

ON THE SELECTION CRITERIA OF HOSPITAL FINISHES

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ABSTRACT

Recently, there has been a fundamental desire to adopt a whole-life attitude regarding the design and management of buildings because of the dramatic shift in the balance between the initial capital cost and the running costs of buildings towards a substantial increase in the running costs. Perhaps one of the challenging obstacles facing this desire is the fact that the design or component selection decisions can often be taken based on factors other than cost criteria. This is especially true in the complex environment of healthcare buildings, in which, for example, the desire to reduce variation for economic reasons has to be balanced against a wide variety of specialist uses and a large number of user groups with widely differing needs.

This paper is the first in a series reporting on on-going research within an NHS-Estates funded project. This project aims to develop an Integrated System for the Optimal Selection of Hospital Finishes. Essential requirements for optimal hospital design are discussed in detail with emphasis on their implication on the selection of finishes. This includes a wide range of design requirements that have a fundamental influence on the value and quality of life in hospital environments. Other issues covered include planning, user, space, finish and other crucial requirements. The paper concludes by introducing directions for further future research within the project.

KEYWORDS

database systems, finishes, hospital design, MCDM, whole-life costing.

INTRODUCTION

Historically, the selection of finishes was predominantly based on their initial capital costs. According to Dean (1996), building finishes are often regarded as a separate and final application to the fabric, sometimes even the last part of the building to be specified, and consequently may be subject to a compromise in their quality by late cost-control exercises. Recently, there has been a fundamental desire to adopt a whole-life attitude regarding the

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design and management of buildings because of the dramatic shift in the balance between the initial capital cost and the running costs of buildings towards a substantial increase in the running costs. This desire has faced a number of substantial obstacles that can be classified into two main categories. The first category relates to whole-life data with the difficulty in obtaining appropriate, relevant and reliable historical information and data; adjusting this data to the specific project at hand; and the analysis of various uncertainties in data. In addition, there exists a lack of a standard computerised system for systematic data collection, recoding and analysis. Furthermore, the time needed for data collection and the analysis process may leave inadequate time for the essential dialogue with the decision-maker and the re-run of alternative options. This is one of the reasons why computerised models are valuable.

The second category relates to the way decisions are made where the design or component selection decisions can often be taken based on factors other than cost criteria, e.g. strength of materials, fire-protection, hygiene, health and environmental protection, safeguarding of use, sound isolation, energy saving and thermal isolation, durability and utilisation (Bogenstatter, 2000). Although several techniques have been proposed to extend the whole-life costing framework to account for multiple non-financial attributes, there has been little progress towards achieving an integrated system that decomposes the process of selecting building elements including finishes into a flexible and logical series of activities that can be followed by decision makers (Kishk et al. 2004).

These arguments are especially true in the complex environment of healthcare buildings, in which, for example, the desire to reduce variation for economic reasons has to be balanced against a wide variety of specialist uses and a large number of user groups with widely differing needs. NHS literature, for example NHS (2004) and NHS (2003), highlight the need for finishes to be above all durable, detailing that cost is secondary to this requirement, and advocate the need for a risk assessment team to have a major influence in the selection of hospital finishes. As such, a life cycle analysis of hospital finishes requires an alternative value method of analysis. This paper details the major non-financial selection criteria for hospital finishes and then details the techniques that this ongoing research project will use for decision making.

HOSPITAL DESIGN

With the new hospital targets for 2010 comes an opportunity for a new design initiative (CABE, 2005; Isack & Gibb, 2001). The overall aim of the modern healthcare environment is to make the design of hospitals both welcoming and patient-driven without reducing clinical efficiency, however (NHS, 2004). In addition, the shape, size, etcetera, of the space in a hospital is dependant upon expected patient numbers but there are a wide variety of influential non-financial factors in the healthcare environment.

