THE LACK OF DESIGN QUALITY FOCUS IN UK CONSTRUCTION: A CASE FOR EXAMINING SUITABLE DESIGN PROCESSES

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A large number of projects in UK construction now involve contractor-led design and are thus very different from the traditional approach which formed the basis of the original Royal Institute of British Architects (RIBA) Outline Plan of Work. Such integrated and contractor-led approaches support the "reform agenda" of the late 1990s that was introduced to tackle process inefficiency. However, within the design professions there has been concern that this resulted in buildings that were 'designed-down' to a cost rather than 'designed-up' to a value. An attempt to address this resulted in the formation of the Commission for Architecture and Built Environment (CABE) in 1999 and the launch, in 2003, of the Design Quality Indicator (DQI) which measures how well a building satisfies stakeholders. This paper presents the early phases of doctoral research which will examine the impact of integrated design management approaches upon Design Quality.

Keywords: contractor-led project, design process, design quality, design quality indicator.

INTRODUCTION

As revealed by Murray and Langford (2003), the construction industry's performance has been the subject of criticism for at least the last 50 years. The theme arising from most of the reports they reviewed is strikingly similar; the need for a change in the relationships between parties involved in construction which encourage process integration rather than fragmentation. Similarly, Bennett *et al.*(1996) note that "the true integration of design and building processes, allied to partnering, represents the building industry's best chance to engineer long-overdue cultural change in construction". Egan's (1998) Rethinking Construction report is widely accepted as having had an important influence (see, for example, Macmillan 2006b; Murray and Langford 2003; Morton, 2002). Central to the report are the achievement of key performance indicators (KPIs) (relating to cost, time, predictability, defects, accidents, productivity and turnover and profit) whose achievement depended on (inter alia) an integrated process and integrated teams. Cole-Colander (2003) laments that the "focus of this revolution" led by managers and accountants, is intensely practical and led to design professionals (particularly the architectural profession) "sitting on the sidelines".

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Architects' roles have changed in recent years. Morton (2002) highlights that architect's traditional claim to be leader of the building team and manager of the construction process has, in the last thirty years, been increasingly challenged. Recent work (Greenwood *et al.* 2008) notes a considerable shift from the 1950s industry order, where the architect dominated the process as client advisor, 'gate-keeper' to the construction process and controller (as administrator) of the contractual relationship between promoter and builder, to a new order, where the architect's position and role is as a member of an inclusive team and, significantly, as a participant in, rather than the leader of, the process. They identify that two drivers are responsible for this change: firstly, a change in society's view of the status, role and nature of professions in general (and the architectural profession in particular).

This appears to have some connection with the notion that clients now more demanding (see, for example, Gray and Hughes 2001). Secondly, a shift in the way promoters buy buildings in the UK, where the increase in non-traditional forms of procurement have served to alter both the 'architect-promoter' and 'architect-contractor' relationships.

The focus of the present study is the effect of these changes on the construction process and its product; and, in particular, the product's quality (i.e. the building itself).

APPARENT IMPROVEMENTS

In his report on 400 demonstration projects, Egan (2002) identified the clear improvements in project performance (cost, time and quality) that followed the introduction of the Rethinking Construction recommendations. Similarly, Macmillan (2006b) highlights recent improvements in on-time delivery and budgetary control (though interestingly an improvement in quality is not mentioned). When the causes of improvement are discussed, expressions such as "Integrated Working", "Collaborative Working" and process and team integration are dominant (Egan 2002; Langford and Murray 2003; Macmillan 2006b).

Authors such as Fernie and Thorpe (2007) and Dainty *et al.* (2001) highlight early, effective and intelligent management of the supply chain as having been linked to producing these higher performing projects: indeed Egan himself (2002) advocates the early appointment of the delivery team. Detailed analysis of Supply Chain Management (SCM) theory lies beyond the scope of this paper. It is however useful to provide an outline definition and contextualise its application in construction in order to provide insight into its use in the industry. Precise SCM definitions vary, however two issues arise: first, inclusivity (i.e. an emphasis on managing the "network" of all firms involved) and second effectiveness; i.e. their management in a way that adds value (see for example, Egan 2002).

