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## 5. Healthcare Infrastructure Planning

### 5.1. Introduction

With the advent of the Darzi review in 2008 and more recently the White Paper 'Equity and Excellence; Liberating the NHS' (2010), the delivery of health and social care in the UK is undergoing profound change and being redesigned to provide high quality, person-centred services and improved capacity and performance. In 2008 and again in 2010, the Chancellor of the Exchequer identified improvements to NHS estate utilisation as a key saving area in 2010/11-2012/13, potentially reducing in 2010/11 the need for new hospital space by up to £3bn and saving up to £100m per annum of estate costs.

The Department of Health is now moving towards a system focussed on 'outcomes and quality standards' rather than operational targets. About 60 per cent of the NHS estate is more than 25 years old and due to the huge costs associated with asset management, the NHS needs to ensure that it achieves value for money in managing its estate. In this change-oriented scenario, the importance of stakeholder consultation and public participation is highly topical with widespread advocacy in government policy literature and healthcare literature; along with systematic management of all decision-making processes taken throughout the life of physical assets.

### 5.2. Project: Strategic Asset Management and Integrated Service Provision within the Healthcare Sector

**Researcher:** Grant Mills, Sameedha Mahadkar  
**Project start and end date:** January 2008 to May 2011

#### Overview

Stakeholder consultation is a complex process that emerges alongside the infrastructure planning and design process. It is needed both at the strategic programme and estates project levels, and must be delivered in a coordinated and efficient way to achieve best value. As such, an action research methodology was adopted in order to understand the specific details of the interrelation of the planning and consultation processes.

The research team worked collaboratively with the local NHS Leicestershire and Rutland County Primary Care Trust to investigate the multi-intuitive and multi-stakeholder approach to infrastructure planning. They worked dynamically with the communications and engagement team at the PCT which was also involved in the development of a live public consultation and service review. Furthermore, a web based review was conducted in order to investigate the consultation exercises carried out with regards to significant estates and service changes within 149 Primary Care

Trusts in England. A conceptual framework was developed based on a literature review in order to understand how decision making and stakeholder consultation can drive value in the infrastructure decision-making in line with Section 242 of the NHS Act 2007.

#### Key findings

This study concluded that all Primary Care Trusts have conducted public consultation which appears to be in line with legislation. However, there have been wide and varied interpretations of how this should be done. There is a lack of a clear definition and guidance to determine when care, estates or transport structural change consultation should be conducted and also a definitive approach should be introduced to determine at what point of the infrastructure planning process should these be conducted.

Studies evaluating the involvement of stakeholders in the definition and assessment of value, suggest that the public are uncomfortable making resource allocation choices. However, others state that this is not the case when stakeholders are given sufficient time and adequate support and information. Very few trusts are using the most advanced approaches to priority setting. Instead they are selecting to use measurement methods that may bias outcomes or samples that may be inadequate.

Few trusts appear to use modeling, simulation or visualisation tools (e.g. GIS) although the stakeholder consultation practice would benefit from the utilisation of these tools and will also help to improve stakeholder judgment making. There is a lack of understanding within trusts on how stakeholder involvement should integrate with the business planning process. Further detailed guidance is required to ensure that consultation is integrated into the decision making process and that the public are provided with enough information to make effective judgments.

### 5.3. Project: Strategic Asset Management

**Researcher:** Sameedha Mahadkar  
**Project start and end date:** April 2008 to September 2011

#### Overview

Planning needs to address critical capacity gaps and establish appropriate demands for accessible service models. With the ever-changing healthcare services environment within the NHS, trusts have to deliver sustainable services that can accommodate increased patient volumes in their existing facilities, while others may need to refurbish or build new facilities to maximise flow. Within the UK, the UK public sector estate is the largest land owner and its largest tenant, with assets worth £370 billion and annual maintenance costs of up to £25 billion.

