series and which map tool suits this purpose. The illustration software tool enabled creation of multiple maps from a master but does not support automatic updates of maps made from the master. More research is needed into the best tool to use to serve purposes of flexible map formats, map series production and maps that can be used with interactive tools.
A signage review was undertaken during the course of the project and is a recommendation when undertaking a wayfinding strategy (DoH, 2006). During the project this review was extended to include all information sources containing locations or services. This type of review has the potential to become a tool that supports the collation of the information layer for an indoor map.

The MAPQUAL quality framework for maps was a valuable tool in assessing the quality of the map (Nossum & Krogstie, 2009). More research could be undertaken with this tool to understand how to evaluate map series, and how to measure map quality.

During the project, the HSE Change Method (HSE, 2014) supported all stages of the design and publication of the map. During mainstreaming it was clear no current decision-making mechanism exists for patient letters and this project could not therefore integrate with existing mechanisms. It may be the case that innovation projects require a different approach to mainstreaming than exists for service improvement projects.

This project has the potential for translational value in so far as developing a culture of patient autonomy in the organisation may offer insights into how patients can develop greater autonomy with their own health.
5.3 Strengths of the project

The strengths of this project are the successful leadership approach and the maps.

5.3.1 Successful Leadership Approach

The project has embodied the six core elements leadership framework (Gill, 2014, Figure 14) where leaders embrace vision, values and purpose, strategy, engagement and empowerment. In leading this project the author created a vision for putting patients at the center of directions, with the purpose of improving the patient experience. It embodies values staff can share in providing an accessible service for patients, while engaging with 124 survey respondents, 40 staff members from administration, nursing, estates, security, ICT and Directors plus three external advisors in dealing with the problem of disorientation. This project empowered staff to make change possible by actively choosing to use the map in the way that suited their service.

![Six Core Elements Leadership Model](image)

Figure 14: Six Core Elements Leadership Model (adapted from Gill, 2013)
The choice of change methodology was a successful choice. It supported the design and publication of an indoor map.

5.3.2 Designed and Published Maps

The project has published the first Irish indoor hospital map. The map reveals all 92 internal locations and services for service users on a one-page colour folding leaflet. The map can be ordered by all staff in the Hospital. Further one-page maps have been created which can be inserted into letter templates or printed on the back of appointment letters, overcoming any issue staff may have with letter templates.

The map development was cost neutral, existing software and in-house printing were used to develop the map. The author spent 80 hours creating and publishing the map series. Widespread adoption of the map for use in letters will incur a cost of €1700 annually (1c/letter). The potential benefit of widespread adoption of maps is a saving of 18 hours/day of staff time spent reorienting patients. The map is cost-beneficial.

5.4 Limitations of the project

Three limitations are discussed in this section including the scope of the research underpinning the project, the resource limitations on the project and the limitations of the software application tool chosen for the project.
5.4.1 Research limitations

The project arose from the assertion that patients become lost and was supported with a survey identifying 28% of patients (n=175) become lost. The survey represents less than 10% daily footfall and could be improved by running the survey with a greater number of service users.

5.4.2 Resource limitations

This project was limited by the resources needed to review some of the data sources, for example patient letters, available to supply map information. For example, the admissions office has no sign but the survey at reception highlighted requests for directions to the admissions office.

5.4.3 Tool limitations

The software tool was Adobe Illustrator CS6 (Adobe, 2014). One limitation with this illustration tool as a mapmaking tool was the level of functionality to output information other than illustrations. Documentation would usefully have included the list of labels which would form the basis of a directory listing. If more time and resources were available, a mapmaking application would have been trialled alongside the illustration application. It would be useful to consider forging links with a local urban planning department. There may be shared mapmaking aims and this would be an implementation of the HSE strategy call for greater collaboration between government bodies (HSE, 2013).
5.5 Recommendations

5.5.1 Research the Effective Implementation of Maps in Hospitals

Having created flexible maps, the project uncovered a variety of ways to deliver them to service users. Further research is needed to evaluate the best type of presentation of a map for a service user. One other interesting observation from the project is that organisations do not currently know the physical journeys they expect service users to take during an episode of care. If this journey is visualized on a map it may influence decision-making when locating services as well as help define the most effective map.