Integrated Supply Chains

Providing an industry context, Xue *et al.* (2007) describe SCM as the integration of key construction business processes, from the demands of client, design to construction, and key members of construction supply chain, including client/owner, designer, contractor, subcontractor and supplier. They also promote a focus on how firms use their suppliers' processes, technology and capability to enhance competitive advantage and stress the extension of traditional intra-enterprise activities by bringing trading partners together with the common goal of optimisation and efficiency (long-term, win-win) . They propose that the ultimate goal of SCM is improving construction performance and adding client value at less cost. Similarly the Specialist Engineering Contractors' Group (SEC 2007: 4) define integrated working as "the bringing together of all the processes involved in construction delivery – especially design and construction – into a seamless whole"...(involving)... consultants, project managers, specialist contractors, facilities managers and suppliers". The importance of early appointment of the team is also stressed. This review of SCM and integrated working shows how the terms may be used interchangeably. This is to say integration in construction is one of the key aspects of the application of SCM.

Integration and procurement methods

One of the advantages claimed for the Design-and-Build procurement method is that it can facilitate early contractor involvement in the design process (see, e.g., Franks 1998). Architects work under sub-contract by the main contractor from varying stages in the design process (see, for example, Greenwood and Walker 2004). Hughes *et al.* (2006) suggest that the value of projects executed through Design-and-Build exceeds that of work performed under traditional methods; they state 46% of UK construction output is associated with Design-and-Build while 37% is attributed to traditional methods. Greenwood *et al.* (2008) identify Design-and-Build as the most predominant procurement form, and portray contractors using the method as being involved to differing degrees in integrated working (e.g. long term relationships). The above observations suggest design methods reflecting a traditional approach no longer best suit today's projects. The original Royal Institute of British Architects (RIBA) Outline Plan of Work, while useful in providing an "industry language", reflects a traditional approach (full design and project coordination by an employer appointed Architect) when in fact Architects are now more typically employed under sub-contract by a main contractor.

Recent research (Austin *et al.* 2007) suggests contracting companies (offering Design and Build services in the construction industry) recognise improvement in design process management is needed – the need to integrate design across organisations successfully is highlighted. Integrated design is a key element of integrated team working. Emmitt (2007: 14) indicates integrated design is characterised by interdisciplinary working within integrated teams. Elvin (2007) affirms integrated design as being incremental, proceeding in stages as the project progresses; the example of an integrated architecture / engineering / construction team is offered. Working together they can define a structural system sufficiently in order to make key purchasing decisions but are also able to employ various strategies to keep the design as open and as flexible as possible to accommodate high levels of speed, uncertainty and complexity and change in today's projects.

"Integrated Solutions" (IS) are a means whereby a group of organisations (consortia) provide clients with a "one-stop-shop" for the whole product or service life cycle. The literature (e.g. Brady *et al.* 2005) indicates IS provision can be traced back to the 19th century and it was common for infrastructure projects to be promoted and financed by private investment prior to the First World War. IS has been described as involving the bringing together of products and services in order to address a customer's particular business need (Brady *et al.* 2005). They highlight IS provision as involving specifying, designing, construction, financing, maintaining, supporting and operating a system / facility. Similarly IS has also been defined as the provision of goods and services in combination to meet a performance requirement (Saxon 2002). In Elvin's (2002) guide relating to "Integrated Practice in Architecture" (the USA equivalent of

IS) a constant theme is integrated team working and integrated design. The entanglement of IS, integrated team working and integrated design is clear.