Even a modest improvement of 15 per cent savings in facilities management costs would result overall across the NHS in savings of £533 million (EC Harris, 2010). There is a clear need for efficient management of NHS estate and huge savings can be achieved through better management of assets.

There is a growing trend within the NHS is to move towards an increasingly community based service with integration between generalist, specialist and social care; but this needs to be underpinned by robust demand data. This work involves the development of a framework which will be outcomes orientated, underpinned by effective stakeholder consultation for improving strategic asset management which can be utilised by practitioners and decision makers to facilitate the planning process.

This is an action-based research project and effective links have been established with local Primary Care Trusts in order to follow their multi intuitive and multi agency process for estates strategic planning and strategic asset management. Strategic asset management can be viewed as a tool for achieving efficient performance of estates and service delivery outcomes through optimum asset management.

### Approach and key findings

A literature review has been conducted and some of the key findings include the following.

- There is no clear definition of asset management and its integration into the healthcare planning process.
- Existing tools, while underpinned by robust baseline data, lack a practical estates decision-making and consultation framework that integrates care service, estates and access planning.
- Transport and access is a major factor in healthcare planning. However, there is little supporting guidance and the benefits of GIS are only just starting to be exploited.
- Existing care, estates and access data, models and assessment methods are too rigid, inflexible and not integrated into a whole infrastructure planning approach.
- There is a need for improved scenario planning approaches.
- Technical specialists in care, estates and transport planning lack an integrated understanding to make optimum value judgements.
- The distribution of a trust's user population should be a large factor in determining care model design.
- Regional and local estates strategy formation must be bespoke to respond to changing local needs and other baseline data.

The research also included a collaborative project with the Prince's Foundation which involved exploring various care models (based on the six recommended specialities by DH) and co-location of facilities. A literature review along with the development of the conceptual framework has been completed. We were also provided

with access to an estates reconfiguration tool 'SHAPE' designed by the Department of Health Estates and Facilities, and a desk study has been completed.

The research team also collaborated with teams at The Bartlett, University College London and have conducted a number of workshops with the following Primary Care Trusts: Milton Keynes, Southampton, Salford Royal, Taunton, St Thomas's and Guys and Brighton. These workshops explored decision-making processes and enabled thinking of new environments and impact of commissioning and the implications on estates projects and the ability of the assets to respond to service re-design. They also provided a platform to examine tools for reconfiguration of service and estate along with multiple stakeholder perspectives (estates and clinicians) to map individual attitudes and understand decision-making networks.

Workshops on Capacity Planning and Lean Healthcare Infrastructure Planning were also conducted at Loughborough University, which informed key aspects of this research. The workshop on 'Lean Healthcare: delivering Value in Planning and Design' was conducted in collaboration with European Construction Institute and Lean Healthcare Institute. This enabled us to define future directions for lean healthcare estates planning and design and its role in achieving reconfiguration, space rationalisation and clinical productivity.

The Capacity Planning workshop was jointly conducted with ECHAA (European Centre for Health Assets and Architecture). It was centred on how flow is accurately modelled to understand both systematic well defined procedures (that account for about 80 per cent of activity) and those more complex, ill-defined and individualised pathways. It further explored how buildings could translate these various care pathways into efficient and unconstrained patient flows.

## 5.4. Project: Evidence-based design of healthcare built environment to improve quality and safety

**Researcher: Nadeeshani Wanigarathna**

**Project start and end date: July 2010 to June 2013**

### Overview

With the findings that better designed buildings contribute to a built healing environment, the concept of Evidence Based Design (EBD) - the process of basing decisions about the built environment on credible research to achieve the best possible outcomes-has gained a wider acceptance by stakeholders including the UK Government.

