HaCIRIC
Health and Care Infrastructure Research and Innovation Centre

REPORT ON THE FIRST HACIRIC PHD RESEARCH SEMINAR HELD ON 7TH JULY, 2008

Developed as part of an Informing Study: Good Practice Identification and Knowledge Base Development

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REPORT ON THE FIRST HACIRIC PHD RESEARCH SEMINAR HELD ON 7TH JULY, 2008

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ABSTRACT

The aim of this document is to facilitate information sharing and collaboration within HaCIRIC by providing a record of the activities and progress of its doctoral research students. Loughborough University HaCIRIC currently has six PhD Researchers working on different areas of its Theme 3 Projects. A PhD Research Seminar was held on the 7th July, 2008 in the RT025 Fire Station Room at Loughborough University's Civil and Building Engineering Department. The concept behind this seminar system is to: familiarise our PhD Researchers with the methodology of their chosen subject; permit them to interact with examples of the practical problems that are encountered during research work; and provide them with beneficial dialogue and feedback. The Research Seminar was well attended by academics and researchers, and provided an opportunity for the six PhD Researchers to report on the progress of their research, which is in its initial stage. This report contains a compilation of the proceedings of this 1st HaCIRIC PhD Research Seminar.

1 INTRODUCTION

1.1 INTRODUCTION TO THE HEALTH AND CARE INFRASTRUCTURE RESEARCH AND INNOVATION CENTRE (HaCIRIC)

The Health and Care Infrastructure Research and Innovation Centre (HaCIRIC) is a multi-disciplinary collaboration between existing research centres at Imperial College London, Loughborough University, University of Reading, and University of Salford. HaCIRIC's resource is valued at over £10 million, which consists of about £7.2 million funding from the Engineering and Physical Sciences Research Council (EPSRC), and £2.9 million from the four research centres. HaCIRIC's focus is on the built and technical infrastructure for health and social care, as well as their interrelationship with policies, and trends. HaCIRIC's aim is to deliver research findings that are innovative and instrumental in improving the way healthcare infrastructure is planned, delivered, operated and managed.

Fig. 1 Loughborough University HaCIRIC is located in the Sir Frank Gibb Building

Loughborough University is leading research on HaCIRIC's Theme 3 – Innovation in Facility Design and Construction Processes, and its project areas include: Delivering and Demonstrating Stakeholder Value for Money – A New Approach to Briefing, Design, Decision Making and Community Engagement; The Innovative Design of Well-Performing Built Health Promoting Environments (BHEs); Integrated Approach to Healthcare Space Optimisation of Healthcare Infrastructure; Creating Sustainable Healthcare Facilities – Enhancing Resilience, Energy and Waste Management; Strategic Asset Management and Integrated Service Provision within the Healthcare Sector; and Improving the Therapeutic Design of Healthcare Environments through Modelling, Simulation and Visualisation (MSV).

Loughborough University HaCIRIC's staff expertise is diverse and in areas that include: Architectural Design; Architectural Engineering; Building Performance Optimisation; Building Services Engineering; Construction Management; Design Management; Environmental Design; Healthcare Engineering; Project Management; Structural Engineering; Sustainable Construction; and Risk Assessment. Its staff strength currently includes: an Academic Director; Eight Academics; Four Research Associates; A Research Assistant; and Six PhD Researchers who delivered presentations on the progress of their research, which is currently in its initial stage.

2 THE HaCIRIC PHD SEMINAR PRESENTATIONS AND PRESENTERS

2.1 A STUDY OF DAY LIT HOSPITAL BUILDING TO SUPPORT CLINICAL RECOVERY

Md. Ashikur Rahman JOARDER
HaCIRIC, Civil and Building Engineering Department,
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Fig. 2 Md. Ashikur Rahman JOARDER delivering his presentation

Md. Ashikur Rahman JOARDER is one of Loughborough University HaCIRIC's PhD Researchers, and is supervised by Professor Andrew PRICE and Dr Monjur MOURSHED. Ashikur delivered a presentation on *A Study of Day Lit Hospital Building to Support Clinical Recovery* (refer to appendix 1). He has a background in Architecture, and is an Assistant Professor with the Bangladesh University of Engineering and Technology (BUET) Architecture Department.

2.2 SUSTAINABLE DEVELOPMENT OF HEALTHCARE FACILITIES

Amey SHETH
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Fig. 3 Amey SHETH delivering his presentation

Amey SHETH is one of Loughborough University HaCIRIC's PhD Researchers, and is supervised by Dr Jacqueline GLASS and Professor Andrew PRICE. Amey delivered a presentation on *Sustainable Development of Healthcare Facilities* (refer to appendix 2). He has a background in Architecture, and is a qualified Architect, registered with the Council of Architecture (COA) in India. He has also worked for a Corporate Architectural Firm for three years.

2.3 RESOURCE OPTIMISATION DURING REFURBISHMENT/SPACE RELOCATION

Yisong ZHAO
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Fig. 4 Yisong ZHAO delivering his presentation

Yisong ZHAO is one of Loughborough University HaCIRIC's PhD Researchers, and is supervised by Dr Monjur MOURSHED and Professor Jonathan WRIGHT. Yisong delivered a presentation on *Resource Optimisation during Refurbishment/Space Relocation* (refer to appendix 3). He has a background in Computer Science and Technology, Energy Technology, and Sustainable Energy Engineering. He has worked on projects involving: Energy Consumption Reduction through the use of IES VE; Environmental Assessment of Buildings; CFD Simulation of Single Room Ventilation System through the use of STAR-CD; Energy Efficiency Improvement for a Hospital through the use of IDA Indoor Climate and Energy; Environmental and Economical Impacts of Renewable Energy; and Reducing Energy Costs of Industrial Energy System.

2.4 REDUCING CONSTRUCTION WASTE IN HEALTHCARE FACILITIES: A PROJECT LIFE CYCLE STRATEGY

D.D.A. Niluka DOMINGO
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Fig. 5 D.D.A. Niluka DOMINGO delivering her presentation

D.D.A. Niluka DOMINGO is one of Loughborough University HaCIRIC's PhD Researchers, and is supervised by Dr Mohamed OSMANI and Professor Andrew PRICE. Niluka delivered a presentation on *Reducing Construction Waste in Healthcare Facilities: A Project Life Cycle Strategy* (refer to appendix 4). She has a background in Quantity Surveying, and has worked as a Quantity Surveyor in an Engineering Corporation, and also as a Lecturer with interests in Measurement, Environmental Economics, Civil Engineering, and Construction.

2.5 STRATEGIC ASSET MANAGEMENT AND INTEGRATED SERVICE PROVISION WITHIN HEALTHCARE

Sameedha MAHADKAR
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Fig. 6 Sameedha MAHADKAR delivering her presentation

Sameedha MAHADKAR is one of Loughborough University HaCIRIC's PhD Researchers, and is supervised by Professor Andrew PRICE. Sameedha delivered a presentation on *Strategic Asset Management and Integrated Service Provision within Healthcare* (refer to appendix 5). She has a background in Civil Engineering, and Construction Management, and has worked as an Assistant Engineer at an Overseas Housing Project in India. She is currently a Research Assistant working on the HaCIRIC Theme 3 Project at Loughborough University.

2.6 IMPROVING WHOLE LIFE VALUE OF HEALTHCARE FACILITIES THROUGH BETTER BRIEFING AND OPTIONEERING

Ruth N. SENGONZI
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Fig. 7 Ruth N. SENGONZI delivering her presentation

Ruth N. SENGONZI is one of Loughborough University HaCIRIC's PhD Researchers, and is supervised by Dr Peter DEMIAN and Professor Stephen EMMITT. Ruth delivered a presentation on *Improving Whole Life Value of Healthcare Facilities through better Briefing and Optioneering* (refer to appendix 6). She has a background in Construction Management, and has worked as a Quantity Surveyor with Uganda's Ministry of Defence.