The UK PFI (Private Finance Initiative) is deemed as having energised the confluence of sectors towards IS provision (Saxon 2002). Extensively used in the UK to deliver public buildings, PFI and its derivatives provide integration of the delivery team in a design-and-build type scenario. Highlighting why there is demand for IS within the industry Saxon (2002: 334) asserts “Customers goals vary hugely, but almost all of them do not include demand for the services of design or construction per se. Customers need the use of facilities only to meet their organisational objectives or as investment products. For the occupier customers, the task of obtaining and managing real estate and facilities is non-core business”. This notion leads to the identification of facilities as solutions for a customer’s specific business or operational needs (Brady *et al.* 2005). The customer-centred approach is clearly in evidence here.

RESEARCH AIM, OBJECTIVES AND METHOD

Based on the above reasoning, the hypothesis upon which the study is founded is that the early integration of (a) contractor(s) into a project’s design process impacts upon a building’s design quality. The aim, therefore is quite simply to test this hypothesis. Although the aim is simple, its accomplishment is not. In essence, the research questions are (1) what is happening within design approaches employed presently? and (2) what resulting effect, if any, is there on design quality?

As noted earlier, relatively recent changes in the industry have resulted in a situation where the “de facto” model of the design process – the RIBA Plan of Work – no longer accurately represents what actually happens. The RIBA Plan of Work (2007) has attempted to address this – with various delivery methods allowed for. This does not confirm how the design process is being applied in current contractor-led projects. Lawson (2004) points out that the design processes of experienced and outstanding designers use quite different sequences. When reviewing the experiences of five main contractors (who acted as design leaders) on recent projects, Greenwood *et al.* (2008) demonstrate a consensus that it was difficult to ‘know’ and therefore control the design process, the “intangibility of design” was a prevalent theme; clearly the process is a complex one, and not easily mapped. This acknowledgement of design difficulty is of particular interest to the author when also considering the turnaround in design approaches in recent years.

The approach will be to investigate how a number of completed projects under investigation were designed; with particular emphasis on the early integration, or otherwise, of members of the supply chain other than the traditional designers. In this respect the classification of a project’s procurement method (see above) is helpful (though not necessarily entirely reliable) and a more fine-grained classification will probably be necessary.

The unit of analysis will be the individual project. Data will be gathered by surveying a number of projects (5, as a pilot, to establish a consistent approach; 10 to gather sufficient data to model the process and outcomes; and a wider sample, of around 20, to validate the model) each of which must provide information (i) on the way its design had been completed (specifically the extent of early integration of the supply chain) and (ii) on some objective assessment of the final quality of the design (excluding pilot cases).

In the first instance 5 geographically local "pilot cases" are to be examined. The feasibility of collecting specific data and gauging its importance will form a key component of "pilot case" examination – the main objective being the refinement / development of a consistent, effective and practical approach rather than actual design quality assessment. 10 interviews combined with project record review will form the data collection method supporting modelling of processes and outcomes. Approximately 20 Questionnaires, suitable for model validation will be utilised.

Satisfaction of the second research question (i.e. the effect on design quality) presents a problem, namely the notoriously difficult task of defining 'quality'. For a number of reasons, the author has adopted an existing, measurable, and reasonably widely accepted measure, namely the Design Quality Indicator (DQI). A fuller analysis of the DQI and its emergence will follow this section. The projects sampled (excluding "pilot cases") will have been subject to a DQI evaluation – CIC (Design Quality Team) supply of existing DQI data will support this area of the research. Such a ready-made measure of design quality, albeit imperfect, permits the aim of the research, that is to test whether the early integration of the supply chain, into a project's design process, has an impact on a building's design quality.

THE DESIGN QUALITY INDICATOR

There are well-documented examples (see, for example, CABE 2002) of good design adding value including improved education results and better levels of motivation in well designed schools and offices respectively. Similarly it is asserted that good design contributes to staff recruitment, retention, recruitment and value for money (NAO 2004). It is argued that design is a generator of value and key to ensuring the built environment provides wide-ranging benefit in which the whole of society shares (Macmillan 2004).