Not only is the practical application of space and design changing, the need to encompass less practical, perhaps, but no less important 'grey', non-cost issues, is recognised as important to the recovery of patients and user morale generally. Health Building Notes (HBN's) are sources of practical information on the design of spaces in hospitals and summarise the current attitude towards the non-cost issues, in relevance to hospital finishes as well as many other design/space issues. The highlight, for example, that infection control

teams have major influence in design decisions and a risk analysis is conducted on many issues of design, for example in the case of flooring in accident and emergency spaces (NHS, 2003). This research has initially focused on identifying the key non-cost values and has split these issues into four focused areas, under planning, user, space and finish requirements.

PLANNING REQUIREMENTS

A hospital, as discussed by Vittori (2002), is complex and caters for many different patients with different injuries and disabilities, and it is important that a hospital can fully accommodate these patients. Finance also has an important influence in the planning of hospitals (Pollock, 1999). Therefore the initial planning requirement of any project for the healthcare industry is to establish the financial implication, both short-term and long-term.

All the financial planning has a trickle down effect upon the hospital specification, the number of staff employed and the projected maintenance schedule (Croome, 2003). It is important therefore to be aware of the wider financial implications when specifying finishes during the planning / design stage.

Beyond these initial considerations there is relatively little planning guidance for new hospitals, over and above the technical and legislative standards regarding health and safety, fire prevention/means of escape, disability, energy, etcetera, which the design teams are expected to meet (Goodwin, 1997). Health Building Notes (HBN's) give general guidance on planning issues relevant to each space and takes account of all relevant statutory requirements. Other sources of information regarding the planning of hospitals can be obtained from the Department of Health and CABE (2005).

As regards the planning requirements of finishes, general guidance is provided by the HBN's with support from technical memorandum, for example HTM 61 (NHS, 1995), were relevant.

USER REQUIREMENTS

CABE (2004 & 2005) has undertaken extensive research in the area of hospital design meeting user requirements. What CABE's research highlights is the need for a change in hospital design and this is encouraged by the belief, with evidence from research, that good design can benefit and quicken the healing process (Kings Fund 2004, Dalke, Hilary, et al, 2004, Lawson and Phiri, 2003, Lawson and Wells-Thorpe, 2002). Lawson (2000) also highlights this area as requiring further research in regards the effect of the design on the lives of staff and patients. In addition CABE (2004) looks at the effect of hospital design on the recruitment and retention of staff.

The NHS (2000a) highlights cleanliness in bathrooms and toilets as having a major effect on improving user satisfaction and in their recovery of patients. The research by Leather, *et al*, (2000) backs-up this view and states that their findings, "support the view that psychological supportive design [does] indeed facilitate patient health and recovery".

Basic issues of space, place, light, control, noise, smell, taste and distraction are all experiences within a hospital, which will influence the convalescence and 'happiness' of a patient (Lawson and Phiri, 2003 and Weller and Finn, 2004). The psychological and aesthetic aspect of the specification of finishes is perhaps the hardest to distinguish.

As a result of the research by CABA, and by earlier research, most HBN's now incorporate design guidance that would benefit patient and staff psychologically. NHS (2003), for example, states that, "designers should create an environment in emergency care that will help patients feel at ease, be conducive to efficient working, and contribute to staff morale". Careful, integrated and co-ordinated specification of finishes are required to ensure that the healthcare environment meets this objective.

SPACE REQUIREMENTS

The NHS provide quite specific advice on the spaces required for any individual department in a hospital, through HBN's, where the size and accommodation schedules of each department is provided. Space is recognised as a significant cost feature in the NHS (NHS, 2001). Hall (2000) provides examples of appropriate design of spaces to save costs and HBN guides provide similar design initiative to reduce space wastage and thus cost. In one example, NHS (2003) suggests that there is a link between the efficient use of space, particularly in A & E, and the reduction of waiting times. This has an effect on the selection of the finishes in a hospital, especially if rooms are smaller and more cellular.

Lawson (2000) notes that the NHS needs to design spaces in hospitals for the longer term as they need to be, "flexible and adaptable", with emphasis on the design of new forms of building. Lawson focus's on the layout of hospital wards as important for the future of the NHS.