3 FEEDBACK ON THE HaCIRIC PHD SEMINAR PRESENTATIONS

Presenter		Presentation Topic	Feedback on Presentation (provided by HaCIRIC PhD Seminar Attendees)
1	Md. Ashikur Rahman JOARDER	***A Study of Day Lit Hospital Building to Support Clinical Recovery***	Good presentation; Interesting research; Think broad – consider different needs; Requires wider integration; What is Evidence Based Design?; Revise methodology to include other variables; Include Qualitative Analysis; Is the focus on new build or existing facilities?; Consider the issue of clinical recovery environment vs. lighting environment; Consider types of buildings; Consider deep vs. shallow; Consider best practice & benchmark; Consider current architectural design practice; Link aim to outcome; Too much text on some slides; Project plan was helpful.
2	Amey SHETH	***Sustainable Development of Healthcare Facilities***	Good presentation; Scope needs more clarity/focus; Identify a research question/hypothesis; Needs more specification; What area of sustainability?; Rather confused presentation; Research aim is not clear; Needs clear focus based on need & justification; Reorganise objectives, literature review, data collection, analysis, framework development, & validation; Consider people issues; Consider issue of cost; Thorough presentation on a critical subject; Too many abbreviations used which were not explained; Carbon emissions due to healthcare facilities will be difficult to calculate, but the other objectives are good; Refine the title.
3	Yisong ZHAO	***Resource Optimisation during Refurbishment/Space Relocation***	Good presentation; Consider variables & parameters; Indoor spaces vs. outdoor spaces?; What spatial levels are being investigated?; How does this relate to new build?; Consider innovation of space layouts; Place in context; Future tools?; Consider people issues; Define *optimisation* & *resources*; Need to collect data on *space layout planning*, current approaches, assessment inefficiencies, & optimisation potential; Focused on energy; *Resource* could be used more widely, title needs some revision; Very interesting area; Well delivered presentation; Consider testing/validation with nurses/other users; More clear linkage of the aspects of the work is needed; Interesting subject, which is linked to Adaptable Futures research by Katy Beadle.
4	D.D.A. Niluka DOMINGO	***Reducing Construction Waste in Healthcare Facilities: a Project Life Cycle Strategy***	Good presentation; Concerns over the complexity of *Lean*; Link with others regarding typologies; How is the waste generated?; Consider *Deconstruction*, & *Offsite*; Research requires focus because there seems to be a lot of issues, each of which would take a lot of resources; Well presented; Great deal of work to complete; Clear & well structured; Scope is extensive; Interesting project that is linked to life cycle & design process; Benefits & expected outcomes – broad & may not be fulfilled.
5	Sameedha MAHADKAR	***Strategic Asset Management and Integrated Service Provision within Healthcare***	Good presentation; What tools are being looked at apart from SHAPE?; Comparative studies between different hospitals is required; Master planning or SAM?; Talk to Barry; Needs clear definition, justification, & SAM mapping; Confident presentation; Research appears to be progressing well; Excellent presentation, well done; Clear & well delivered; Examine why others do not use SHAPE; Project plan presented was helpful; Methodology could have been explained a bit more; Some slides could have been clearer; It might have been useful to have research aim earlier; Very realistic & achievable objectives.
6	Ruth N. SENGONZI	***Improving Whole Life Value of Healthcare Facilities through better Briefing and Optioneering***	Good presentation; Very clear visual presentation; Methods were well laid out with lots of details; Interview questions need to be informed by literature & should be planned well in advance; Presentation seemed to change with timings; Architects are often the ones who put together the strategic brief; Well organised presentation; Consider a more sensible scope – perhaps on a particular type of project/problem/focus, rather than all types; Good breakdown of work packages & methods; Discuss with Sameedha – there might be some common areas; Perhaps too many overheads – it distracted from the main message; Perhaps objectives should be focused on healthcare (not generic); Consider defining & clarifying *briefing*; Consider stakeholders' mapping & the impact on decision making; Framework or module?; Generic, customised or specific to healthcare?; Who will use the project output?; Look into *Real Options Theory*; Look into issue of *Flexibility/Standardisation*; What is in Framework?; Briefing Process vs. Optioneering Process? (what is the difference between these two?); Understand the Procurement Process (speak to Ahmed Ibrahim); Project Life Cycle Management?

Fig. 8 Some of the 1st HaCIRIC PhD Seminar Attendees and Participants

Fig. 9 Some of the 1st HaCIRIC PhD Seminar Attendees and Participants

Fig. 10 Some of the 1st HaCIRIC PhD Seminar Attendees and Participants

Fig. 11 Some of the 1st HaCIRIC PhD Seminar Attendees and Participants

4 APPENDICES

Appendix 1: A STUDY OF DAY LIT HOSPITAL BUILDING TO SUPPORT CLINICAL RECOVERY

A Study of Daylit Hospital Building to Support Clinical Recovery

Ashik R Joarder
Assistant Professor, Department of Architecture
BUET, Bangladesh.

Started : 1 April, 2008

First we shape our buildings
Thereafter, they shape us.

Winston Churchill

Concept of Therapeutic Environment

as old as

Florence Nightingale's **(1863)** idea

to a contemporary one

AIA Guidelines **(2006)** for Design and Construction of Health Care Facilities

Architectural properties that affect medical outcomes include
(Loftness et al., 2006, Ulrich, 2004, 2003, 1992, Griffin, 1992; MacDonald et al., 1981; Wilson, 1972).

- Noise
- Air quality
- Presence of windows vs. absence
- **Natural lighting**
- Natural view , garden & art
- Ward layouts and nurses stations
- Single vs. multiple occupancy rooms
- Furniture arrangement
- Carpeting vs. lino.

The argument for day lit buildings has three strands *(Energy Research Group, 1994)*:

- It provides a healthier and more enjoyable indoor climate
- It conserves the earth's resources
- Because it saves energy, it saves money.

Poor visual environment

In a recent study of hospital lighting, it is shown that it is often poorly maintained, concentrating only on basic requirements for task illumination resulting in a poor visual environment (Dalkea et al., 2006, Loe et al., 2000).

Example of lack of thought in available daylighting results in a very unpleasant and unnerving experience for people in two UK hospitals.

Source: H. Dalke et al. / Optics & Laser Technology 38 (2006) 343–365

Justifications

- There is, as yet, no firm consensus among the lighting designers and researchers on the psychological aspects and degree of impact created by lighting *(Durak et al., 2007).*
- Little information on the visual environment, lighting and colour is available in a user friendly and accessible format for use for the construction of hospitals *(Dalkea et al., 2006).*
- As technology improves, the hospital environment itself should contribute to the patients' recovery. Lighting can play its part in this process and should be given serious consideration at the design stage by the client, architect and engineer *(Brennan, 2007).*
- Work is urgently needed to establish some basic design guidance on uses of colour and lighting that would provide a comfortable, ambient and optimal environment for all *(Dalkea et al., 2006).*
- There are a huge variety of different directions for research on both natural and artificial lighting *(Beales 2003).*
- More research needs to be conducted to improve hospitals' visual environment by daylighting to support clinical recovery, and it has the potential to come up with innovative design solutions.

Examples of successful combination of daylight and artificial light in some UK hospitals.

Source: H. Dalke et al. / Optics & Laser Technology 38 (2006) 343–365

Aims & Objectives

Aim:
The research is aimed to design innovative day lit hospital buildings to support clinical recovery.

Objectives:

- To test 'Biophilia Hypothesis'. (Whether daylight without natural views impacts on clinical recovery)
- To establish the quantitative impacts of daylight on clinical recovery
- To find out parameters that can help to improve the luminous environment of hospitals by daylighting.
- To integrate daylighting technology in hospital buildings for reduced energy use and CO^2 emissions

Methodology

- Literature review
- Field study
- Simulation Study
  - Data Simulation (Regression-SPSS)
  - Building energy simulation (Daylight -EnergyPlus)
- Visualisation

Field Study (1)

- Firstly, a number of hospitals will be audited to establish a picture of current UK practices.
- Then one hospital will be chosen as an 'Exemplar Case'.
- In the second stage a number of adult patients who are undergoing heart surgery will be taken as samples from the exemplar case.

Field Study (2)

The recovery rates of the patients will be identified by:

– how much time the patient spent in hospital and

– the strength of painkillers taken by the patient.