There have been several studies that present opportunities for EBD to strategically inform design and thereby increase healthcare outcomes. Ulrich (2005) identified design to increase safety, reduce infections, falls, medical errors, staff fatigue, eliminate environmental stressors etc as the main opportunities of EBD through specific

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strategies, such as: single instead of shared patient rooms; rooms with natural light and nature views; using acoustical materials and creating sight lines; decentralised nurses stations; and large scale art projects. At a macro scale, Webster and Steinke (2009) established that EBD can assist in addressing issues of an aging population and workforce, labour shortage, high incidences of workplace injury and increasing absenteeism.

It is timely, especially in the UK, to research extensively into EBD considering the country's specific characteristics and the National Health Service's future requirements. This research aims to investigate how an Evidence Based Learning Environment (EBLE) can be created within the healthcare built environment through evidence-informed design standards, guidance to improve quality and safety. The specific objectives are as follows.

- To review existing quality standards, guidance and evaluation tools to identify their quality and safety realization mechanism.
- To investigate the current healthcare built environment design process to identify how design process manages quality and safety of its products.
- To identify the changing future requirements of the healthcare built environment and its design process locally and internationally.
- To explore the opportunities to improve quality and safety through evidence-based guidance to healthcare built environment design process.
- To identify how to create an EBLE within the healthcare built environment design process to improve health and safety.

### Methodologies

This research will review literature of standards, guidance and tools and the healthcare built environment design process. Further selected books, journals, newspapers, reports, television programmes etc. to partially identify the foresight of the healthcare built environment and its design process. This will be further investigated by a questionnaire survey followed by further rounds to achieve fourth and fifth objectives using Delphi technique.

### Anticipated/planned outcomes

- How existing design standards, guidance and tools contribute to quality and safety of the healthcare buildings.
- Future requirements of the healthcare built environment and building design process.
- Opportunities to improve quality and safety of the healthcare built environment through evidence-based guidance to the people involved in their design process.

## 5.5. Project: Open Scenario Planning: Enabling Service Transformation with Change-Ready Infrastructure

**Researcher: Phil Astley**

**Project start and end date: October 2009 to June 2011**

### Overview

The development of research currently undertaken at the Bartlett, University College London with the HaCIRIC team at Loughborough University Department focuses on the development of: Open Scenario Planning for Healthcare Infrastructure (OPHI). The study has proposed Open Scenario Planning approaches to support the front end stage of planning to enable service transformation with insights drawn from A&E and Urgent Care and how it connects to space and infrastructure.

We have generated a method using scenario building techniques driven by operational innovation for a range of possible futures that will have an impact on the future configuration of A&E/ Urgent care (and other associated) pathways. They test strategic scenario options for clinical effectiveness rather than traditional functional relationships.

The ideas and direction of the research are underpinned by concepts of Open Building with case studies from England, Switzerland and the Netherlands. The research has investigated current approaches to master planning of hospital sites. It proposes a new framework that directs the future development of the hospital and partner organisations as a set of high level objectives driven by clinical priorities. This framework incorporates planning and design innovation through the mapping of divergent operational scenarios. It is a non-linear planning process that provides for a range of change-ready scenarios and the potential for rationalisation of existing property and buildings, whilst improving decision making for healthcare pathways across locations and settings.

### Research Questions

The research addresses some key questions. What new approaches need to be developed for service and spatial strategies that respond to uncertainty and change for effective planning, design and project management at the inception of projects? What are the multi-disciplinary decision-making networks, structures and competencies required? How can we determine Open Scenario Planning approaches that understand the need for 'preparedness' for constant clinical change and capacity? What are the range of tools and techniques available to facilitate the implementation of new infrastructure investment strategies?

## Methodologies

Evidence and analysis has been drawn from workshops in the field of A&E/trauma and urgent care service (re)organisation within seven English Trusts. These workshops set out a process to determine scenarios of a shifting pattern of patient-centred requirements and clinical priorities by testing strategic options for clinical effectiveness rather than functional arrangements. The ideas and direction of the research are also supported by our engagement with case studies from Switzerland and the Netherlands that have applied open building methods for the scenario planning of infrastructure and built assets.