5.5.2 Establish Indoor Maps in Complex Hospital Buildings

Three learnings from the project are that it is possible to diagnose your building as complex (Table 2), gather the information layer to create a map and then design and publish a good quality map that has proven usefulness. It is important that service users receive a map when attending a complex building to develop their autonomy and reduce their anxiety. It is therefore a recommendation of this project that Irish Hospitals that are complex buildings should develop and publish indoor maps for service users.

5.5.3 Develop a Wayfinding Strategy in Hospital Groups

During this project, information in letters, kiosks, and signage was either not available or not readily accessible. Greater collaboration is needed
between departments to synthesize information in these sources. Hospital groups face an even greater problem when developing consistency across naming conventions, letters, signs, maps, and information contained in national computer systems. A wayfinding strategy offers hospital groups a way to become integrated organisations and present an organised approach to the service user.

5.6 Summary and Conclusion

This project was the introduction of the first publicly available indoor Hospital map in Ireland. The objectives to design, evaluate and publish a map were achieved, the map is available on the Hospital website and is being given to new staff and sent to service users on the reverse of their letters.

In a survey undertaken during this project 28% of patients expressed a feeling of disorientation during their visit to the Hospital; extrapolating this to daily footfall, using an average time to reorient a service user, leads to approximately 18 hours per day of staff time taken up with reorienting up to 600 patients. To tackle this problem with widespread adoption of maps will cost the Hospital €1700 annually (1 cent/letter).

do not complain (Campos Andrade et al, 2013) and so the evidence for introducing maps will stem from the literature on maps.

During the project, it was discovered that no hospital map existed; 8 types of services were discovered and located; 433 signs were found to be 69% accurate with 92 locations published on the map. Adobe Illustrator (Adobe, 2014) was the chosen map making tool. It was mastered and a map leaflet was designed covering the whole campus. During evaluation the map leaflet was rearranged as four types of one-page map for the reverse of letters. All the maps were endorsed by senior management and publicized in a variety of ways including loading them on the website. The project was celebrated at the Hospital's annual Clinical Audit and Quality Improvement seminar.

Maps were successfully used by new staff to discover locations new to them. Iterative improvements were carried out with three external, 15 internal and 174 new patients. The map scored medium-high with a quality evaluation framework (MAPQUAL, Nossum and Krogstie, 2009) identifying that users were able to recognise the hospital from the map, the map was useable, available to users, reflected the whole campus and reflected hospital goals. Maps are deeply embedded in hospital structures, reflecting existing hospital issues such as the lack of accuracy in Hospital signage and the lack of ownership in letter management. These issues reduce organisational legibility and map quality.
The leadership of the project using the HSE Change Model was an effective choice as a change methodology to create and introduce an indoor map. Further research is needed to understand how this model can support mainstreaming innovation projects into existing hospital processes if the project disrupts those processes. The leadership of this project was a project strength and it embodied the six core elements leadership model (Gill, 2013).

The project limitations were related to resources to carry out broader service user surveys, analyse more data sources and evaluation other mapmaking tools. There are three project recommendations: firstly, that more research is carried out to understand the best type of map for each type of service user; secondly that maps are established in complex hospital buildings in Ireland and thirdly that wayfinding strategies are developed in the hospital groups.

If these recommendations are implemented, patients will receive a consistent message through information provided by hospital groups. Patients and visitors will become more autonomous in complex buildings; have no stress added to their visit by the layout of the Hospital; and feel more satisfied with their experience. Staff and patients will give their focus to the reason for the visit.
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Appendices
### Appendix A  Risk Analysis