The lighting (both daylight and artificial light) levels of each unit related to the particular patient's staying time of the year will be calculated by:

- using an integrated whole building simulation program (such as EnergyPlus)

Field Study (3)

Required DATA

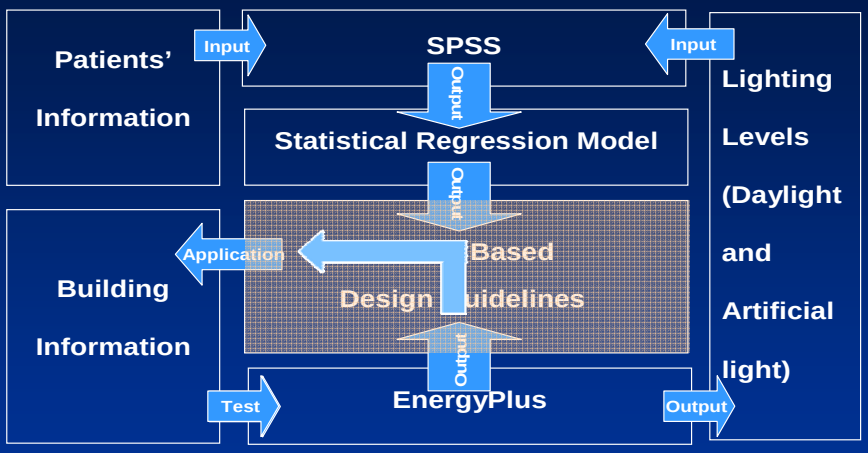
Patients' Information

Sample no.	Admission time	Release time	Stay time in Hour	Gender(M/F)	Age(Year)	Weight(KG)	Height(Meter)	Body Mass Index (BMI)	Patient Skin Colour (Ethnic Origin)	High or low Blood pressure	Smoking Habit	Surgery Record	Amount of painkillers taken by the patient	Power of painkillers taken by the patient	Total Strength of Painkillers (Amount x Power)

Building Information

Primary Data					Secondary Data				
Plan (Layout)	Elevation	Section	Details	Specifications	Average daylight level during day time(Lux)	Average artificial light level during day time(Lux)	Average ambient(Daylight + Artificial) light level during day time(Lux)	Provision of Glare and Discomfort (Y/N)	Provision of natural view from Bed (Y/N)

Data Flow Diagram



Output

Expected outcomes include, but not limited to:

- A regression model that will give best description of the relationship between daylight and clinical recovery rate.

For Example:

"Recovery Time" = a + b* Painkiller + c* Daylight + d* Artificial Light + ……
……+ l* Skin Colour + m* Glare + n* view + e

- Guidelines for the application of the regression model to Hospitals' Physical Environment.
- Evidence based design guidelines for day lit hospital building to save energy and support clinical recovery.

Change in appearance of the Built Environment

Example of an old endoscopy unit at St. Thomas hospital, the coloured, reflected and filtered daylight adds considerably to this unit's improved visual appearance.

Source: H. Dalke et al. / Optics & Laser Technology 38 (2006) 343–365

Generalisation

- As health and energy is a general concern for design and operation of any sustainable construction,
- it is expected that the evidence based design guidelines will also be applicable to other types of buildings like, Residences, Hotels, Offices, Educational Institutions etc.

Thank You

Related References

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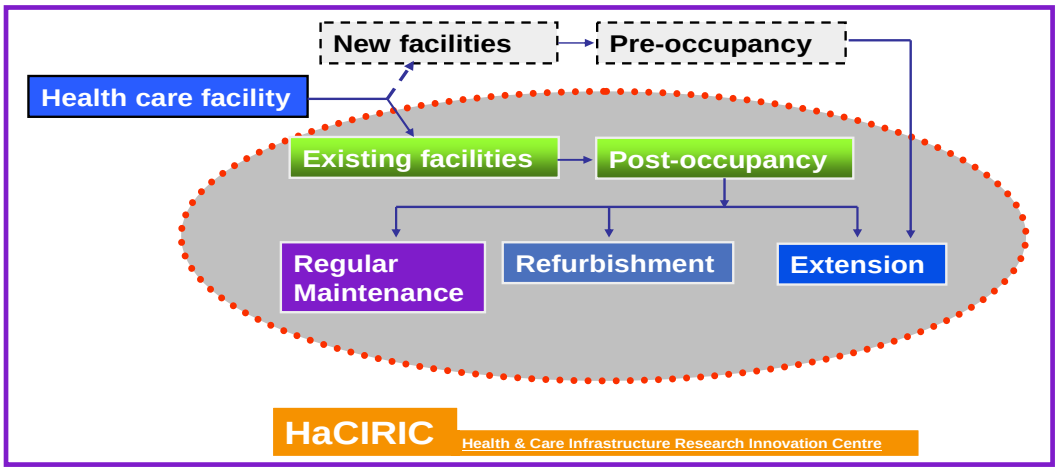
Appendix 2: SUSTAINABLE DEVELOPMENT OF HEALTHCARE FACILITIES

CONTENTS

AREAS FOR RESEARCH

➢This research will mainly focus on energy consumption and carbon emission aspects of sustainability.



ANALYSIS OF THE AREA

STRENGTHS

- Sustainability; Future of construction industry
- Large foot print (very simple changes by the NHS could have a massive impact)
- Saving natural resources
- Minimise whole life cost and environmental impact
- Intangible operational benefits

OPPORTUNITIES

- Large area to work on
- Reimbursement, payback for each and every action
- Environmental benefits and Huge carbon foot print
- To create paradigms
- HCFs are visited by huge part of population

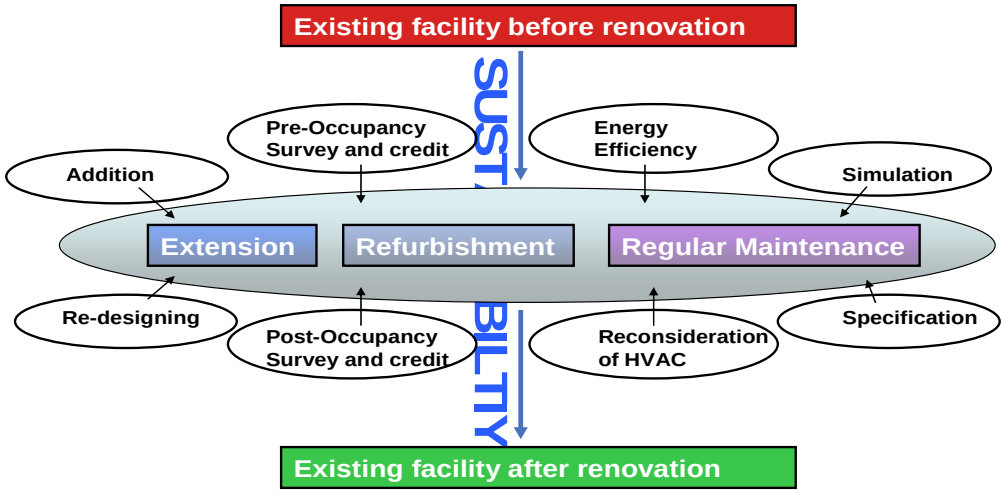
THREATS

- Traditional technology and methodology; trends
- Unawareness of benefits of sustainability among stakeholders
- NHS working style, (de-organise in terms of estate management)
- 24 by 7 working
- Difficult to get access to NHS, healthcare facilities for research purpose

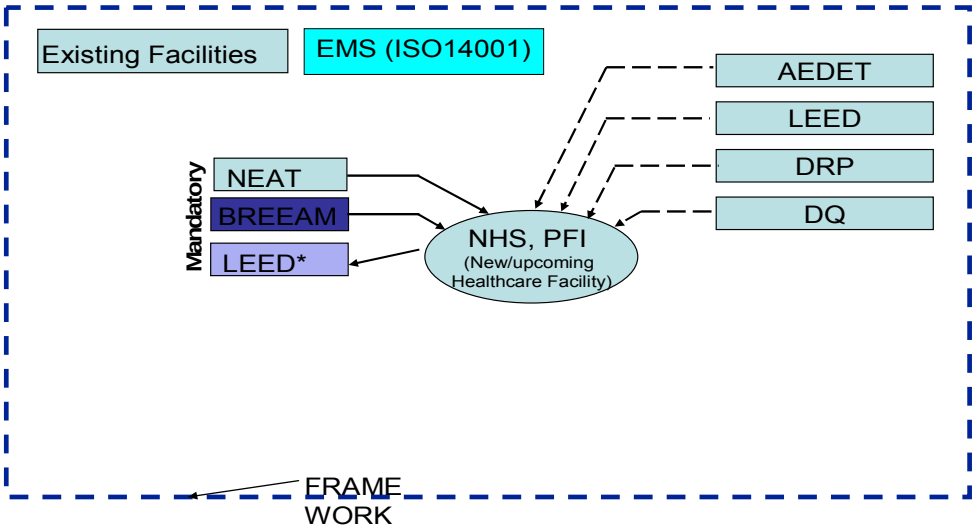
WEAKNESS

- Inadequate Knowledge/research
- Initial investment for research and development
- Budget constrain and time limit
- Unawareness sustainable development among architects, sustainable
- Government policies and guidelines and standards.
- No two project are similar

AREA OF RESEARCH-I



AREA OF RESEARCH-II

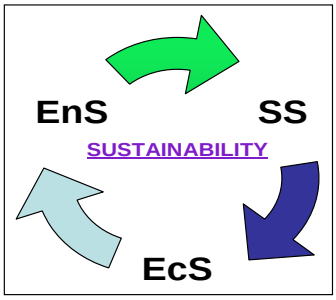


KEY DEFINITIONS/AREAS

➢**Hospital**: A **hospital** is an institution for healthcare providing treatment by specialised staff and equipment, and often but not always providing for longer-term patient stays (www.wikipedia.org)

➢Sustainability: There are many definitions of sustainability.

