

## AEC INTERNATIONAL CONFERENCE 2012

### POST OCCUPANCY INTERVENTIONS – A REVIEW OF STAKEHOLDER ROLE IN THE DECISION MAKING PROCESS

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#### **Abstract**

School buildings and supporting facilities makes significant contribution to the quality and experience of education especially at the pre-tertiary stage. In the UK, the government spends a significant part of the education budget on providing and maintaining school properties throughout the country. In recent years, particular emphasis has been placed on replacing ageing facilities, however, in the current economic climate, the performance renewal and upkeep of school buildings is receiving more focus than the complete replacement of existing facilities.

Building on previous research, the aim of this study was to understand factors that affect the effective delivery of post-occupancy interventions in schools. The study pays particular attention to stakeholder requirements as well as the factors that affect user satisfaction. The focus / steering group as the research methodology of choice was to ensure direct insights into the cause and effects of intervention problems. This methodology also ensured that strategies that can improve the process from design intent to delivery are co-created with stakeholders.

The findings emphasised the need for a coherent and robust information and knowledge process during the conceptualisation stages of post-occupancy interventions/work. The importance of effectively capturing user requirements at the inception stages and ensuring that these requirements are integrated into the project and design brief was also found. The findings also highlighted the long term consequence and impact of the fore mentioned factors on the day-to-day operational and maintenance activities of school buildings. The main contribution of this paper is to highlight the complexity of design decision making in schools, present the view point of stakeholders and make recommendations based on findings.

**Keywords:** Building interventions, Design decisions, Post-occupancy processes, School buildings, Stakeholder involvement.

#### **INTRODUCTION**

Central governments in the UK spend a significant portion of their budget on education. In 2005-2006, the then Department for Education and Skills DfES launched a new building investment programme, known as Building Schools for the

Future (BSF). This programme was primarily aimed at secondary education but soon was accompanied, in March 2006, by the Primary Capital Programme (PCP) for primary schools. The BSF programme was ambitious in trying to “provide school buildings for the 21st century at the scale that has not been seen since Victorian times”. At a cost of £45 billion, the purpose was to rebuild or refurbish all secondary schools in participating regions in a series of 15 ‘waves’ over a period of 15 years. (House of Commons 2007). In July 2010, an overhaul to England’s school building programme and the BSF was announced (DfE 2011a). However, the now Department for Education (DfE) still upholds the commitment to creating a world-class state education system by giving greater autonomy to schools, improving parental choice, offering more support for the poorest, whole system improvement, and great quality provision for children (DfE 2011b).

The overall resulted in increased decentralisation of decision processes through devolved capital budget and responsibility to the local governments and devolved maintenance budgets directly to schools. This on one hand has led to better utilisation of information scattered throughout the lower levels of the firm’s hierarchy (subject to effective information and knowledge management) but on the other hand loss of control for the upper level managers (Zabojnik 2002). With increasing number of active role-players, there is increased complexity in roles, responsibility and liabilities of decisions and consequences. Understanding stakeholder issues is therefore important for implementing effective post-occupancy building work in this context. The blend of perspectives obtained through evaluation or consultation processes can positively inform recommendations regarding interventions and maintenance programs for the buildings (Ornstein *et al.* 2009). Early collaboration will also ensure that lifecycle performance requirements are effectively captured from schools managers and users, the main beneficiaries of the work, while the work is implemented within value expectations of the client – often the local authority.

This research focuses on the information and knowledge processes during the conceptualisation stages of post-occupancy interventions/work; who is involved, when, where and how. Raising the question of whether short-range occupancy evaluations are effective in capturing user requirements and also whether these requirements are effectively integrated into the project and design brief. It explores the long term consequence of capital project decisions (by the client) on the day-to-day operational and maintenance activities of school buildings (by the user). Although participants in a project may be short-termed compared to lifetime of the project itself, the effects of their collaboration, in terms of the decisions they made and the action they have taken when they were part of the project team, may well impact and constrain the freedom of action of other participants long after the original participants have departed (Kalay 2006). It then highlights the need for lifecycle factors in the cost-benefit considerations for post-occupancy evaluations in schools.