<table>
<thead>
<tr>
<th>Risk</th>
<th>Description</th>
<th>Mitigation</th>
<th>Likelihood</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community of interest rejects</td>
<td>Key receptionists feel a map will detract from rather than add to their role.</td>
<td>Listen to their experience. Engage them with the map development. Do a survey of their directions to include them all. Feedback on the directions to the staff who create the most directions. Give them early sight of the map. Early feedback is very positive – not an issue.</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Map tools are unavailable</td>
<td>Tools for maps are too costly, or not available or not suitable for integration with other functions</td>
<td>Source existing software in the organisation (CAD, illustrator, power point) for map development. Identify pros and cons for software. Identify the learning path. Trial the software. Sourced a licence - Not an issue.</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Disinterest in community for reviewing map or being involved</td>
<td>Community of interest disinterested in maps</td>
<td>Do a general questionnaire linking maps with patients who are lost. Examine reasons for support or lack of support. Harness the interested parties and have them work on others. Not an issue.</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Governance is not established</td>
<td>Map is not seen as a valuable additional work load</td>
<td>Listen to competing factors and find sources to describe what it is like to be lost in a public hospital. Work with sponsors on other allied areas to try and ascertain their interest levels. Create argument for service improvement. Interest is there, not an issue.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Governance is not established</td>
<td>Map is set among too many other unmanaged issues that are themselves a disincentive.</td>
<td>Listen to arguments and try to understand prioritisation of work. Time poor – no opportunity to listen to arguments, busy people are impossible to get to, agreement is there time is not offered, autonomy is also not offered.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Finance unavailable</td>
<td>Governance is agreed but funding is not available</td>
<td>Look to other sources for funding, think of offering map service to other sites in group? Outocme: Costs are neutral for map development, not an issue.</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Map quality poor</td>
<td>Map design maybe inadequate due to lack of design training</td>
<td>Find external organisations for map and design expertise to help, establish a link with Ordinance Survey Ireland. Find graphic art links with hospital art officer. Read map design books to grow expertise. Dry run the map with staff to get feedback. Established links and evaluation is positive – no longer an issue.</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>
**Appendix B  Stakeholders Analysis**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Project Role</th>
<th>Interest</th>
<th>Influence</th>
<th>Communication methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director 1</td>
<td>Stakeholder for patient flow and wayfinding</td>
<td>Medium</td>
<td>High</td>
<td>Formal regular meetings</td>
</tr>
<tr>
<td>Director 2</td>
<td>Stakeholder for signage</td>
<td>Medium</td>
<td>High</td>
<td>Written updates</td>
</tr>
<tr>
<td>Director 3</td>
<td>Stakeholder for digital publication</td>
<td>Medium</td>
<td>Low</td>
<td>Informal verbal updates</td>
</tr>
<tr>
<td>Business Managers</td>
<td>Source staff</td>
<td>High</td>
<td>High</td>
<td>Formal irregular meetings</td>
</tr>
<tr>
<td>Societies</td>
<td>Stakeholder for patient advocacy</td>
<td>High</td>
<td>Medium</td>
<td>Informal</td>
</tr>
<tr>
<td>Receptionists</td>
<td>Evaluation with patients</td>
<td>Medium</td>
<td>Low</td>
<td>informal/regular</td>
</tr>
<tr>
<td>Volunteer manager</td>
<td>Team - directions</td>
<td>High</td>
<td>Medium</td>
<td>formal, regular face to face</td>
</tr>
<tr>
<td>Patient Representative</td>
<td>Team - directions</td>
<td>High</td>
<td>Low</td>
<td>informal/regular</td>
</tr>
<tr>
<td>Quality Manager</td>
<td>Team - desk reviewer</td>
<td>High</td>
<td>Medium</td>
<td>informal</td>
</tr>
<tr>
<td>FOI officer</td>
<td>Team - desk reviewer</td>
<td>High</td>
<td>Low</td>
<td>informal</td>
</tr>
<tr>
<td>Patient advocacy</td>
<td>Team - desk reviewer</td>
<td>High</td>
<td>Medium</td>
<td>informal</td>
</tr>
<tr>
<td>Arts officer</td>
<td>Team - desk reviewer</td>
<td>Medium</td>
<td>Low</td>
<td>informal</td>
</tr>
<tr>
<td>External cartographer</td>
<td>Team - desk reviewer</td>
<td>Medium</td>
<td>High</td>
<td>informal</td>
</tr>
<tr>
<td>External graphic artist</td>
<td>Team - desk reviewer</td>
<td>Medium</td>
<td>High</td>
<td>informal</td>
</tr>
<tr>
<td>Kiosk project manager</td>
<td>Team for existing destinations and directions</td>
<td>High</td>
<td>Low</td>
<td>informal</td>
</tr>
<tr>
<td>Facilities project manager</td>
<td>Team for signage and YAH map locations</td>
<td>High</td>
<td>Medium</td>
<td>formal, regular face to face</td>
</tr>
<tr>
<td>Internet administration</td>
<td>Setting up new maps</td>
<td>Medium</td>
<td>Medium</td>
<td>Informal</td>
</tr>
<tr>
<td>Printing department</td>
<td>Team for reprints and maintenance</td>
<td>Medium</td>
<td>Medium</td>
<td>Regular Informal meetings</td>
</tr>
<tr>
<td>New staff (10)</td>
<td>Evaluation with new locations</td>
<td>Medium</td>
<td>Medium</td>
<td>Informal</td>
</tr>
<tr>
<td>Staff links for developing direction material</td>
<td>Review existing directions</td>
<td>Mixed</td>
<td>Medium</td>
<td>Formal, regular, email</td>
</tr>
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</table>
Appendix C  Signage review excerpt

| Signage review listing sign location, sign attributes and sign presence at each decision point for the signs from the Atrium Southwards to Oncology. |
Appendix D  Building outline map with services