- "Sustainability is not rocket science, it's just smart thinking, and the "4thD" of the construction world"
- Environmental Sustainability (EnS);
- Social Sustainability (SS); and
- Economical Sustainability (EcS).



AIM

➢**Develop a framework for assessing and improving the sustainability of existing healthcare facilities.**

OBJECTIVES

- To explore and demonstrate the **importance of sustainability in HCFs**;
- To audit the energy consumption and carbon emission due to, and within healthcare facilities;
- To examine, and review the standards and tools available for the development of HCFs. For example, LEED, BREEAM & NEAT, etc.;
- To identify current trends;
- To develop and validate a strategy for sustainable development; and/or
- To develop and validate guidelines and/or line of action for sustainable development of existing healthcare facilities.

EXPECTED OUTCOMES

➢A framework for existing healthcare facilities to:

- **➢ save energy;**
- **➢ reduce carbon emission; and**
- **➢ achieve means of sustainability.**

To improve overall performance of healthcare facilities

METHODOLOGY MATRIX

	Methodology / Objectives	LR	Case Study	Questionnaire	Interviews		Simulation	Short term goal	Long term goal	
					Face to Face	Telephonic				
1	Importance of sustainable healthcare facilities.	√		√				√		
2	Energy consumption and carbon emission.	√	√	√				√		
3	Study standards available for the development of sustainable healthcare facility, viz. LEED, BREEAM & NEAT, etc.	√		√				√		1st year report
4	Trends in existing health care facility.	√	√	√	√	√		√	√	
5	Develop strategy plan for sustainable development.						√		√	
6	Develop guidelines/methodology for sustainable development.						√		√	
7	Final Proposal.								√	2nd year report
										Thesis

LR= Literature Review

PROGRESS SO FAR . . . .

- General overview, understanding of a healthcare (NHS and PFI) system;
- Understanding available simulation tools, standards and guidelines for sustainability and a healthcare facility (use and forget);
- Understanding the studies initiated by other experts and organisations in the area of sustainability and healthcare facilities;
- Understanding the ISO approach. Re-verification, Auditing, re-registration, validation.
- Paper for ARCOM based on literature review
- Questionnaire development

Questions

THANK YOU

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Loughborough University

Appendix 3: RESOURCE OPTIMISATION DURING REFURBISHMENT/SPACE RELOCATION

Loughborough University

Resource Optimisation during Refurbishment/Space-Relocation of Healthcare Facilities

Yisong Zhao

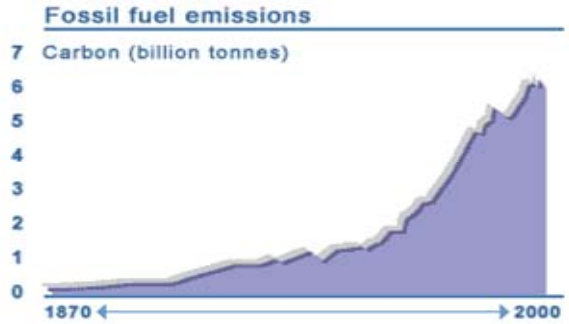
Supervisor: Dr Monjur Mourshed,
Prof Jonathan Wright
Dept. of Civil and Building Engineering
Loughborough University

Loughborough University

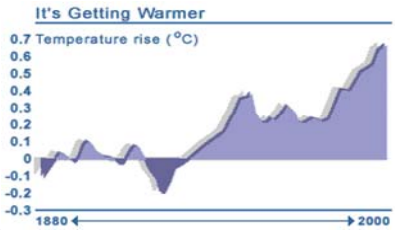
Contents:

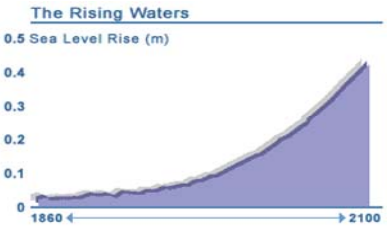
- Background
- Aims
- Objectives
- Research Methodology
- Benefits and Expected Outcomes
- Current work

Challenge of Climate Change



Most scientists agree that pollution levels are contributing to global warming.





(The Intergovernmental Panel on Climate Change (IPCC), a consortium of several thousand independent scientists)

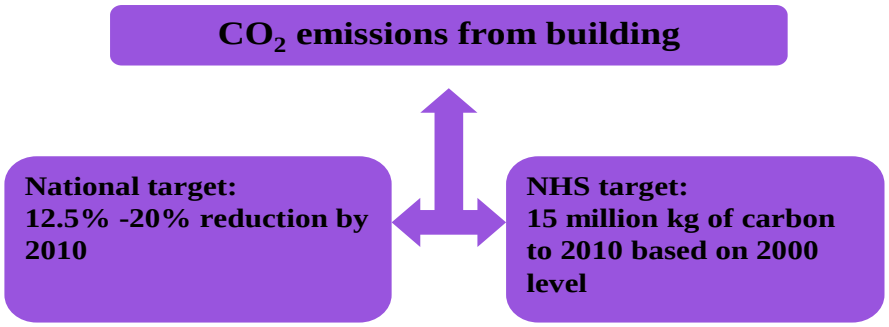
Improving energy efficiency in the building sector

Buildings-related emissions and their anticipated growth play a significant global role:

1. Energy use in the buildings sector was responsible for one-third of total global CO_2 emissions in 2004;
2. This share could grow to 35-42% by 2030;
3. Energy use in buildings will release to the atmosphere 11.8 to 15.6Gt CO_2 in 2030, up from 8Gt in 2004.

(IPCC 2007)

Tackling the CO_2 emissions (UK)



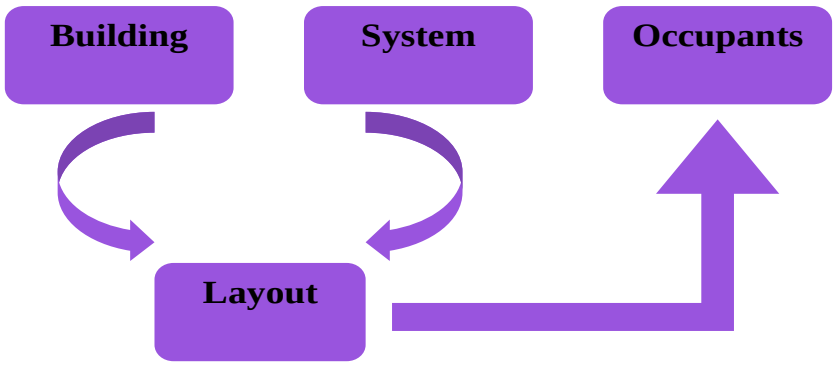
Refurbishment on the to do list

- Carmarthenshire NHS Trust refurbishment, Wales, UK;
- King's College Hospital, UK, construction and refurbishment , £76 million 4 years;
- Cossham Hospital and Kingswood Health Centre, UK, set for £19 million refurbishment; (2008)
- Royal London Hospital, UK, £4 million to kick start the first phase of refurbishment work. (2005)

Ways to refurbish: Space layout planning

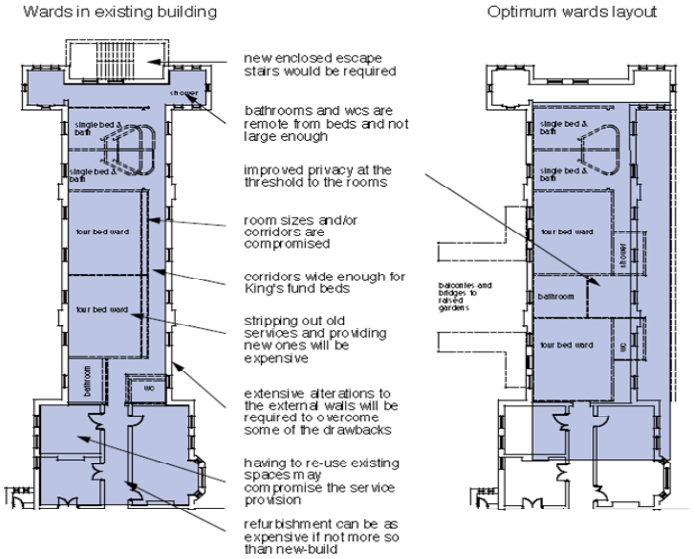
- What is space layout planning?
  Space layout planning is the process of allocating a set of space elements according to certain design criteria. It usually results in a topological and/or geometrical relationship between the elements.
- What is the task?
  Solving ill-defined problems;
  Addressing qualitative constraints.