The accommodation in hospitals has different brief requirements from each other and space requirements, the design and maintenance of each of these areas are given by the relevant NHS guides (HBN's). This will determine the selection of materials, finishes, systems, etc in these areas.

FINISH REQUIREMENTS

Guidance notes and reports do provide the NHS with basic specification criteria for the selection of finishes. In NHS (2000b), for example, five specific criterion are detailed, which are; Safety; Access; Fire Evacuation; Patient Care, and; Environmental Design. In addition HTM 61 (NHS, 1995), for example, also suggests a range of floor coverings for an extensive list of locations and spaces in hospitals. These sources only scratch the surface of the many non-cost criteria in the selection of finishes. Figure 1 attempts to categorise these non-cost criteria. Figure 1 assumes that after planning, legislative and building standards have been met for a specific space (represented by the dotted line 'room space') then these non-cost issues become the critical issues in the selection of hospital finishes. Each of these non-cost issues will have different values or weightings depending upon the space, but is also important to consider the wider, holistic issues also (NHS, 2003).

THE SELECTION TECHNIQUE

Several techniques have been proposed to extend the whole-life costing framework to account for multiple non-financial attributes. These techniques are derived from cost-benefit analysis, value and decision theories.

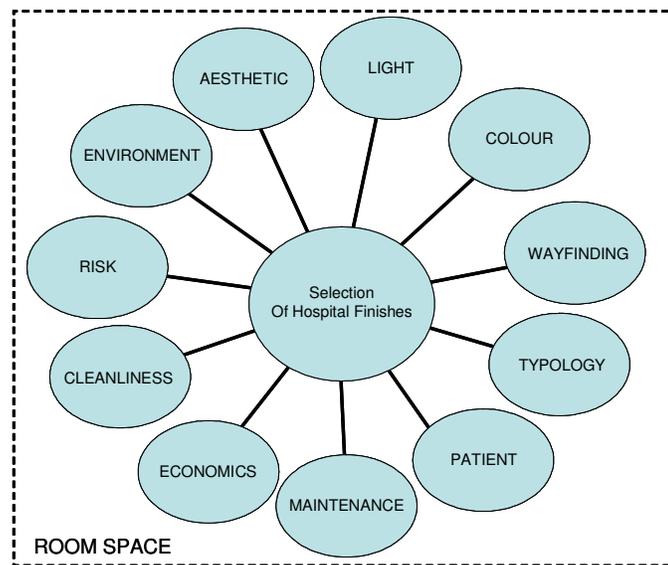


Figure 1: Additional non-financial issues for the selection of hospital finishes

Recognising that subjective decision-making may destroy a complex and intricate WLC analysis, Dale (1993) recommends basing decision-making on a broader front than a simple economic analysis by utilising various methods of value theory. This view is supported by Langston and Ding (2001) who claimed that a means of assessing overall value is necessary, such that the rationale for choices can be more objective and defensible.

Value management (Kelly and Male, 1993; Kirk and Dell'Isola, 1995; Langston and Ding, 2001; Walker and Greenwood, 2002) and cost effectiveness approach (Fabrycky and Blanchard, 1991) were tools critically assessed for this research. Generally, the disadvantage of these tools were that they considered only single cost criterion, relative importance was ignored and there was no definitive way for making decisions (Kishk, 2002). Healthcare environments are recognisably complex environments and therefore a multi-criteria decision making method is being utilised to select hospital finishes. This decision making tool will utilise the issues raised previously.

Multi-criteria decision making (MCDM) theory treats intangibles in a non-monetary context while retaining costs within its natural monetary context. For example, the weighted evaluation (WE) method has been used in WLC studies by many researchers including Ferry and Flanagan (1991), Kirk and Dell'Isola (1995), among others. This method consists of two processes. First, criteria are identified and the weights of their relative importance are established. The second process is a rating and ordering process.