Early map design – building outline from Google maps (Google Earth, 2015), with services identified, before all labels were applied.
Appendix E  Decision Tree for software selection
## Project Plans and Gantt Chart

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<td>Kiosk supplier</td>
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<td><strong>Teal</strong></td>
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<td>Establish a sponsor</td>
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<td></td>
<td></td>
<td><strong>Purple</strong></td>
</tr>
</tbody>
</table>
Appendix G  Whole Hospital Map Trifold Leaflet
Appendix H  One Page Outpatient Department map

[Map of Tallaght Hospital]

Where to find Tallaght Hospital
www.amnch.ie  53.2892, 6.3757

Hospital Outpatient Departments

Legend

Leaflet supported by the Neath Foundation

Page 108 of 120
Appendix K  Route map for use with self check-in kiosks
## Appendix L  Project Issue Log extract

<table>
<thead>
<tr>
<th>Issue number</th>
<th>Issue description</th>
<th>Person</th>
<th>Comments</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The National children’s hospital wards should be named on the map</td>
<td>TL</td>
<td>Agreed. Although only signed as NCH, the wards have a significant number of requests</td>
<td>Included</td>
</tr>
<tr>
<td>2</td>
<td>There is no presence of bio-medical engineering on the map</td>
<td>BM</td>
<td>This department is signed and on hospital street, but not a service user department.</td>
<td>Not included</td>
</tr>
<tr>
<td>3</td>
<td>The kiosks have to be named as they cannot be recognised</td>
<td>PO</td>
<td>The kiosks should have a symbol developed.</td>
<td>Kiosks named. Kiosk symbol developed. Kiosk symbol reviewed and redeveloped.</td>
</tr>
<tr>
<td>4</td>
<td>The hospital gate should be more prominent</td>
<td>SS</td>
<td>Gate is the only entry. Some mechanism for recognising the arrival may be superfluous.</td>
<td>Gate trialled and reviewed with evaluator - agreed.</td>
</tr>
<tr>
<td>5</td>
<td>There are departments which have no name plate in the hospital and are needed on the map</td>
<td>KR</td>
<td>Ask them to request signage from the Estates department. Requested from Estates.</td>
<td>In progress</td>
</tr>
<tr>
<td>6</td>
<td>There are departments who change their names as the patient progresses along the hospital street</td>
<td>KR</td>
<td>Find a person in the specialty who can decide the preferred name. Established, agreement outstanding.</td>
<td>In progress</td>
</tr>
<tr>
<td>7</td>
<td>There are departments who have their name appearing only at or near to their door</td>
<td>KR</td>
<td>Start a signage proposal with the Estates Manager. Completed, sent, agreement to review achieved.</td>
<td>In progress</td>
</tr>
<tr>
<td>8</td>
<td>The temporary signs for the kiosks are not in situ</td>
<td>KR</td>
<td>Raise with the outpatient manager and estates manager achieve a new sign set up.</td>
<td>In progress</td>
</tr>
<tr>
<td>9</td>
<td>The inset link does not work</td>
<td>KR</td>
<td>Review inset links in other popular publications for examples and trial these incrementally. Review with graphic artist for feedback.</td>
<td>Solved</td>
</tr>
<tr>
<td>10</td>
<td>Baby change and breast feeding facilities are not advertised anywhere</td>
<td>KR</td>
<td>Speak with paediatric contacts and resolve.</td>
<td>Sourced</td>
</tr>
<tr>
<td>11</td>
<td>There is an additional bathroom in suite 6</td>
<td>AC</td>
<td>Check and insert</td>
<td>Resolved</td>
</tr>
<tr>
<td>12</td>
<td>The lift symbol is confusing with the toilet symbol and is in fact the wrong symbol in use in outpatients</td>
<td>COT, OB, JM</td>
<td>Trial other symbols, review again, retrial.</td>
<td>Solved</td>
</tr>
</tbody>
</table>
Appendix M  Hospital website links for hospital maps