Despite the initial concentration of industry reform on process and efficiency improvement (Saxon 2005) the importance of design quality has gained momentum (see Whyte *et al.* 2004: 197). The comparative lack of emphasis on design quality in the emergence of performance measurement following the publication of Rethinking Construction led to disquiet among the UK building design community (Gann *et al.* 2003). There were concerns that the value of building design might be relegated to a secondary issue with an agenda focusing heavily on the measurement of processes. This concern is supported by the literature (e.g. Macmillan 2006a) that asserted that the absence of the ability to quantify "delivered value" resulted in a risk of building "down to a cost" rather than "up to a value".

Since World War II buildings were designed down to a budget by consultants, and then tendered for by contractors, with the lowest-cost tender winning, and a near-complete absence of consideration relating to the effect of the building on its occupants' performance and well-being and the lifetime operating costs (Saxon 2005). Authors (Gann and Whyte 2003) lamented the fact that "we do not have a well developed understanding of what design quality means or how it is measured". Cole-Colander (2003) broadly described "design quality" as the least easily-measured and articulated values of a building (as apposed to the more easily-measured: buildability, maintainability, process management and delivery). Whereas ideally, the design of a building should produce the best possible combination of a building's functionality, quality and impact as being central to achieving design quality (see, for example, Gann *et al.* 2003).

Macmillan (2006a) suggests that the establishment, in 1999, of the Commission for Architecture and Built Environment (CABE) was pivotal to the promotion of design Quality in the industry. The Better Public Buildings campaign is cited as an early success of the organisation. The campaign intended to bring about a step change in building quality and promoted benefits of good design (i.e. children learning better in well designed schools). This organisation, amongst others (for example, Constructing Excellence and the Strategic forum for Construction), sponsored the development of an industry tool with the primary objective of measuring building quality. While uncertainty over the role and existence in the industry of some of the sponsoring bodies has surfaced in the last 5 years CABE has established itself as an authoritative voice for design in the built environment (Meikle and Dickson 2006).

Government interest in design quality culminated in The Construction Industry Council (CIC) commissioning the Science Policy Research Unit at Sussex University, Brighton, to develop DQI as a means to assess the product (Gann and Whyte 2003). Work pertaining to the background, application and benefits of the tool are well documented. Perhaps the most helpful insight comes from the researchers involved in the initial roll out of the DQI in 2002 (Whyte *et al.* 2004; Gann *et al.* 2003) but there are many others (Eley 2004; Prasad 2004; Dickson 2004; Slaughter 2004; Thomson *et al.* 2003).

These texts highlight that the aim of the DQI was to provide a tool, having learned from existing tools, which measured design quality in buildings as well as ultimately capturing lessons from the outcome of current building design and feeding these into next generation designs.

The tool, capable of eliciting data based on “perception” and personal opinion, is made up of three elements. Firstly the Conceptual Framework i.e. Functionality, Building Quality and Impact. This broad framework forms the basis of building quality assessment. Secondly the data gathering tool which is split into ten sections derived from the conceptual framework, table 1 refers. The data gathering tool is a questionnaire soliciting responses from participants (Clients, Users, Designers etc.) to a series of statements relating to the ten sections identified in table 1.

The questionnaire also collects information relating to “constraints” and “enablers” which helps magnify areas where the building has performed well despite budget limitations. Thirdly the weighting mechanism FAVE (Fundamental, Added Value and Excellent) which is used to prioritise elements of the building deemed most important to key stakeholders. It can be applied at the briefing stage to gauge aspirations (this is deemed as the tools most useful application), at mid design allowing for measurement against aspirations, at “ready for occupation” (to check original intent achievement) and “in-use” to aid learning on future projects.

Table 1: The DQI data gathering tool sections.

Conceptual framework area.	Sections within the data gathering tool
Functionality	Use, access , space
Building quality	Performance, engineering systems, construction
Impact	Character and innovation, form and materials, internal environment, urban and social integration.

