

HEALTHCARE BUILT ENVIRONMENT IMPACTS, CONSTRUCTION PROJECTS AND ORGANISATIONAL CHANGE

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Understanding the links between a building and outcome measures relevant to the purpose of the building should be an important issue for those commissioning, designing, delivering and operating facilities. In project teams that concern is often tacit and understanding is limited. The links are complex, under-researched and hard to demonstrate. Progress has been made in the context of healthcare infrastructure - an influential body of literature has demonstrated the role of the built environment in achieving good healthcare outcomes. However, applying such knowledge often requires new building or adaptation of existing buildings. These are process of change undertaken by healthcare organisations and others. Building change and organisational change happen together and influence each other. And both can be expected to subsequently influence organisational and healthcare outcomes. These relationships are explored using the findings from a mixed-method, longitudinal case study of the design, construction and operation of a new day surgery ward. The analysis draws on built healing environment, health management, organisational research and value management to propose ways in which the impact of the built environment can be mediated through construction/organisational change projects and potential implications for construction practice.

Keywords: architecture, building performance, organizational analysis, value management, project management

INTRODUCTION

Architectural theory and research has been concerned with understanding the relationship between building and purpose for decades (e.g. Studer, 1969; Stitt, 1985; Groák, 2002). This relationship between ‘form and function’ is central and one of the most challenging aspects of the building design process is for clients to convey to the designer what they want the building to do. Clients can find it hard to think of their requirements in abstract terms and designers have the difficult job of understanding and interpreting the client's vision and requirements and developing both a design ‘brief’ and a solution that meets the client's aspirations. Frequently the reality falls short of this difficult and theoretical process (Barrett & Stanley, 1999; Blyth & Worthington, 2001). Research in environmental psychology has attempted to provide an empirical basis for the effect of form on function and have accumulated evidence

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of effects of specific individual features of the work environment e.g. light levels, noise, personalisation and layout (Bechtel, 1997). Understanding the links between a building and outcome measures relevant to the purpose of the building should be an important issue for those commissioning, designing, delivering and operating facilities. Unfortunately in project teams that concern is often tacit and understanding is limited as the relevant knowledge is specialised and the links are complex, under-researched and hard to demonstrate in practice (Anthes, 2009).

This is not just a concern for architectural theorists and psychologists however. Assumptions about the ability to make decisions based on knowledge of the causal effects of building design and construction on outcomes that owners and users of buildings care about are at the core of a number of persistent issues in construction management and an implicit foundation of some recent innovations. Included in this are briefing, design management more broadly (particularly the tracing of requirements through the design process (Delgado-Hernandez et al, 2007)) and value engineering/value management (Short et al, 2007). Project management practices such as business case production and agreement (Gannon & Smith, 2011) and the operation of gateway review processes (OGC, 2007) in client-specific and generic methodologies also assume a robust understanding of the implications of decisions. The same is true for post-project activities such as post-occupancy evaluation and managed handover (Way & Bordass, 2005) and the current concern with occupant behaviour as a component of built environment's contribution to sustainability policy (Pilkington et al, 2011). More broadly understanding these links are necessary to realise the potential of innovative business models such as performance-based contracting (Gruneberg et al, 2007) and service-led construction (Leiringer et al, 2009).

This paper seeks to contribute to an aspect of this understanding through exploring these relationships using some findings from a mixed-method, longitudinal case study of the design, construction and operation of a new day surgery ward in a National Health Service hospital in England. The paper introduces specific research on the 'healing environment' and work on organisational change that incorporates aspects of the built environment. The case study is described and discussed, drawing out implications and suggestions for further research in the relationship between; buildings, projects and organisations.

HEALTHCARE BUILT ENVIRONMENT AND ORGANISATIONAL CHANGE

An emerging and increasingly influential body of academic literature has demonstrated the importance of the built environment in achieving good healthcare outcomes. Reviews have found relationships between design and: staff stress and effectiveness; patient safety; patient and family stress and healing; improved overall healthcare quality and cost; and patient satisfaction (Ulrich & Zimring, 2004). There is an increasing awareness that the built environment does not just accommodate healthcare organisations and care delivery practices but can, and should, significantly contribute to their effectiveness (e.g. CABE, 2006). At the same time, in an environment of resource limitations, capital budgets compete with those for improved medical technologies and drugs – both of which have better developed procedures for determining efficacy and value for money. Justifying the allocation of resources for improved and high-quality healthcare environments away from immediate operational care ('stealing from patients'), can be culturally and politically difficult in the NHS

(Boyd & Chinyio, 2006). There is a need to ensure that investment decisions are soundly made and the greatest possible benefit derived from them. Improving the assessment of the outcomes of healthcare infrastructure projects is, therefore, politically and organisationally as well as scientifically important.