To further clarify the context of this study, the findings focuses on post occupancy work carried on to either adapt or extend school buildings and facilities. These major works are generally either due to the performance failure of certain parts of the building, the decommissioning and/ or upgrade of key spaces, the need for more capacity etc. The funding mechanism in public schools places the responsibility (and funding) for major/capital works on Local Authorities. These types of work are different from the routine maintenance, operation and management of school buildings. Post occupancy minor works are the devolved responsibility of the schools

However; school stakeholders argue that design decisions in major works often impact on the operational and management of the building afterwards. Therefore they need to be involved in the decision process before, during and after the interventions. This paper presents direct findings from the stakeholders' obtained from a sampled steering group. It presents current practise and makes recommendation for improvements.

## **POST-OCCUPANCY BUILDING PERFORMANCE AND INTERVENTIONS**

The use of every building results in deterioration over time, resulting in loss of value especially for building users. The process of change often results in (Douglas 2006; Addy 2004): poor quality buildings/ facilities, non-functional spaces e.g. narrow corridors, insufficient capacity etc., new and untested products/ materials, buildings that offer no flexibility to its users, not future proofed, difficult to operate and use, and difficult to maintain. Apart from wear and tear, loss of value may also occur due to: design and development briefs that give no flexibility to the design team, inappropriately high quality standards, and delays in decision making, the use of one off design solutions, poor information supply and unmanaged change (Addy 2004).

Post-occupancy building practices are interventions to obsolescence, dilapidation, deterioration, deficiencies in performance and sustainability of buildings (Douglas 2006). The performance concept is a systematic way of determining and achieving desired results by focusing on ends rather than means (CIB 1993). To this end, post-occupancy building performance is about providing an environment that supports the activities of the occupants; providing delight and inspiration, with low impact on the environment in the *long* and *short* term, cost effective to operate and maintain and which is robust and flexible enough to adapt to changes (Pegg 2009; Hadjri and Crozier 2009). There are two elements to performance management; interventions for performance upkeep i.e. maintenance and repairs, or for performance adjustment, including building adaptation work (Douglas 2006). Interventions as a response to diminishing building performance is influenced by both qualitative and quantitative factors including; asset and value management criteria, statutory requirements for sustainability, health and safety etc as well as user requirements (Ornstein et al 2009; Douglas 2006). However, qualitative (subjective) considerations can sometimes be overlooked to favour quantitative benchmarks (Preiser and Vischer 2005), thereby focusing more on function than functionality.

For existing building works, a complete diagnostics is generally carried out during the inception stages. This is used to acquire quantitative information and knowledge for the efficient planning, design, construction and implementation of building interventions to benefit stakeholders (Hadjri and Crozier 2009). Information derived from building performance evaluations, such as condition surveys primarily inform intervention decisions either for performance upkeep or performance adjustments in existing buildings and infrastructure. It also gives a holistic picture of how well a building is behaving overall and in the long term and findings from these studies are incorporated in the brief (Preiser 2002 p. 42; Whyte and Gann, 2001; Preiser et al. 1988; Hadjri and Crozier 2009). In spite of an increasing interest globally in building performance assessment and post-occupancy evaluation (POE), such assessments are sometimes not undertaken, not routinely available thereby failing to capture the complete picture, or ignored by most design and building teams. Users responding to

studies on POEs also indicate poor confidence in findings. Often using phrases such as: A tick-box exercise, lacking in breadth and depth, non-transparent, and non-engaging. Lack of communication and feedback were also highlighted as barriers to effective POE. Often participants do not know if their suggestions were considered or implemented (Bordass 2006).

## **UNDERSTANDING PERFORMANCE REQUIREMENTS**

Design intent and criteria are the explicit goals that a project must achieve in order to be successful (Perelman *et al.* 2001). It is a document which stipulates in a clear and concise manner, the client's value and functionality requirement. Through appraisals, feasibility studies and performance evaluations, the design and decision criteria are defined and enumerated in the briefing documentation. This information and knowledge process affects the success and failures of building performance interventions in school facilities. Information and knowledge captured during POE and BPE are therefore crucial for preparing realistic project and performance specifications such that when decisions are being made, efforts are made to balance these criteria to satisfy both client and users. The briefing process is often implemented in two stages. The first is referred to as strategic briefing and is concerned with understanding the client's business processes and expectations. The second stage comprises the conceptualisation of built solutions and issues of performance specification (Green and Simister 1999). Green and Simister consider the first stage to be the most problematic. However, Kelly *et al.* (2005) contend that the second stage is more tactical in nature and is primarily concerned with issues of performance specification. In post-occupancy work, stakeholder involvement at this latter phase is crucial. Buildings are a complex arrangement of systems and sub-systems. Therefore, selection of performance criteria has to be done within the context of the property concerned and be based on the needs of the client and its users (Douglas 2006).