Why SLP in refurbishment?



Comparison of layouts

Source: Dulwich community hospital refurbishment report



Benefit from the BES and LCA

- What is BES and LCA

  Building Energy Simulation and Life Cycle Assessment.
- Calculate the energy consumption.
- Evaluate the environmental impact.
- Software to be used---EnergyPlus.

Aims

- This project aims to develop methodologies to optimise the use of resources during Refurbishment/Space-Relocation (RSR) of healthcare facilities by integrating environmental performance assessment, automated layout planning, and mathematical optimisation techniques in the decision making process.

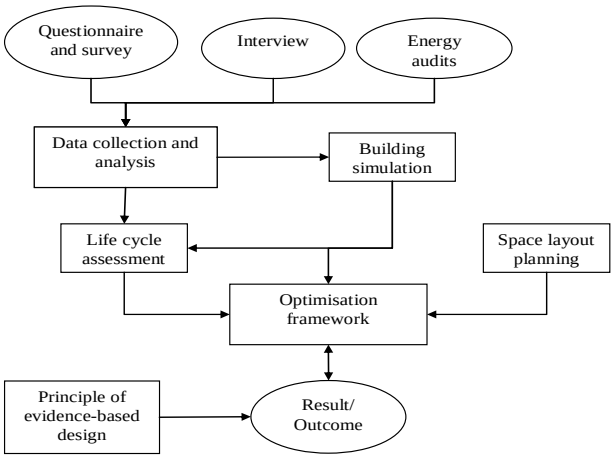
Objectives

- To gain an understanding of energy use patterns in healthcare facilities through energy audits and simulations;
- To investigate the factors that affect decision making during RSR of healthcare facilities;
- To develop a framework for the integration of environmental performance assessment in RSR decision making process through the use of automated space layout planning, and mathematical optimisation methods;
- To test the developed framework in solving realistic hospital RSR problems using the principles of evidence-based design.

Research Methodology

- Explore the state of the art by literature review of:
  - Energy use in healthcare facilities.
  - Integration of building simulation and the life cycle analysis in the design of buildings
  - Automated space layout planning.
  - Factors that influence the decision making in the RSR
- Investigation of energy use in the healthcare facility by means of energy audits, simulations, and case studies.
- Using mathematical optimisation techniques in minimising the energy consumption, generating facility layout, and developing the integrated methodology.

Research Flow Chart

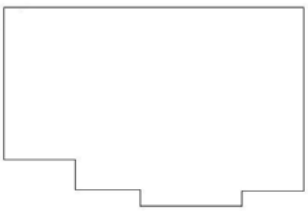


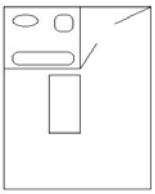
Benefits and Expected Outcomes

- The developed framework is envisaged to be used by decision-makers to optimise the use of resources (e.g. energy, cost, etc.) and minimise environmental impacts (e.g. CO_2 emissions) during RSR of healthcare facilities;
- The use of the proposed framework will contribute to the national and organisational sustainable development agenda;
- Creation of safe and therapeutic environments for patient care to promote the healings based on evidence-based design;
- Promotion of the healthcare facilities becoming patient/resident centred, staff focused, environment friendly, energy efficient, and quality oriented

Current Work

- Literature review on space layout planning, refurbishment, and hospital design.
- Solving a small typical space layout planning problem of a hospital.





- Thank you!☺

Appendix 4: REDUCING CONSTRUCTION WASTE IN HEALTHCARE FACILITIES: A PROJECT LIFE CYCLE STRATEGY

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REDUCING CONSTRUCTION WASTE IN HEALTHCARE FACILITIES: A PROJECT LIFECYCLE APPROACH

By

N. Domingo, M. Osmani & A. Price

Civil and Building Engineering Department
Loughborough University

Loughborough University

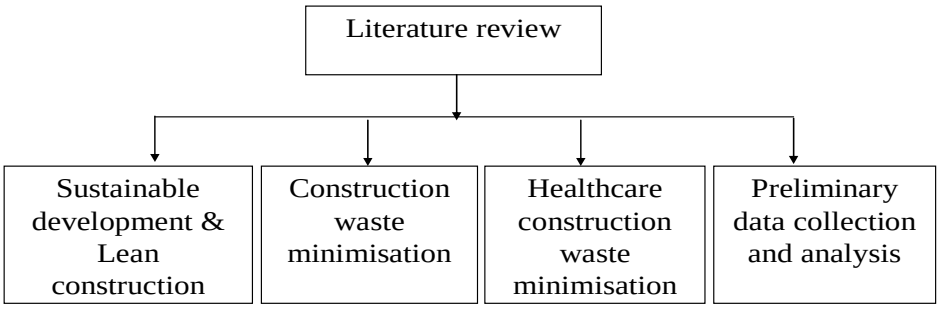
OVERVIEW

- Background
- Literature review
- Gap analysis
- The way forward
- Research proposal
- Research methodology

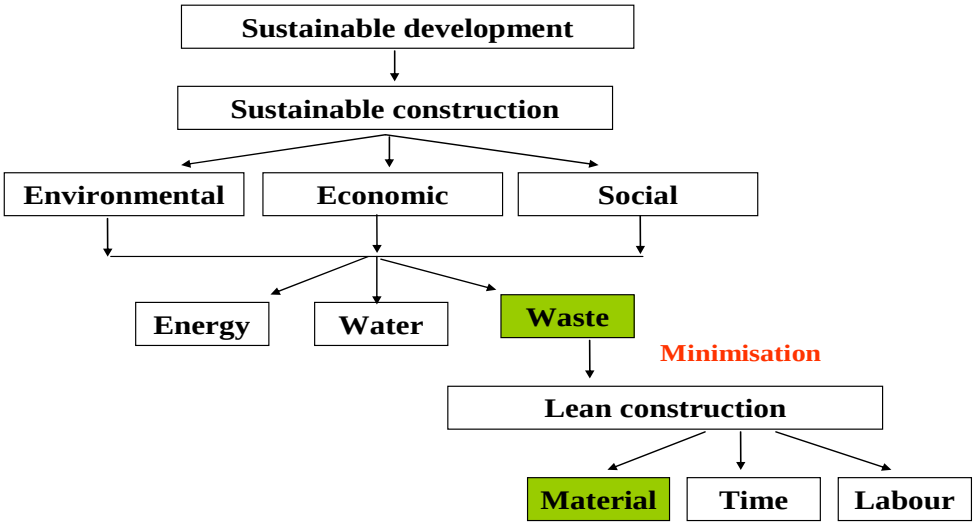
BACKGROUND

- UK C & D waste 120 million tonnes every year .
- C & D waste > 3 x household waste in UK
- NHS construction : 25% buildings replaced or upgraded;
  100 new hospitals by 2010;
  3000 GP premises built/replace/refurbished
- Increasing number of building projects increase environmental challenges.
- Construction waste reduction is one of the biggest challenges.