Measuring value is particularly difficult due to the varying stakeholders judging and differing value types (Thomson 2006; Saxon 2005). Some discussion here is useful as good design quality is deemed to positively affect the hard to measure value by increasing "what you get" and reducing "what you give" (CIC 2005). Prasad (2004) refers to this affect as enlarging the "resource envelope" by increasing value over a longer timescale with greater affect than that of capital investment.

Within the literature the term “value” generally centres on the relationship between quality and cost or of closely related terms. The thinking being that in well designed buildings quality should exceed cost thus providing some value. Having reviewed the term value in several fields in order to develop a useful understanding in a construction context Thomson *et al.* (2003) adopted the following working definition:

$$\text{Value} = \frac{\text{Benefits (what you get)}}{\text{Sacrifices (what you put in)}}$$

They sum up by indicating value is the relationship between positive and negative consequences (output and input, or benefits and sacrifices). The working definition expresses provision of the right product or service, at the right time, for the right consideration, to the right customer. Other recent work (Saxon 2005) has produced similar thinking, i.e.

$$\text{Value} = \frac{\text{What you Get}}{\text{What you give}}$$

Positive value exists for any player when they get more in their own terms than they must give up. Negative value exists when sacrifices exceed benefits.

The tool has subsequently been used at various stages of design to help inform design decision-making (Gann *et al.* 2003). Similar observation (Eley 2004) notes the DQI as providing a tool for clarifying the brief, and more importantly, a reasonably simple way to ensure that the relevant parties give the brief the attention it deserves and requires.

DISCUSSION

To some extent, the argument that the early involvement of the project’s deliverers in its design may appear paradoxical. For instance, Bennett *et al.* (1996) assert that “the image which design-build conjures up is that of the worst possible building, low in quality and of little or no architectural merit. The only priority being the bottom-line cost”.

Dewulf and Meel (2004) in their evaluation of 400 UK PFI buildings in 2001, note that there was a focus on efficiency rather than quality and innovation; they go on to highlight similar problems identified in Holland in 2002, where Public Private Partnerships focused on low capital cost and efficiency, rather than the value a building can add to society. Cole-Colander (2003) also notes the negative affect on design quality when the prime aim is to reduce construction costs by 30% (as was deemed desirable and achievable by Egan in 1998).

However, following the call for design-led integrated working in the mid 1990s, Bennett *et al.* (1996) refer to “the seeds of a better way forward” provided by the integrated approach which design-build provides, if only it were truly design led. In the 1990s, UK built environment research was dominated largely by construction-related issues and a focus on the business process of construction rather than its products and their impact (Macmillan 2006a). Yet Egan’s Accelerating Change

Report (published in 2002) “corrected” the omission of “quality of product” from the earlier report (Rethinking Construction 1998), and quality has, subsequently been on the improvement agenda.

Is integrated design, and the early involvement of the contractor (in particular) indeed a formula for a down-valuing of quality? Or does this kind of approach improve things beyond mere time and cost efficiency and their predictability? In order to answer such questions, two problems, that of uncertainty about variations on the design process and how they can be categorised, and that of objectively measuring quality, must be overcome. These are the key objectives of the research.

CONCLUSIONS

The industry has been characterised for many years by discontinuity in the construction process leading to inefficiency and dissatisfied clients. The KPI-driven Rethinking Construction agenda (Egan 1998) encouraged the integration (via SCM) of project participants, and contractor-led design is now common (e.g. through the use of the design-and-build procurement method and PFI).

This change is arguably one of the factors responsible for a major change in the architect’s role - now more commonly a participant in the project rather than its leader. Efficiency has been improved but, some have alleged, to the detriment of design quality (Dewulf and Meel 2004) which ultimately affects value (Prasad 2004).

Design method ambiguity coupled with the changing approaches encouraged by the Rethinking Construction agenda and the recent design quality importance elevation and measurement feasibility in the industry (supported by CABE and CIC) provide an interesting area for research. For example, can the different approaches to building design (and its management and integration) be properly categorised? Have they already been, in which case are the current categories still valid? And if so, what design approaches best foster design quality.

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