To effectively achieve post-occupancy project objectives, a collaborative approach where different people with varying knowledge and expertise work together (Emmitt and Gorse 2003) are essential. If the work is to be carried out on an existing building, the information derived from building performance evaluation helps to identify what is actually feasible in the context of the existing building. It will also ensure that relevant specialist information and knowledge that is relevant to the problem, is captured even from the most unlikely sources e.g. caretakers and premises officers, who may ordinarily not be involved in high level building decisions. Knowledge garnered from the day-to-day management and use of existing facilities will be highly beneficial to guide client and design requirements, and ensure that mistakes are not repeated, and that long term value is delivered. After all, an integrated collaborative approach ensures that the most relevant information is accessible and accessed (Emmitt and Gorse 2003). It also ensures that the stakeholder expectations are captured and managed from inception, to design to implementation. Experience acquired through the practice of design, maintenance or management of a building, in this respect, can be considered to be more readily available, acceptable and quicker to use. The importance of school premises officers and caretakers cannot be overlooked for this reason.

## RESEARCH AIM AND OBJECTIVES

The aim of this study was investigate factors affecting post occupancy interventions in school buildings, from the stakeholder perspective. This was achieved with the following objectives:

- From existing literature, identify key factors that affect post occupancy building strategies, decisions and work
- Review existing processes and procedures, identifying impact and barriers to effective design, implementation of user requirements in work done in existing schools
- Identify opportunities and constraints for procedural improvements
- Make practical recommendations for stakeholder improvement and improved decision making for post occupancy building interventions in schools.

### Research methodology

Steering groups, as a qualitative approach, was utilised for this study. Qualitative methods deal with narrative data and interpretive epistemology and this approach was chosen because it provides insights and understanding of the problem setting (Karami *et al.* 2006). Data from qualitative methods such as interviews and focus groups require systematic collection, organisation, and interpretation of textual material derived from talk or observation.

The first stage of the research was to explore existing literature and identify key factors which affect the successful delivery of post occupancy building interventions either in the context of minor or major works. The second stage was sampling. Sampling is the first stage of measurement where the selection of a few (a sample) from a bigger group (the sampling population) becomes the basis for estimating or predicting the prevalence of an unknown piece of information, situation or outcome regarding the bigger group (Kumar 2005). Sampling for the focus/steering group (stakeholder forum) comprised of a sample of primary and secondary school representatives, local authority representatives and building professionals. Invitations were sent to 60 randomly selected private and public, primary and secondary schools in the Sussex area. In addition, another 20 invitations were sent to the relevant local authority department and building professionals. 2 design/academic experts were also invited to serve as advisers.

The result was a total of 13 members in the steering group. The composition was; 3 Facilities managers /premises offices, 3 Buildings expert (architect, engineering consultants), 3 Finance/ Business managers/Bursars, 1 Academic expert, 1 School Heads, governors and 2 County council (capital projects) representatives.

The composition of the steering group is representative of the key decision stakeholders for major and minor works in a school project even if there may be procedural or implementation variations at the local or individual school level in Sussex, England.

This paper is based on findings from 2 steering group meeting. In both instances, minutes of the meetings were also circulated to members and corrected for errors where appropriate. The analysis was also conducted in two stages. First, the textual data from the first steering group meeting was analysed for content and context. This was done by identifying recurring themes and factors that relate to, or affect each

theme. This resulted in thematic clusters which identified both contributory and consequential factors that related to each theme. These findings are then tabulated and fed back to the steering group at a second meeting. This second stage was to check for accuracy of content and interpretation.

In addition to exploring stakeholder role in, and perception of, post-occupancy interventions, the scope of the meeting also covered:

1. Identifying the requirements (user, physical and procedural) of school building using requirements and performance management principles (Douglas 1996; Lee, Hayes and Egbu 2005) and post-occupancy evaluation methods (Bordass 2006).
2. Identifying what information is required to meet these requirements (and make decisions) for specific processes pertaining to school buildings; operations and facilities management and maintenance.
3. Identifying links and relationships between requirements and information which will in turn inform the fore mentioned processes as well as future for adaption and other work.