This 'built healing environment' research has mainly studied steady-state relationships between aspects of buildings (e.g. light levels, configuration) and healthcare outcomes (e.g. patient satisfaction, care quality, recovery time). Constructing or changing buildings to achieve the potential of such knowledge requires designers, builders and healthcare organisations to come together in projects. These projects necessarily contain elements of building change and organisational change that can influence each other and can be expected to subsequently influence organisational and healthcare outcomes. Some healthcare building types are intended to achieve organisational objectives such as collaboration or integrated working by bringing together disparate services. Example of this include mixed-use buildings like diagnostics & treatment centres, some joint primary care and local authority projects or, more broadly, coordinating IT projects like the NHS care records programme. The use of technology to achieve organisational or practice objectives has been documented by health services researchers. Crump (2002) found that, "medical and technical staff expect integration to occur [...] It is mainly thought about as a technological problem and, as such, an answer to it will be provided by some form of technical innovation or development" (p111). The physical design and layout of hospitals, as with other buildings, also reflect organisational arrangements. Esian & Rich (2005) describe how, in order to manage complexity, the hospital system has specialised activities into functional departments. Healthcare organisations "create boundaries between departments and often support these with physical boundaries" (p84).

METHODS

The research from which these findings and analysis are drawn was a longitudinal, multi-method case study of the design, construction and operation of a new healthcare space, a day surgery unit (DSU). The aim of the research was to study the design and use of the DSU with particular focus on the role of, and interactions with, a new 'care pathway'. Methodologically, the research conduct and analysis adopted what has since been characterised as an abductive approach (Timmermans & Tavory, 2012) in which the researcher enters the field with a variety of theoretical and explanatory frameworks and an expectation of anticipated findings but remains open to, and places analytical importance on, 'surprise' in the form of either novelty (a new experience) or anomaly (an unexpected experience). The methods that generated data drawn on in this paper include; interviews (transcribed, semi-structured), informal discussions, unstructured non-participant observation, analysis of business performance metrics, document analysis, research meetings and seminars. A mixed methods approach is recommended for post-occupancy evaluation, of which the research presented here is a variant, to help "unpick the detail of what is affecting our performance in the workplace" (Turpin-Brooks & Viccars, 2006; 193). Trust performance data was used in post-hoc analysis alongside the qualitative findings in order for the two data types to interrogate each other in the analysis.

Case description

The research partner is an NHS acute trust ('East Trust') in the south of England that offers a full range of acute and other secondary services including accident and emergency. Although a good performer in some areas, the Trust identified itself as

under-performing with respect to its day surgery rates (at the beginning of the research engagement it was 66% compared to the NHS target of 75% and a national average of 68%). The Trust was engaged in an ongoing series of infrastructure and pathway initiatives with the objective of increasing its day surgery rates (the percentage of specified procedures delivered in a single episode in which the patient is discharged on the same day without an overnight stay). Those recently completed and currently planned at the time of the research included: internal modernisation project for day surgery; development of a generic day case and short stay surgery care pathway; work on patient flows in previous day surgery ward; design, construction and activation of the new dedicated DSU; development of new condition-specific care pathways; work associated with a national NHS IT programme.

The new DSU was designed and constructed during 2006-7 and opened in August 2007. The DSU project was an alteration and refurbishment of available space within the existing hospital building. Technically, the new DSU is a ‘dedicated day ward’ having no new operating theatres and using the main hospital theatres. The unit is adjacent to the theatres however (the theatre suite also has a designated ‘day surgery theatre’ although the remainder are allocated by specialty) and is designed to achieve a ‘circular flow’ model of care as envisioned by NHS design documentation (HBN 52: NHS Estates, 1993). The DSU accommodated the following activities (as well as the unit staff and necessary storage): reception and waiting; pre-operative preparation; post-anaesthesia recovery; pre-discharge recovery; and discharge. It is significant that the DSU project was an adaptation of available space. As such it represents a hybrid solution typical of Trusts trying to achieve targets within the limits of budgetary and other constraints.

A number of specific objectives for the DSU were outlined in the Full Business Case (FBC) for the project. This paper concentrates on the first objective which was also the only objective mentioned in the interviews with research participants. This was “Achievement of national day case rates”. The FBC outlined that this was to be measured as “Day case rate as a percentage of total elective surgical workload” via the “Monthly trust performance report”. Other objectives were: quality of care; and patient satisfaction and patient choice.