LITERATURE REVIEW



SUSTAINABLE DEVELOPMENT & LEAN CONSTRUCTION



CONSTRUCTION WASTE MINIMISATION

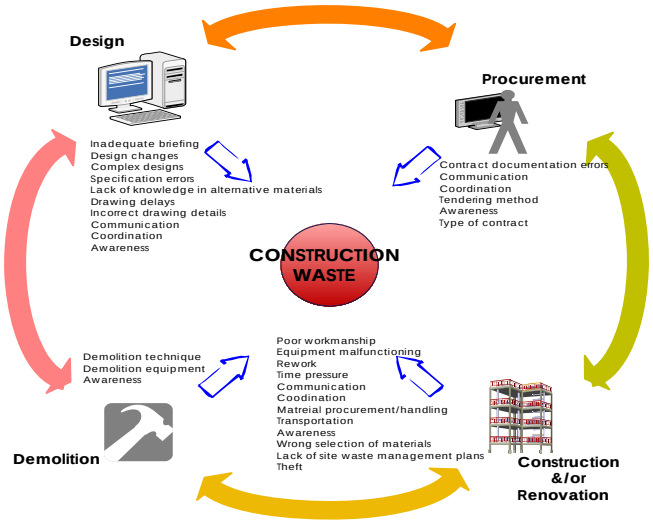
Construction waste minimisation drivers

- Environmental drivers (i.e. 420 million waste, land use)
- Business drivers (i.e. 10% GDP, 1.5 million people)
- Economic drivers (i.e. cost 4% company turnover, 10% material delivered to site get wasted)
- Legislative drivers (landfill tax increase £24 -£48 by 2010, SWMPs)

WASTE MINIMISATION APPROACHES

Phase	Waste minimisation approaches
Design	▪Waste reduction through designs ▪Introduction of Waste minimisation manuals, guides for designers
Procurement	
Construction / Renovation	▪On-site waste management ▪Waste quantification and source evaluation ▪Implementation of legislation ▪Development of on-site waste auditing and assessment tools ▪Improve supply chain integration ▪Reuse and recycle in construction ▪Waste minimisation benefits ▪Development of waste data collection models, waste mapping
Demolition	▪Reuse and recycle ▪Pre demolition audits

LIFE CYCLE CONSTRUCTION WASTE MAPPING



HEALTHCARE CONSTRUCTION WASTE MINIMISATION

Sustainability issues	NHS targets
1. Energy consumption – 45 million Giga Joules	Reduce 15% by 2010 (based on 2000 level), use 10% electricity from renewable sources by 2010
2. Water consumption – 40 billion litres	Management of consumption
3. CO_2 emission – 3.4 million tonnes	Green transport
4. Waste generation – 350,000 tonnes/ year = 1% all UK waste	Minimisation & recycling

HEALTHCARE CONSTRUCTION

Design

- Designs are very critical (i.e. poor designs cause health problems)
- Designs need to be flexible for future changes.

Procurement

- Procurement systems : PFI, Procure 21

Construction

- Large investment projects.
- Use off site constructions.

Renovation

- Subject to high rate of change.
- Need stay 100% operational throughout the lifetime of the project.

Demolition

- Very few studies

GAP ANALYSIS

- Very little research apply a lifecycle waste reduction approach.
- Healthcare facilities have unique characteristics.
- Causes/ origins of waste can be different.
- Not enough literature to map causes/ origins of construction waste for healthcare facilities.

THE WAY FORWARD

1. Map and classify healthcare building typology in UK.
2. Preliminary data collection and analysis
   - Questionnaire survey : Designers, Procurement managers, contractors, demolition contractors, Quantity surveyors, Project Managers & Clients
   - Main objective: customise the life cycle construction waste mapping to healthcare construction.

RESEARCH PROPOSAL

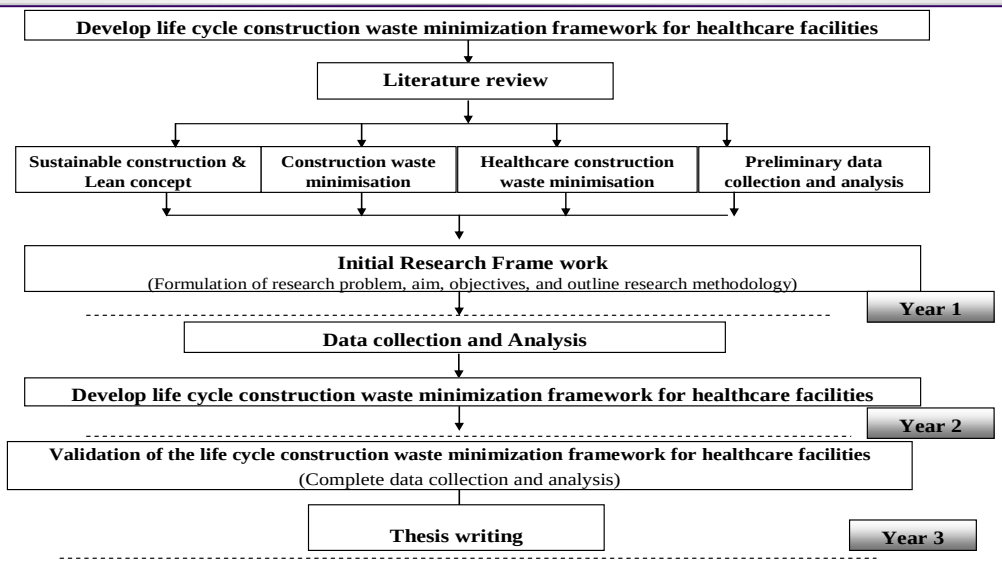
AIM

Develop a life cycle construction waste minimization framework for healthcare facilities.

OBJECTIVES

1. Explore the relationship between waste minimization and sustainable construction.
2. Assess the potential of lean concepts and techniques to construction waste minimization.
3. Examine construction waste minimization drivers, causes and origins, current practices, with particular reference to healthcare facilities.
4. Develop a lifecycle construction waste mapping.
5. Map and classify healthcare building typology in UK.
6. Customize the lifecycle construction waste mapping for healthcare facilities in UK.
7. Develop and validate a life cycle construction waste minimization framework for healthcare facilities.
8. Forward recommendations that embed waste reduction strategies throughout the lifecycle of healthcare facilities.

RESEARCH METHODOLOGY FLOW CHART



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THANK YOU

ANY QUESTIONS ??

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Appendix 5: STRATEGIC ASSET MANAGEMENT AND INTEGRATED SERVICE PROVISION WITHIN HEALTHCARE

Strategic Asset Management & Integrated Service Provision within the healthcare sector

By:
Sameedha Mahadkar

Background

The challenge for the NHS (National Health Service), in the context of Lord Darzi's review of the next stage of NHS reform, is to determine ways of learning from the experience of integrated systems and adapting this learning for the benefit of patients (Ham 2007).

The NHS Next Stage Review Interim Report 'Our NHS Our Future' suggests the development of a more strategic, long-term and community focused approach to commissioning services, where commissioners and health and care professionals work together to deliver improved local health outcomes.

ourNHS our future

Background

Strategic Asset Management:

An integrated evidence and resource based process to strategic planning that underpins all activities related to managing building assets for optimal outcomes. Asset Management is a process for making timely decisions about institutional assets to meet institutional needs within nested health economies, meet patient and public need.

Source: www.deighton.com/deighton%20solutions.jpg

Background

Service Integration:

'Integration of services includes inputs, delivery, management and organisation of services related to diagnosis, treatment, care, rehabilitation and health promotion. It is also a means to develop and improve the services in relation to access, quality, user satisfaction and efficiency.'

- World Health Organisation (2001)

Background

World Class Commissioning

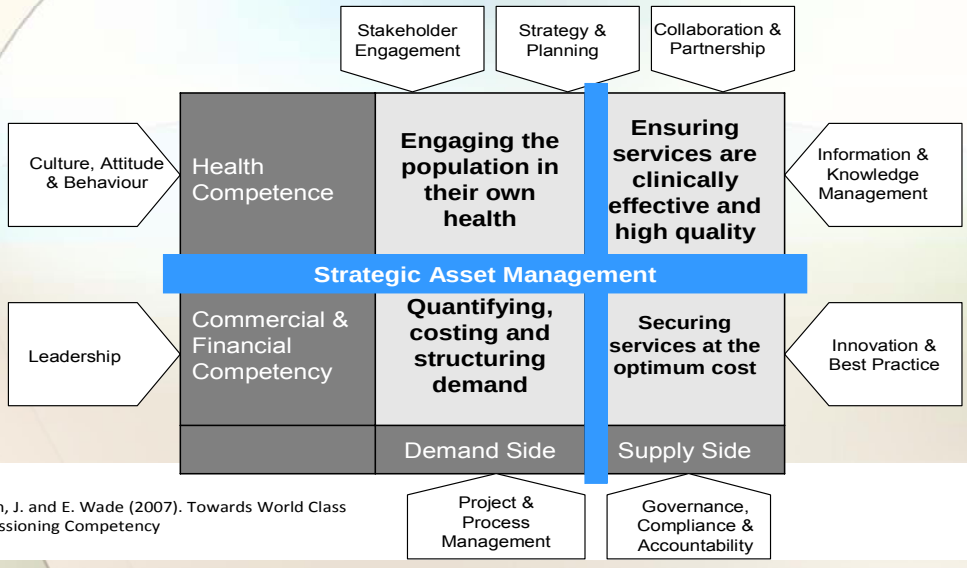
'World class commissioning will deliver a more strategic and long-term approach to commissioning services, with a clear focus on delivering improved health outcomes.'