## **FINDINGS**

The steering group discussed and reviewed post occupancy building work and associated processes. Particular focus was given to the performance expectations of users post-completion. The steering group members agreed that the performance of school buildings is based on whether:

- The buildings and associated spaces and site support the teaching and learning activities, thereby providing inspiration.
- The building and its facilities are safe to use and promote health and welfare.
- The facilities are optimised for resource use e.g. energy and water and has a low impact on the environment in the long and short term.
- The facilities are cost effective - to operate and maintain.
- The spaces are adaptable to change and future proof.
- The building fabric and materials are robust, durable and require low maintenance.

Deliberations then covered stake holder relationships, lifecycle processes, public expectation and government standards, funding and resources versus cost and investment. Questions focused on:

- The work and associated decision making processes
- What is needed to achieve the ideal requirements?
- Who is responsible?
- What resources are required? and;
- To what extent does this affect decisions, processes and procedures locally in schools?

The following three (3) factors were also highlighted to have crucial impact on post occupancy processes:

- **Quality and competence of design, construction and workmanship:** The main problems experienced by school representatives on the steering group included:

poor, non-functional design or poor build quality as a result of design complexity. This often results in schools planning and implementing adjustments or rework to resolve design and construction errors or the long term consequences for poor workmanship/ materials. There was the general perception that apart from cost, client and design teams appear to favour aesthetics above functionality. Unnecessary design complexity, leading to more defects than is necessary was constantly mentioned by the schools represented in the steering group. “If it is difficult to build, it will be difficult to maintain”. This leads to one problem after the other; “Under floor heating – gone wrong. Inverted roofs! Aesthetics over functionality, regular clogging of the drain pipes has cost implications. We are constantly making operational adjustments to fix design errors. A building that is over budget but still poor design is difficult to justify”.

- Procurement and Budget constraints:** The clients represented in the steering group highlighted the difficulty in balancing the demand to provide adequate and sufficient school places, the user requirements and limited funds. Due to the economic climate, there are funding/ budgetary constraints and the capital expenditure (CAPEX) budgets are much reduced compared to previous years. Therefore, it is inevitable that in most cases procurement strategies will sometime results in contracts awarded based on cost. The schools argue that the cheapest tender often translates to higher maintenance costs and framework or partnering agreements does not always guarantee value/quality. In addition, some procurement agreements make latent defects with warranties/guarantees difficult to enforce and in recent times, with increasing contractor bankruptcy, many schools are left with the cost and burden of remedial work in addition to the high maintenance and operational costs due to poor design and construction decisions.
- Time:** The client (local authorities in most instances) indicated that it is not always possible to allow adequate lead-in period for proper evaluations, consultations and brief development. All members of the steering group will like this to be the case, stating that inadequate lead-in time often leads to higher levels of latent defects and liabilities. “If the time is spent fine tuning the design brief it works, especially if there is time to go through the design evolution process”.

In Table 1 below, the recurring themes from the discussions was clustered under four main headings; design issues, the role of the client, implementation problems and the impact the design, client and implementation factors has on post-occupancy processes such as routing operation, management and management of the school facilities.

Table 1 Thematic summary of findings

| Design            | Client  | Implementation  | Impact (post-occupancy processes)                             |
|-------------------|---|---|---|
| Brief development | Too much reliance on expert competence and advice over user needs/ lifecycle requirements | Framework agreement/ partnering does not always guarantee value/quality | Complex decision making processes                             |
|                   | Difficult to balance multiple demands/ requirements with                                  | Procurement strategy sometimes results in cheapest                      | Cheapest tender often translates to higher maintenance costs. |