Although the WE method introduces some objectivity into the decision-making process, it still has two limitations. First, input parameters are fixed at single-value levels. This restricts any vagueness the decision-maker may have regarding the levels of those variables (Lavelle et al., 1997). Other researchers (e.g. Lopes and Flavell, 1998) even described such rigid scale as mechanistic and unsatisfactory. A similar note can be said about the use of a crisp scale in the rating process. Secondly, the calculation of the final weights such that the maximum value is 10 seems arbitrary. The resulting set of weights is not normalised which is

contrary to the usual practice and may have an effect on the final rating (Baas and Kwakernaak, 1977). To tackle these shortcomings, a fuzzy version of the WE method has been proposed by Kishk (2002).

OTHER CRUCIAL REQUIREMENTS

As mentioned earlier, a means of assessing the overall value is necessary for an objective and defensible decision. In order that an assessment of value can be regarded as having relevance within future projects, it is first necessary that the methods of assessment to be followed are clear, that they make a realistic use of data and that the range and depth of the information required is realistic (Laing, 1999). Although a value-for-money metric should be used to make the final decision, other measures may be required. For example, alternatives that do not satisfy the minimum technical and performance requirements are excluded regardless of their value-for-money metrics.

A practical method for identifying decision criteria and eliciting their weights of importance is also required. In addition, another method is required to rate competing alternatives in relation to those criteria. Because such a method should involve comparing various alternatives, two more requirements may be identified. First, the assessment of whole life costs of various alternatives requires the inclusion of a data source including their life cycles, initial costs and future operating and maintenance costs. Secondly, a visualisation tool should be employed to show simultaneously various characteristics of competing alternatives to allow for other qualitative assessments.

Because some of the techniques may be too technical to implement in practice, they should be implemented into computational algorithms. Besides, various tools and techniques need to be integrated into a well-defined approach to achieve more computational efficiency by eliminating repeated operations and to automate critical stages of the decision-making process. Besides, some of the employed techniques may need to be simplified to make them more acceptable. Obviously, this could be further facilitated by implementing the integrated approach into dedicated user-friendly software. This will reduce the costs and time of data collection and analysis; and consequently provides the adequate time for the essential dialogue with the decision-maker and avoids the re-run of alternative options. One desirable feature of this software is to incorporate an interactive graphical user interface (GUI) to facilitate the assessment and refinement of data during various stages of the preparation stage. It is anticipated that the development of such software will increase the chances of the realisation of the approach by practitioners and the further development of the employed techniques.

SUMMARY AND THE WAY FORWARD

Key issues in the selection of finishes in hospitals have been identified. These include planning, user, space, finish and other criteria. Financial planning has a trickle down effect upon the hospital specification and the projected maintenance schedule. Besides, various technical and legislative standards regarding health and safety, fire prevention/means of escape, disability, energy, etc. , which the design teams have to be met by the design team.

User requirements are those issues that can influence the convalescence and 'happiness' of patients and the satisfaction of other users including the staff and the general public. The psychological benefit of clean, bright and colourful environments aids the healing process, where finishes are an integral part of the wider environment.

Space has also has an effect on the selection of the finishes in a hospital, especially if rooms are smaller and more cellular. Besides, the accommodation in hospitals has different brief requirements from each other. Space requirements, the design and maintenance of each of these areas are given by the relevant NHS guides.

Other non-financial criteria provided by several guide notes and reports include safety; access; fire evacuation; patient care, and; environmental design; among others. Each of these issues will have different values or weightings depending upon the space under consideration. A practical method for identifying decision criteria and eliciting their weights of importance is also required. In addition, another method is required to rate competing alternatives in relation to those criteria.

Future work within the project include designing and implementing a decision support system for the selection of hospital finishes. This system is mainly a database management system as a data repository, and a number of tools that interact with the data repository through an interactive interface. These tools aim to generate feasible alternatives and criteria for a given application, and the identification of the optimal alternative. This includes a whole-life costing tool, an evaluation tool to rate various options in respect of qualitative criteria, and a tool to elicit weights of importance of criteria from various stakeholders.

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