(Department of Health, 2008)

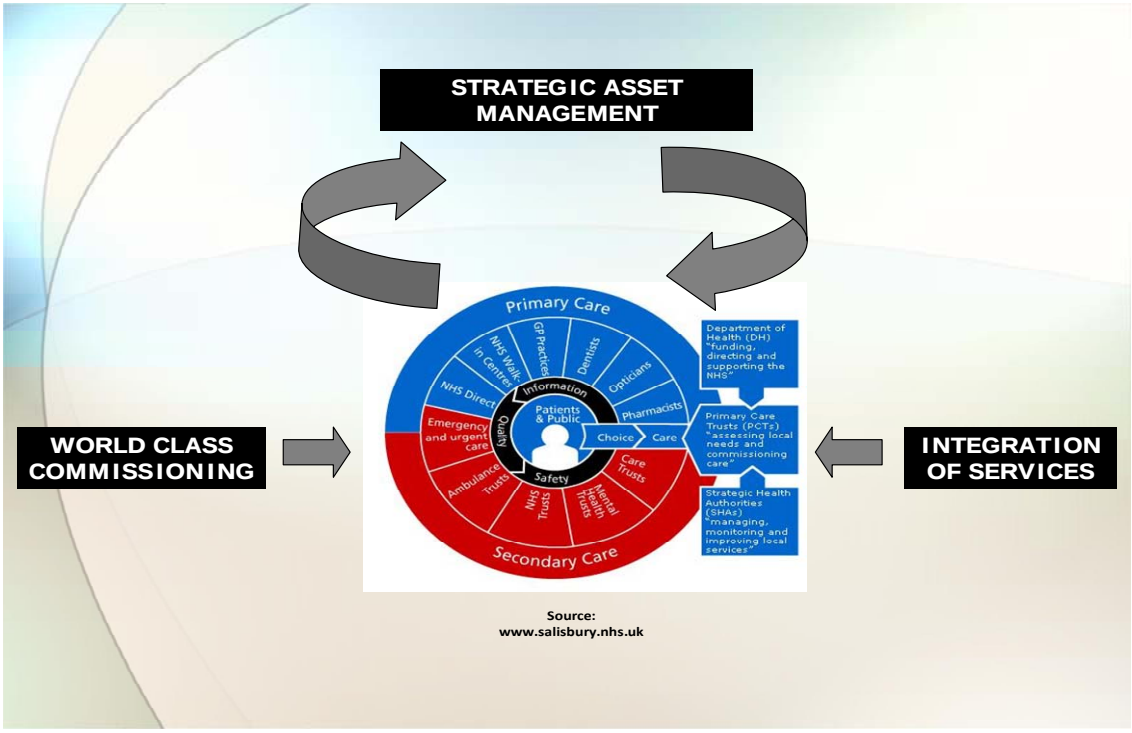
- Shift from traditional models of care
- Develop innovative partnerships
- Deliver better health and well-being
- Reduce health inequalities dramatically
- Deliver better value through informed decisions

worldclasscommissioning

How is Strategic Asset Management Changing?



Woodin, J. and E. Wade (2007). Towards World Class Commissioning Competency



Source:
www.salisbury.nhs.uk

Aim

To improve the Strategic Asset Management of healthcare infrastructure and explore the various implications on local Primary Care Trusts (PCTs) dealing with Integrated Service Provision and World Class Commissioning

How can Strategic Asset Management be improved?

What types of consultations are required for Strategic Asset Management?

How can current theory be enhanced and how can value be modelled within the context of Strategic Asset Management and Integrated Service Provision?

What are the available tools for Integrated Service Provision?

Are there any potential gaps for effective Strategic Asset Management within the context of World Class Commissioning?

What innovative approaches are being used to implement Integrated Service Provision and what lessons can be learnt?

Objectives

- To establish a conceptual framework linking Strategic Management, Change Management, and Implementation of Innovation.
- To evaluate existing data, tools and knowledge for effective Strategic Asset Management within the context of World Class Commissioning.
- To investigate good and innovative practices and lessons learnt from the implementation of World Class Commissioning and its impact on Strategic Asset Management within the Primary Care Trusts (PCTs).
- To evaluate the implementation of Integrated Service Provision focussing primarily on strategy development, identifying 'care models' and investigating care services and their provision in Leicestershire and Rutland.
- To develop a framework for improving the Strategic Asset Management of regional healthcare infrastructure based on a range of modelling, simulation and visualisation tools that help explore different approaches and strategies.

Methodology

Desk Studies- Initial Literature Review

Action Based Research

Case Study of Leicestershire County and Rutland PCT and interviews- to review the process of strategic asset management

Delphi Review- implementation of Integrated Service Provision, identifying 'care models' and investigating care services

Progress

Care Service Model - Delphi Review + Action Based Research

Lack of Time to Identify Potential Service Changes

Full service integration / redesign or part service integration

Long List Options

Outpatient follow up

Diagnostics

Care closer to home

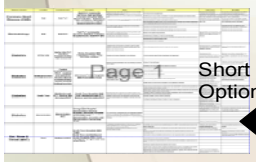
Prevention

Emergency attendance

Intermediate Care

Self care

Demonstration sites: Dermatology, ENT, General Surgery, Gynaecology, Orthopaedics, Urology



Integration of health & social care

Short List Options

Models of palliative care

Care closer to homes

Intermediate Care

Models of Care away from inpatient beds

Palliative Care

Independent support providers

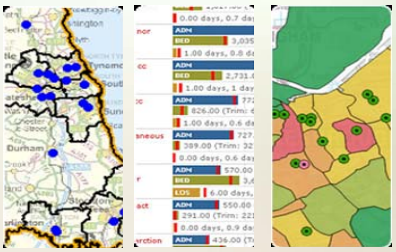
International models

Rehabilitation

Current Work

Building relationship with Leicestershire and Rutland PCT to investigate the intuitive multi-agency and multi-stream approach taken by Leicestershire and Rutland PCT and compare this to the structured ICT tool approach taken by SHAPE.

- Strategic Health Asset Planning and Evaluation application (SHAPE) has been developed by the Department of Health for SHAs and PCTs.
- a web enabled, evidence based tool designed to support and inform strategic planning.
- strategic planning process involves the potential re-design and improved delivery of health and social care services and supporting estate.
- aimed at SHAs and PCTs delivering service reconfiguration within a whole health economy.



SHAPE Tool

Thank-You
Any Questions?

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Diagrams:
www.deighton.com/deighton%20solutions.jpg
www.salisbury.nhs.uk

Appendix 6: IMPROVING WHOLE LIFE VALUE OF HEALTHCARE FACILITIES THROUGH BETTER BRIEFING AND OPTIONEERING

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INTERNAL HACIRIC SEMINAR
DATE: 07/07/08

IMPROVING WHOLE LIFE VALUE THROUGH BETTER BRIEFING AND OPTIONEERING

Ruth Sengonzi

Supervised by:
Dr. P. Demian
Prof. S. Emmitt

Outline

- Aim
- Objectives
- Methods
- Progress
- Identified gaps
- Focus
- Expected outcomes

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Project Aim

- To develop better ways through which whole life value of healthcare infrastructure may be enhanced and delivered by focusing on improving briefing and option selection processes.

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Project Objectives (1 of 3)

Through literature surveys :

- Explore construction briefing and optioneering theory;
- Investigate the meaning of Whole Life Value and its linkages to briefing and option selection for construction projects;

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Project Objectives (2 of 3)

- Examine briefing and optioneering practice in the healthcare sector; and,
- Case studies on healthcare (PCTs) facilities;
- Identify gaps in briefing and optioneering knowledge and practice based on abovementioned investigations;

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Project Objectives (3 of 3)

- Carry out an analysis (PEST) of the healthcare sector using published data;
- Evaluate briefing as well as optioneering practices in other service or production sectors;
- Develop models and approaches for practical application in both briefing and optioneering as part of standard whole life value-driven procedure in the healthcare facilities delivery.

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Expected Outcomes

- A framework/model of application for,
  - better briefing and optioneering, comprising a toolkit of methods, based on Whole Life Value.