## Findings

The findings of our study with the acute hospital trusts in England respond to emerging radical solutions in A&E and Urgent Care to control demand and the potential of identifying key savings from the efficient planning of space. We have investigated the appropriateness of their introduction within the context of UK service reorganisation for patient-centred, integrated care. Findings are suggesting clinically-led units supported by mobile multi-disciplinary teams for on and off-site planning of admission avoidance, referral patterns and long-term care of chronic conditions. This is informing scenarios of community driven social care models, the virtual management of care, and the infrastructure requirements to support this activity.

## Conclusions

This work has informed principles and strategies for an 'Open Scenario Framework', the purpose of which is to direct scenario building methods for the future development of the hospital as a set of high level objectives driven by service transformations. The Framework incorporates planning and design principles for change-ready infrastructure aligned to open building concepts for the organisation of projects. The outcome illustrates an Open Scenario Planning approach to enable decisions based on stakeholder values made against these principles.

## 5.6. Project: The development of a knowledge feedback loop between design and construction within healthcare infrastructure projects

**Researcher: James Henderson**

**Start and end date: October 2009 – September 2012**

### Overview

The built environment is directly related to the quality of service that is provided and therefore linked to positive health outcomes. However, the construction industry as a whole is viewed as providing suboptimal facilities due to the lack of learning from previous experiences. For many years the need has been constantly raised for the construction industry to better manage and share knowledge that resides within the supply chain, with their clients and internally within construction firms themselves. This is due mainly to the cited efficiency and effectiveness benefits that can be gained. However, interest surrounding organisational learning and knowledge management within construction has seen a disproportionate degree of focus concentrated on post occupancy evaluations.

The aim of this research is to investigate the application of a feedback loop framework between the phases of design and construction to facilitate closer integration and learning. The main objectives have been listed below:

- To identify the need/drivers for and barriers against the design-construction feedback loop
- To investigate current practices (if any) designed to improve the feedback of poor design quality
- To investigate what knowledge is currently being captured and assess its usefulness if fed back to the design stage
- To identify the relevant techniques and technologies that assist the delivery of a design-construction quality loop
- To identify the makeup of an enhanced or innovative design-construction quality loop framework

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### Methodology

A whole to parts process has been adopted in order to narrow the focus of this broad topic. Firstly, an extensive literature review concentrated on establishing a holistic view of related research. This subsequently shaped the formulation of further interest areas. In particular, the identification of the need to concentrate effort on cross-phase knowledge sharing and learning between the phases of design and construction was recognised. This led to the development of an electronic survey which aimed to: validate the need for further research in this area; further focus the key research areas; and highlight the challenges faced in developing the proposed feedback loop within healthcare infrastructure projects. In order to move towards the concentrated investigation of how a feedback loop can be devised within this context, more in-depth case study research is planned.

### Findings

- Most formal feedback and learning for designers is generated from post occupancy evaluations. However, very little is gained regarding how the facility's design can be improved to be built more effectively and efficiently.
- Many project and industry level barriers exist which hinder learning from past projects to take place.
- There is a greater appreciation now than in the past regarding the need for early integration of construction personnel in the design stage in order for the industry to provide better value end products.
- The issues of buildability problems are discovered as being reoccurring but avoidable. Therefore, a lack of value is currently being experienced.
- Current knowledge management procedures are insufficient in providing effective learning outcomes to be applied to future projects.

### Recommendations

- The current lack of integration and/or feedback between design and construction is severely restricting the extent to which learning and continuous improvement can be achieved from previous healthcare infrastructure projects to the next.
- At present, a lack of value is being experienced due to the repetition of inefficiencies such as rework, delays and cost overruns due to a lack of learning.
- In order to share knowledge between phases, current knowledge management procedures need to move away from text based explicit knowledge, towards attempting to capture tacit knowledge.
- Furthermore, for the knowledge capture to be of the highest quality, greater efforts are needed to capture knowledge live.