RESULTS AND ANALYSIS

Organisational changes

The organisational innovation most specifically relevant to the new DSU was the development of a ‘care pathway’ for day case surgery. A care pathway is an, “outline of anticipated care, placed in an appropriate timeframe, to help a patient with a specific condition or set of symptoms move progressively through a clinical experience to positive outcomes” (Middleton et al, 2001). Managers in the Trust claimed that they had designed the new DSU around the newly implemented care pathway. Introducing a care pathway is an organisational as well as a clinical intervention and can, through the process of introduction, provide a problem-solving approach for staff, encourage the integration of services, and help identify required changes to clinical and organisational practices (Currie & Harvey, 2000). Some researchers attribute the positive outcomes of care pathways to improved multidisciplinary collaboration in the broadest sense and even to the simple fact of multidisciplinary discussion and agreements about care in the early stages of pathway development whether or not a formal pathway is subsequently designed and implemented (e.g. Kent & Chalmers, 2006). Studies of pathway implementation in

detail highlight challenges including problems of integrating and standardising practice across disciplines, the difficulties of working and innovating across boundaries and the desire to maintain ‘safe and political enclaves’ (Crump, 2002).

Physically the pathway developed at East Trust was a multi-page, printed-paper care record and checklist. The pathway was generic in the sense that it was applicable to any surgical procedure suitable for treatment on a short stay basis. As such it was specific on the steps involved in the phases of pre-admission, admission, anaesthetic, theatre management, recovery, discharge and follow-up with a blank space provided for the details of the surgical procedure itself. This has meant that the content of the pathway is medically uncontroversial and has had no effect on surgical practice. This was explained in terms of budgetary constraints and the unacceptable cost of producing procedure-specific documents. It is likely though that the difficulty of standardising consultant work will have been a factor here too (see Crump, 2002). It was championed and produced by a nurse matron in consultation and negotiation with a variety of internal stakeholders.

Accounts of the rationale behind the introduction of the pathway and its development stressed the administrative benefits. The pathway was described as achieving outcomes in terms of collating and streamlining multiple paper forms preventing re-work, lost information and error. It was not been presented as having contributed significantly to either clinical or efficiency improvements and was not formally evaluated as such. However it was believed to have contributed to a reduction in process inefficiencies by ensuring that necessary actions have been performed, e.g. ensuring that a day surgery patient has a carer scheduled to collect them from the DSU before the end of the day. The development of the pathway was part of a wider service improvement project with the aim of increasing the trust’s day surgery rates. As such, the development process was described as a symbolic change management initiative as much as a technical or administrative one.

Day surgery unit changes

The new DSU was an alteration and refurbishment project converting a large former canteen area into patient reception, recovery and discharge areas. Although the DSU was "designed around the care pathway" the care pathway as described above played a surprisingly small part in the design and briefing of the DSU. Instead the DSU was designed around the idea of a patient pathway with patient flows analysed from scratch for the purpose of decision making about the unit. Practically, this took the form of the surgery management team and surgical nurses mapping the existing process in the previous unit by walking through the process as it was done.

Before the construction of the new DSU the day surgery team worked in a surgical ward with a central nurse’s station and twelve trolleys (beds) arranged on two or four bed bays. The ward was adjacent to normal surgical and medical wards and a considerable distance from theatres. Patients were admitted to, transported on, and returned to the same trolley and bed bay. Due to the distance from theatres, patients were wheeled on trolleys down a number of corridors across the hospital site – this was regarded as a process inefficiency and also problematic for the privacy and dignity of the patient. The layout of the old day surgery ward was considered “static”. The new DSU was designed as a series of distinct spaces including: main reception; pre-operative waiting (including separate changing and consulting rooms); link corridor (through which patients walked to theatres); post-operative recovery (a single large space with fifteen trolleys); step-down recovery (furnished with reclining

chairs); and post-discharge waiting area where patients could wait for their escorts/carers to arrive. The layout of the new DSU was designed to encourage “flow” with patients entering the unit then progressing broadly clockwise through stages and spaces outlined above. The notion of step-down recovery was a small but significant innovation intended to free-up trolleys in the recovery areas and increase utilisation of the unit.