| <b>Design</b>  | <b>Client</b>  | <b>Implementation</b>   | <b>Impact (post-occupancy processes)</b>   |
|--|--|---|--|
|  | limited budget   | contractor.   | Dealing with design-induced maintenance cycles   |
| Poor, non-functional design<br>Poor design quality   | Poor briefing strategy   | Poor build quality  | Planning and implementing adjustments/ rework to resolve design and construction errors                                    |
| Specifying untested materials/methods  | Putting aesthetics above functionality   | Untested methods and materials  | Little or no involvement in briefing process or design decisions   |
| No consideration for lifecycle impact<br>Lack of consideration for building operation and management. E.g. implement passive design    | Not always possible to allow adequate lead-in period for proper evaluations, consultations and brief development     | Latent defects and liabilities  | Changing legislation and statutory requirements  |
| Unnecessary design complexity<br>Difficult to build/difficult to maintain<br>High defects  | Long term consequences of short term decisions.<br>Not effectively managing the expectations of various stakeholders | Lacking of continuity for learning and knowledge transfer   | Funding/ budgetary constraints<br>CAPEX cuts   |
| Design incompetence  |  | Lack of expertise experience<br>Due to untested design/materials  | Old buildings have different operation and maintenance requirements  |
| Poor spatial design especially: Circulation space<br>Communal spaces<br>Teaching spaces  |  | Latent defects with warranties/liabilities that cannot always be enforced<br>Contractor bankruptcy<br>Rework or Maintenance liability falls on client | New buildings do not often translate to better buildings.<br>Coping with or replacing non-functional spaces and facilities |
| Lack of consideration for growth. No future-proofing   |  | Long term consequences for poor workmanship/materials   | High maintenance and operational costs due to poor design and construction   |
| Lack of effective communication<br>Dissociation between design communication (drawings) and finished building                          | Poor communication/consultation  | Poor communication/information for building operation/maintenance especially during handover  | Lack of communication between important parties  |
| Design quality standards/criteria dissociated from user/client criteria<br>Differences in designer/user/client/regulators expectations |  |   | Non-integrated data/information sources and types  |
| Poor learning/knowledge transfer processes   |  |   | Repeated mistakes due to lack of collaboration and knowledge transfer  |



## **RECOMMENDATIONS**

The recommendations by the steering group were that; the decision processes needs to be more compact, collaborative and inclusive. “Some independence of decision making is useful”. It is important for stakeholders, user groups in particular, to contribute to a knowledgeable client. This ensures that clients spend the time to fine-tune design brief and choose the right teams so as to “Get it right the first time”. Some felt that “schools should be allowed to make some direct value decisions, independent of the Local Authority”. Stakeholders should have clearly defined involvement and acknowledged responsibilities for decision making. Clients and users should be “Firm and focussed, know what you want” and “Acknowledge that decision making is an evolving process”. Strategic and collaborative brief development and decision making can be long and complex, “so allow sufficient lead-in time for briefing development”. Integrate existing knowledge of post occupancy issues to improve briefing strategy/ briefing process. POE should not a one-off exercise, “it should a living document”. It is essential to have robust information processes in place that link up data streams, before the interventions and to support operation processes with the right tools which presents a complete picture and facilitates decision making. Building users and managers often override design intent. Therefore, it will be beneficial to link up design criteria with operational criteria. Designs and design intent should also take operational/maintenance issues into account. Wrong design prioritisation e.g. aesthetics over functionality should be avoided. Functionality is more important than aesthetics in post-occupancy stages.

Due to the economic climate, cost is an important decision criterion. However, in addition to need, Local Authorities’ prioritises for funding should also consider long term value. Time should be taken to review long term post-occupancy solutions that are effective for the existing buildings and options to generate additional income from existing assets should not be overlooked. Lastly, feedback processes before and after the intervention is important to avoid repeated mistakes. This could be in the form of a toolkit which captures and retains knowledge and learning within the organisation and sector.

## **CONCLUSION**

In addition to physical problems due to deterioration, obsolesces, wear and tear of school facilities, this study found that additional problems occur in post-occupancy interventions due to: poor communication, conflicting agendas and fixed mindsets, complex decision making processes, recycling old ineffective solutions and the lack of collaborative working, detachment: value gaps between users, strategic stakeholders and decision makers, ineffective communication, conflicting or fixed top-down agendas, lack of collaborative decisions, lack of ownership, lack of opportunities for long term planning, unmanaged (or unmanageable) change and lack of influence or control.

This study found that effective information and knowledge capture i.e. no one-off POEs, strategic involvement from stakeholders, a design brief that integrates existing information and knowledge and is primarily influenced by the long term operation and maintenance requirements of the school facilities will ensure that post-occupancy interventions deliver value – quality and cost effectiveness for the benefit of its users.

## Acknowledgements

This project is funded by the SET-RTF fund at the School of Environment and Technology, University of Brighton. The researchers will like to thank all the steering group members for their time and contribution to the ongoing research project.

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