Screenshot of the Hospital website entry for patients and visitors showing access to maps. http://www.amnch.ie/Patients-Visitors/Hospital-Maps/ [Accessed 28th April 2015]

Screenshot of the Hospital intranet site for staff showing access to maps. http://bit.ly/1FmU0Yp - Staff and public information [Accessed 28th April 2015]
Appendix N Internal and external Hospital map publicity

Indoor Map for Tallaght Hospital

Another example of innovation and a first for Tallaght Hospital this month is the launch of the first indoor map of a hospital in Ireland. The map designed by Kerry Ryder from the ICT Dept shows users how to get to the destinations they should attend and covers all areas of the campus. On a 60,000 sq. m site on a 35 acre campus this was no easy task. The project was completed by mapping the internal signage locations and kiosk directions. The maps show users how to get to the destinations they should attend.

The intention is that every patient letter would be accompanied by a map tailored to show their patient’s destination. This will enable patients to get to their appointments with ease, and should they become lost, staff (who don’t always know the answer!) will be able to refer to the map and point them in the right direction more easily.

There is a department tube map style route directory for use internally at induction for our new staff so they can adjust as quickly as possible to the campus.

In the creation of the maps it was found through research that 30% of our patients had been disoriented during their visit, and a high volume of staff see the maps as a service improvement. The maps have been extensively evaluated for use with staff and volunteers who have found their way to previously unknown destinations, and with brand new patients who provided feedback to reception staff. The completion of the project which was spearheaded by Kerry Ryder involved a large number of stakeholders and their assistance was invaluable as it was integral to making the maps as comprehensive and clear as they are.

The maps are available to view, print or download on the intranet, and will be available on the internet site shortly. Feedback is welcome to maps@amnch.ie

Screenshot of Hospital Newsletter publicity. 8th April, 2015

Screenshot of Hospital Facebook publicity. 28th April, 2015
Appendix O  Tallaght Hospital - Staff Questionnaire.

Please take a few moments to look at the map.
Describe to me what you see

Please tell me location you have never been to:
Feedback after using the map

What do you think the symbols on the right represent?

Please point to where you are on the map?

Please point to the diabetes center on the map?

Please point to the diabetes center in the building?

Age group: <25  25-35  35-50  50+
Work area:
Map user?
Appendix P  Tallaght Hospital - Patient Questionnaire

This Appendix shows the section of a letter sent to new patients asking them about the map attached to their letter.

<table>
<thead>
<tr>
<th>Map Questionnaire</th>
<th>Please hand in to reception</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Did you find the map useful during your visit today</td>
<td>yes / no</td>
</tr>
<tr>
<td>2. What locations did you go to?</td>
<td></td>
</tr>
<tr>
<td>Outpatients/ X-Ray / Wards / Tests / Therapy / Other: ____________</td>
<td></td>
</tr>
<tr>
<td>3. Is there anything you would change on the map?</td>
<td></td>
</tr>
<tr>
<td>4. Is there anything on the map you did not understand?</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix Q  Staff questionnaire results