The new DSU was designed and constructed during 2006-7 and opened in August 2007. Almost immediately, the pre-op waiting area and the consulting rooms ran into capacity problems resulting in patients being routed ‘against’ the intended flow – by using the final waiting area as spill over pre-op waiting and by doing pre-operative checks on the recovery bay trolleys. This event was surprising (Timmermans & Tavory, 2012) when set against the logic of construction project delivery which emphasises well-controlled project delivery to meet client requirements (Tuuli et al (2010). This event could be taken as evidence of a ‘failure’ of the construction process but it is perhaps more fruitful to interpret it as an illustration of the interconnectedness of built environment and organisational arrangements and changes. In this case patients were batched into morning and afternoon theatre lists, meaning that a surge of between twenty and thirty patients would arrive each morning at 7.30 to be processed and accommodated in a space that couldn’t accommodate them. Batching, queuing and buffering in healthcare buildings and processes has been identified as both common and wasteful (Esian & Rich, 2005) although it is often intended to maximising use of scarce and expensive resources in the system. Using the recovery bay trolleys for pre-operative checks was also organisationally significant as it maintained the previous working methods of some consultant surgeons who were used to having their patients for the day ‘lined up’ in adjacent beds rather than having to call them individually to a separate consulting room. The DSU was a nurse-led unit in both design and operation and the capacity problems encountered in the early days of the DSU made it more difficult to maintain the intended change in the care model.

Effect on West Trust day-case rate

The performance of East Trust against its target of achieving 75% of National Audit Office ‘basket’ of procedures as day cases) is shown in figure 1.

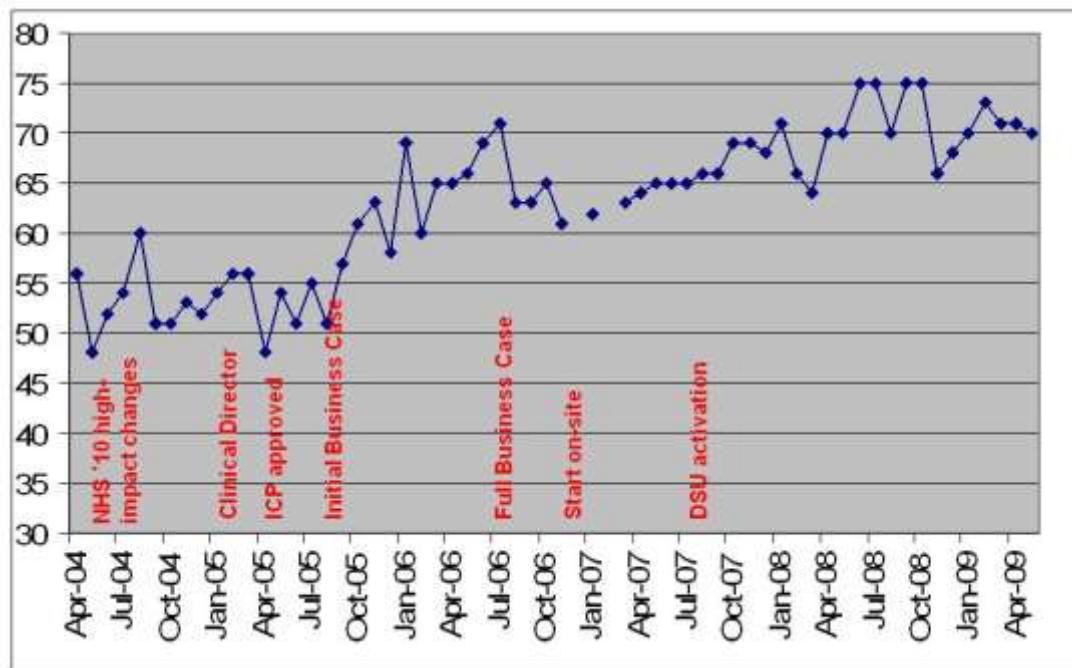


Figure 1: East Trust day case rates (as % of National Audit Office 'basket' of procedures)

Analysis of the Trust's performance against this indicator between 2004 and 2009 showed an improvement from a low of 48% to a high of 75% in July 2008 then settling to just over 70%. According to these figures, the DSU itself produced only a small gain in performance relative to target and failed to deliver its predicted benefit. Various mechanisms by which the DSU was intended to deliver the required performance were offered during the case study. The most technical concept was that the design of the unit and the introduction of "flow" into the process would accelerate throughput allowing more cases to be managed as day cases. This assumption was not measured directly as part of the research but there was little evidence that this was happening during observations.

Some problems with capacity and routing in the unit have already been discussed. A further issue was that the step-down recovery area was not used as designed as, being in a separate space to the main recovery area, nurses were unable to observe patients in the recliners so were reluctant to lose clinical control of patients that they had not discharged. This can be interpreted as a design error or compromise – failing to ensure sight-lines to the step-down recovery area: but also as a building change not achieving its desired effect because of the absence of a corresponding organisational change in terms of the nursing model for the unit. Also, the fact that the DSU did not have its own operating theatres meant that its workflow was dictated by the operating teams who would 'pull' patients from the DSU when they were ready for them (and often day surgery cases, being simpler, were undertaken at the end of theatre session after more complex procedures). Other mechanisms by which the DSU was expected to have an effect was through its role in persuading reluctant consultants to perform procedures as day cases whether through reassurance that patients would be closer to the hospital core, the prestige of working out of a new unit or, simply, by removing what some managers saw as the "last excuse", namely that "we haven't got a day surgery unit". The Trust's financial commitment to the DSU was also used by managers as evidence of the seriousness of the day surgery target.