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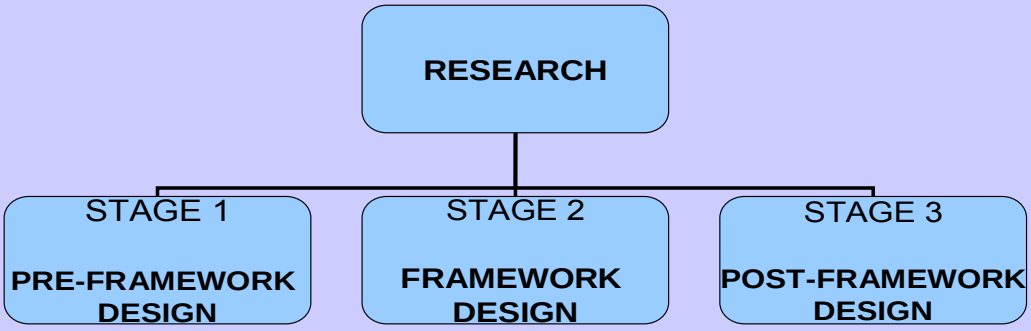
Methods



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8

Stage 1 (1 of 2)

Aims to:

- Investigate briefing and optioneering practice in the healthcare sector;

Through:

- Literature surveys on briefing and optioneering;
- Case studies:
  - Using secondary data from briefing- and optioneering-document scrutiny;
  - Empirical data collected from PCTs through:
    - Interviews, questionnaires and focus groups;
    - Non-participant observation.

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Stage 1 (2 of 2)

- Understand the healthcare sector through a context analysis (PEST) based on published data.

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Stage 2

- Framework design based on results from:
  - Literature surveys;
  - Case studies ;
  - Analysed data; and,
  - PEST analysis.

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Stage 3

- Testing and validating framework:
- Collaborating with future users of the framework (e.g. healthcare Trusts) through Action Research to check for its:
  - Validity (fitness for intended purpose);
  - Transparency;
  - Precision/clarity;
  - Usability.
- Refining framework and dissertation write-up.

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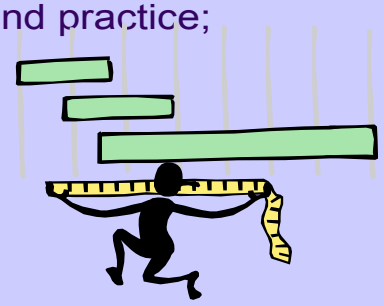
12

Progress so far…

- Overview of:
  - Construction briefing theory and practice;
  - Strategic briefing;
  - Whole life value,
- Some work on:
  - Optioneering;
  - Healthcare facilities briefing.



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13

Some gaps identified

- Not much research done on strategic briefing as compared to project briefing;
- No explicit emphasis on capturing needs directly from healthcare facility end-users, especially patients, during early briefing stages;
- Little evidence on explicit use of feedback (PPE/POE) and lessons learnt from past/on-going projects during early stages of healthcare project formulation;
- Not much published on early project option selection processes; and,
- Not much is reported about linking needs & requirements to value; optioneering; and, project - whole life facility strategy;

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14

Briefing

- The construction briefing process is usually divided into two stages:
  - Strategic briefing leading to a 'Strategic brief';
  - Project briefing leading to a 'Project Brief' (or 'Detailed brief').

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Strategic briefing (1 of 2)

Strategic briefing

"Describes clearly and objectively the 'mission of the business project' and its strategic fit with the corporate aims of the client organisations;

The strategic briefing study also explores a range of options for delivering the 'business project', either through physical or non-physical asset alternatives".

(Kelly *et al*, 2004)

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16

Strategic briefing

- "Strategic briefing springs from the current operational needs, but also takes a longer perspective and focuses on the operation's strategic development plans, its prospects, and the building's potential for adaptation for other uses" (Ryd and Fristedt, 2007).

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17

Focus

Strategic briefing:

- How stakeholder (end-user) needs and requirements could be captured, elicited and managed better at the earliest stage during project initiation;
- Methodology for project options selection at project feasibility and appraisal stage;

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18

Rationale for focus (1 of 2)

- From a construction industry perspective, not much research on strategic briefing as compared to project briefing;
- Strategic briefing could best address healthcare-dynamics challenges thereby leading to valuable built assets that will respond to future care requirements and technological advances;

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19

Rationale for focus (2 of 2)

- Encourages early engagement/involvement of stakeholders as well as early investigation of the real needs;
- Best aligns with optioneering;
- Focus on 'end-user' stakeholders because a good proportion of healthcare facility stakeholders is likely to fall within this group.

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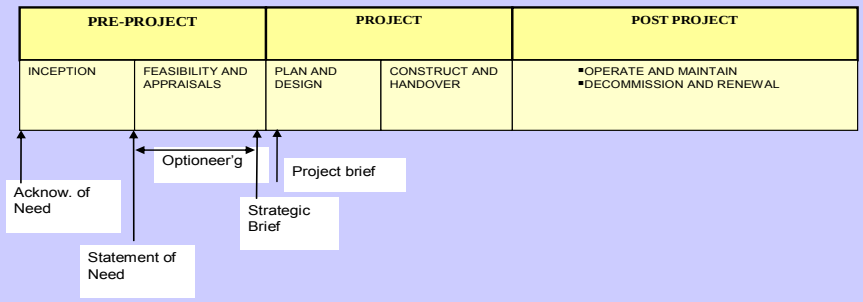
20

Project Life Cycle



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21

Expected Outcomes

- A standard framework/model of application for better briefing and optioneering comprising a toolkit of methods based on Whole Life Value.

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22

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Thank You

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Appendix 7: PROGRAMME FOR 1st HaCIRIC PHD RESEARCH SEMINAR

1st HaCIRIC PHD RESEARCH SEMINAR (07.07.2008: 10:20 am – 1:25 pm), RT025, Civil & Building Engineering, Loughborough University

10:25 am: An Introduction to The Health and Care Infrastructure Research and Innovation Centre (H a C I R I C) by Emeka Efe Osaji

	PhD Student	PhD Supervisors	Stage of Research	Presentation Topic/Area by PhD Researcher	Date of Presentation	Timing: (10 minutes for presentation; 10 minutes for questions)	Venue of Presentation	Feedback on Presentation	Contact Detail (E-mail) of Feedback Author
1	Md. Ashikur Rahman JOARDER	Andrew PRICE Monjur MOURSHED	Initial	A Study of Day Lit Hospital Building to Support Clinical Recovery	07.07.08	10:30 am – 10:50 am	↑		
2	Amey SHETH	Jacqueline GLASS Andrew PRICE	Initial	Sustainable Development of Healthcare Facilities	07.07.08	10:55 am – 11:15 am	RT025 Fire Station		
3	Yisong ZHAO	Monjur MOURSHED Jonathan WRIGHT	Initial	Resource Optimisation during Refurbishment / Space Relocation	07.07.08	11:20 am – 11:40 am	↓		
				L u n c h B r e a k					
4	D.D.A. Niluka DOMINGO	Mohamed OSMANI Andrew PRICE	Initial	Reducing Construction Waste in Healthcare Facilities: a project life cycle strategy	07.07.08	12:15 am – 12:35 pm	↑		
5	Sameedha MAHADKAR	Andrew PRICE	Initial	Strategic Asset Management and Integrated Service Provision within Healthcare	07.07.08	12:40 pm – 1:00 pm	RT025 Fire Station		
6	Ruth N. SENGONZI	Peter DEMIAN Stephen EMMITT	Initial	Improving Whole Life Value of Healthcare Facilities through better Briefing and Optioneering	07.07.08	1:05 pm – 1:25 pm	↓		
				C l o s e					

Appendix 8: ATTENDEES AT 1st HaCIRIC PHD RESEARCH SEMINAR

HaCIRIC

1st HaCIRIC PhD Research Seminar: 07.07.08 (10:20am – 1:25pm)
RT025, Civil & Building Engineering, Loughborough University

Attendees:

1. Katy Beadle (KB)
2. Andrew Dainty (AD)
3. Niluka Domingo (ND)
4. Stephen Emmitt (SE)
5. Inoka Shyamal Withana Gamage (ISWG)
6. Alistair Gibb (AG)
7. Jacqueline Glass (JG)
8. Ashikur Joarder (AJ)
9. Fahmida Khandokar (FK)
10. Ozan Koseoglu (OK)
11. Sameedha Mahadkar (SM)
12. Inoka Manthilake (IM)
13. Grant Mills (GM)
14. Masoumeh Nazarian (MN)
15. Seyi Odeyale (SO)
16. Emeka Efe Osaji (EO)
17. Mohamed Osmani (MO)
18. Andrew Price (AP)
19. Ruth Sengonzi (RS)
20. Amey Sheth (AS)
21. Yisong Zhao (YZ)

Apologies:

1. Nebil Achour (NA)
2. Simon Austin (SA)
3. Peter Demian (PD)
4. Jun Lu (JL)
5. Monjur Mourshed (MM)
6. Jonathan Wright (JW)