<table>
<thead>
<tr>
<th>Work area</th>
<th>Age</th>
<th>Sex</th>
<th>Symbols</th>
<th>Dept Found</th>
<th>Point test</th>
<th>Issues?</th>
<th>Response</th>
<th>Map User</th>
</tr>
</thead>
<tbody>
<tr>
<td>admin</td>
<td>35-50</td>
<td>f</td>
<td>kiosk?</td>
<td>y</td>
<td>y</td>
<td>lettering not on coloured</td>
<td>can I have one</td>
<td>y</td>
</tr>
<tr>
<td>Ext</td>
<td>&lt;25</td>
<td>m</td>
<td>kiosk?</td>
<td>y</td>
<td>y</td>
<td>Don’t know what the kiosk icon is</td>
<td>see why you need one</td>
<td>n</td>
</tr>
<tr>
<td>admin</td>
<td>&lt;25</td>
<td>f</td>
<td>kiosk?</td>
<td>y</td>
<td>y</td>
<td>name the kiosks put traffic lights on draw in the gate</td>
<td>I think it will be useful, give it to new people</td>
<td>n</td>
</tr>
<tr>
<td>Nurse</td>
<td>50+</td>
<td>f</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>Inset needs a better title</td>
<td>I’ll be able to use it for all my patients</td>
<td>y</td>
</tr>
<tr>
<td>admin</td>
<td>50+</td>
<td>f</td>
<td>lifts?</td>
<td>y</td>
<td>y</td>
<td>Inset confusion Are the lift icons good enough</td>
<td>I never knew some of these places even existed</td>
<td>y</td>
</tr>
<tr>
<td>admin</td>
<td>50+</td>
<td>f</td>
<td>lifts?</td>
<td>y</td>
<td>y</td>
<td>lift icons mistaken for toilet icons</td>
<td>it's really good</td>
<td>y</td>
</tr>
<tr>
<td>admin</td>
<td>35-50</td>
<td>f</td>
<td>lifts?</td>
<td>y</td>
<td>y</td>
<td>Main reception confusing- link to hospital street confusing are the lifts bunk beds?</td>
<td>Prefer signage don't really do maps</td>
<td>n</td>
</tr>
<tr>
<td>admin</td>
<td>35-50</td>
<td>f</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>spaces between words, coffee shop missing on legend Public car park wrong layer</td>
<td></td>
<td>n</td>
</tr>
<tr>
<td>admin</td>
<td>35-50</td>
<td>m</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>can’t see coffee shop from atrium so remove can’t tell where to go out of lifts, which way are wards</td>
<td>it’s great, definitely useful</td>
<td>y</td>
</tr>
<tr>
<td>Ext</td>
<td>35-50</td>
<td>f</td>
<td>y</td>
<td>y</td>
<td>n</td>
<td>get a better perspective between inset and street to stop confusion. eye travels to big icons 1st.</td>
<td>can I use this for my work?</td>
<td>y</td>
</tr>
<tr>
<td>Mgmt</td>
<td>50+</td>
<td>f</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>Names for transition ward, remove complex names</td>
<td>wish I had it earlier</td>
<td>y</td>
</tr>
<tr>
<td>admin</td>
<td>25-33</td>
<td>f</td>
<td>y</td>
<td></td>
<td></td>
<td>lift toilet icon mistake floor level confusion kiosk name confusion</td>
<td></td>
<td>y</td>
</tr>
<tr>
<td>student</td>
<td>&lt;25</td>
<td>m</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>lift and toilet icons mistaken, focus on OPD inset saw nothing else</td>
<td>easy to get around. would be happy to come as a patient</td>
<td>n</td>
</tr>
<tr>
<td>Ext</td>
<td>25-33</td>
<td>f</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>remove lift volume, remove foliage, reduce name labels, remove 2nd hand wash icon</td>
<td>map is complex because labelling is complex</td>
<td>y</td>
</tr>
<tr>
<td>AHP</td>
<td>25-33</td>
<td>m</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>No issues</td>
<td>Really speeds up access</td>
<td></td>
</tr>
</tbody>
</table>
Appendix R  Map Visual Hierarchy

Map Documentation

Corridors are drawn as rectangles in red (0,100,100,0) with a black outline (1 point). Opacity is 20%. Corridors are grouped in a group called pathways. In the visual hierarchy corridors are below symbols and icons.

Symbols are editable through the symbol panel. They are navy (100,100,0,0) rounded rectangles on a clear background, with white insets. The contents are grouped together.

The symbols are grouped together in the layer panel in a group called symbols. In the visual hierarchy symbols are below labels.

Building boundary is the closure of the map. It is the lowest layer in the visual hierarchy. It is produced with an outline of light blue (100,0,0,0) in 2 point with a black infill (0,0,0,20).

Landmarks cover all items to help the user around the map. These include seats, barriers such as walls, foliage and the daffodil centre. These are grouped in the layer panel into a group called landmarks. Seats are also designed as an icon to enable ease of standardisation. They are intended to guide the reader about availability and density of seating, and not intended to reflect the colours of the actual seats. The foliage has a standard nature pattern to create texture.

Labels are grouped under a heading of syntax. Labels use are the font avenir roman in varying degrees of size from 10 to 21 pitch. Label colour is green (75,25,100,25) to mimic the crest colour. There is a white 3 point outline with a white drop shadow effect to hover the words over the background map and bringing them to the foreground for legibility.

The hospital coat of arms is the modern version with red in the banner, and trimmed banner tails. Available on the hospital website.