These mechanisms are a reminder that the DSU project was itself part of a wider initiative to increase day case rates. Figure 1 also includes some major events in the history of the DSU project as well as other day surgery related work within the Trust and suggests a number of sources of conjecture about the nature of the interactions between infrastructure projects and ‘business’ outcomes. In this case, before and during the business case process for the new unit a number of other initiatives had taken place (appointment of a clinical director for day surgery, development of the care pathway for day surgery, various procedure-specific changes). This activity coincided with the highest increase in day surgery rates. This correlation leads us to speculate whether the time, effort and extra activity necessary to develop and gain approval for a capital project may deliver a significant proportion of the potential improvements even before work has started on-site so that by the time the building work is done there is little scope for improvements attributable to the new infrastructure. In any change programme, initial improvements are easier to achieve as gross inefficiencies are addressed – subsequent improvements, often requiring wider changes, are likely to be more difficult. This has challenging implications for those seeking to demonstrate the benefit of built environment changes. More optimistically, it points to the important theoretical need to avoid splitting ‘technical’ and ‘organisational’ aspects of change programmes when assessing impact. In this case, although the data suggests that the activation of the physical infrastructure had a small marginal impact, the development of the unit can be seen as an integral part of the overall programme of activity that may have ‘failed’ without the existence of the capital project to provide a focus for apparently ‘non-technical’ activities.

DISCUSSION AND CONCLUSIONS

The research presented here has highlighted a number of linkages between buildings, organisations, people and projects. The first thing to note is the small apparent performance effect of the new DSU. In this illustrative case study it is not possible to establish this effect as a general empirical finding but the longitudinal nature of the data makes it strongly suggestive and a potential effect worthy of further study. An implication of this finding is that construction project benefits are gained, at least in part, via developing rather than delivering the project as found by Kent & Chalmers (2006) for organisational changes. An alternative explanation that would be important to consider is the possibility that the organisational effects of the built environment simply are small. Bechtel (1997) reminds us that “any normal physical aspect of the workplace is of marginal utility” and “[to] keep the physical environment in proper perspective” (p395).

Another feature of the data is the building project's role as a ‘tangible’ form of legitimisation of, and way of securing management and budgetary authority for, contested behaviour change. Thinking of the building and the building project in this way challenges the finding that the built environment has only a small effect on organisational change - rather, the wider construction and change project can be seen to be implicated in any effect. It could be that building projects represent a special case and opportunity for organisational change. It is recognised that greenfield sites in manufacturing represent an opportunity to introduce changes to working methods and organisation that would be too challenging to achieve in existing settings (Preece, 1993). Bragato & Jacobs (2003) describe pathways changes in healthcare that were would have not been possible if not attempted in a stand-alone unit. This possibility requires a wider sociotechnical (Clegg, 2000) view of projects that has significant implications for construction professionals and their engagement with their clients and

points to the need for active organisational change efforts alongside apparently merely physical built environment changes (Cherns & Bryant, 1984; Boyd & Chinyio, 2006). Even this partial report of a simple case study shows complex mutual interactions between built-environment, organisation and people as the project unfolds and as the building is used. This is an established principle in architectural theory (Brand, 1994) but the built environment is often elided from accounts of organisational change (e.g. McNulty & Ferlie, 2002).

The findings also point to a difficulty in applying evidence-based design insofar as the evidence-base is limited to narrow aspects of the physical built environment and the steady-state effect on users of the final building configuration. The rhetorical and evidential weight of the approach risks moving practices still further from the broader sociotechnical considerations that also take into account the effects of implementation practices. A promising mechanism with which to redress the balance might be through an extension to various approaches in value management (VM). Rather than seeing the construction process and its products as too complex and impractical to apply VM (Ellis et al, 2005) consideration of complexity would allow a high-level approach to functional analysis (Spaulding et al, 2005) in which the required abstraction and the emphasis on function/outcome would be supported. The broader project boundary implied suggests that VM could be applied to this wider project definition, perhaps through the application of 'soft' VM (Green & Liu, 2007) that might be better suited to developing a socially negotiated understanding between multiple stakeholders with differing viewpoints and interests.

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