The visual hierarchy
The visual hierarchy is comprised of labels at the foreground. Icons, landmarks and corridors are mid ground. Building layout is the background.
Appendix S  Project Abstract

Designing and publishing indoor maps for service users in an Academic Teaching Hospital
K. J. Ryder, MSc Leadership

Abstract

Introduction. This project aims to improve the service user experience by designing and publishing an accessible indoor map in an academic teaching hospital. On a daily basis approximately 800 service users will be disoriented in the hospital resulting in 18 hours/day staff time spent helping patients find their way. 84% (n=109) of staff categorised indoor maps as a service improvement. Patients who get lost can feel anxiety, shame and even panic. Maps can improve patient autonomy1. Internationally hospitals develop a wayfinding strategy to co-ordinate information received by service users.

Initiation. Volunteer-run project survey (n=175) showed 84% of disoriented patients would have liked a map. Up to 18 hours/day staff time is invested in re-orientating approximately 800 patients daily.

Planning. Analysis of service user locations included signs, directions, and kiosk locations. Tool choice was Adobe Illustrator (CS6) to create paper maps. Maps available in leaflet form, on the reverse of a letter or as a kiosk ticket.

Implementation. The map was endorsed by senior management and published on the hospital website.

Development time was 80 hours but project was cost neutral. Adopting maps will cost €1700 annually (1c/letter).

Evaluation. MAPQUAL quality framework2 gave a medium-high map quality score, issues identified with signage accuracy (69%) affecting map clarity, usefulness and availability through patient letters.

Conclusion. The HSE Change Model3 supports developing innovation projects but mainstreaming may require further research where change disrupts processes. Irish hospitals should develop wayfinding strategies that deliver information consistency across hospital groups for service users.

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Appendix T  Project Poster

Designing and publishing indoor maps for service users in an Academic Teaching Hospital

K. J. Ryder, MSc Leadership

Introduction & Background

On a daily basis approximately 600 service users will be disoriented in the hospital resulting in 18 hours/day staff time spent helping patients find their way.

The Hospital Street is 350m in length and staff frequently comment on the amount of time they spend re-orienting patients while they travel to their work location. 84% (n=109) of staff categorised indoor maps as a service improvement.

Patients who get lost can feel anxiety, shame and even panic and do make complaints. Maps can improve patient autonomy1.

Internationally hospitals develop a wayfinding strategy to co-ordinate information on letters, signs & maps.

Aim & Objectives

This project aims to improve the service user experience by:

- Designing an comprehensive indoor map by January 2015
- Evaluate maps by February 2015
- Publishing the map through existing channels of communication by March 2015

Methodology

The project was undertaken using the HSE Change Model (Figure 2).

![Figure 2: HSE Change Model](image)

Initiation

Volunteer-run project survey showed 28% of service users (n=175, 9% daily footfall) reported experiencing disorientation during a project survey. 84% of disoriented patients (n=175) would have liked a map.

Planning

Analysis recovered service user locations from signage, kiosks and a reception survey. Services were discovered. Existing maps checked. Adobe Illustration Software was mastered as design tool for maps. Map format choice was paper. Campus designed in sections.

Implementation

The map series was made available as a flexible, varied format for handout, letters and kiosks. Trials of map were successful. Development costs: 80 hours of time, cost neutral. Adoption costs are €1700 annually.

Mainstreaming

The Executive Management Team endorsed map use for service users. Accessible maps widely available on hospital. Publicity in hospital, magazine and at Clinical Audit day.

Lessons: Maps are deeply embedded in organisational structures and allow hospitals to visualise organisational legibility.

Evaluation

- Quality framework (MAPQUAL2) scored map medium-high.
- 3 external experts, 15 new staff and 120 new patients iteratively improved the map.
- Hospital issues include sign accuracy (Figure 3) affecting map clarity and useability, and user uptake into patient letters.

Organisational Impact

Service users have access to maps. Maps made accessible on the website and for printing by service providers adopting new roles.

Conclusion

The HSE Change Model supports developing innovation projects but may need new mainstreaming if change brings disruption to existing mechanisms.

Irish hospitals should develop wayfinding strategies to deliver information consistency in hospital groups for service users.

References

2 www.hse.ie – The Change Hub

The Maps

There are five maps.

Three one sheet customisable maps for the reverse of service user letters (Figure 1).

A whole hospital map leaflet plus a route map for self check-in kiosks.

![Figure 1: Indoor map leaflet](image)