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**DESIGN MANAGEMENT FROM A CONTRACTOR'S
PERSPECTIVE: THE NEED FOR CLARITY**

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ABSTRACT

Over the last forty years, a concern with the adoption of business methods to support successful design development has emerged. Design management as a discipline addresses such concern through two central schools of thought. The first focuses on organising the design firm, and the second aims to better understand the design process (its nature, stages and activities) and to propose improved communication and coordination mechanisms. Both schools of thought have taken essentially a design professionals' perspective to analyse design.

Nevertheless, the recent adoption of procurement routes in which contractors are responsible for design, construction and facilities management has imposed on contractors the need to manage design to maintain competitiveness. This paper presents results from two case studies investigating the contractors' role in managing the design process. Research results are presented in terms of the problems contractors face in managing design, the necessity for appropriate design management as well as the skills contractors believe are required for effective design management. The paper concludes by advocating a need for clarity in the definition of design management from a contractors' perspective.

Keywords: design management, design managers, contractors

1. INTRODUCTION

Architectural design is a complex activity which poses difficult managerial problems. Complexities lie within the technical knowledge, information availability, the uniqueness of design and interactions between different stakeholders (Sebastian, 2005). Design involves a number of decisions with numerous interdependencies (Cornick, 1991; Ballard and Koskela, 1998). There are often conflicting requirements, demanding an effort to recognise, understand and manage trade-offs, and decisions must usually be made quickly and sometimes without complete information (Reinerstsen, 1997; Sanban *et al.*, 2000; Koskela, 2004). A large number of stakeholders are involved, such as architects, project managers, structural engineers, building services engineers and marketing consultants. Moreover, feedback from production and operation takes a long time to be obtained and tends to be ineffective (Formoso *et al.*, 2002).

Design management as a body of knowledge has emerged aiming at better understanding and tackling some of these issues. In recent years, the rising complexity of projects and a growing market competition has significantly increased the pressures to improve design performance, i.e. develop high quality design solutions through shorter timescales. Such complexities affect both designers and contractors.

In the UK context, procurement routes like Design and Build (D&B) and Private Public Partnerships (PPP) are currently being widely adopted. These enable clients and/or owners to benefit from having one single organisation taking responsibility for delivering the required building and associated services according to predefined standards (Bennett *et al.* 1996). Akintoye (1994) further elucidate that the majority of D&B contractors employ external consultant architects and engineers to develop design. Within this environment, contractors need to appropriately manage the design process to maintain competitiveness in the marketplace and to reduce waste both in design and in downstream construction activities (Broadbent and Laughlin, 2003).

However, up to date, design management research has not sufficiently emphasised how contractors could manage design, what is their role in this process and what barriers they face. The concept of design management and the necessary skills to manage design from a contractor's perspective appear to be unclear. Such a gap may be a partial consequence of the fact that design management has typically been approached mainly from the perspective of the different professionals involved in design (Press and Cooper, 2002). Therefore, a broader perspective on design management is needed.

This paper aims to partially address this issue by analysing data from two case studies in which contractors were responsible for managing the design process. The paper discusses the role of contractors in design management, examining the skills needs for design managers from a contractor's perspective. Questions for further research are also posed.

2. DESIGN MANAGEMENT

Design management endeavours to establish managerial practices focused on improving the design process, thus creating opportunities for the development of high quality innovative products through effective processes. Even though excellence in management is not considered a substitute for high quality creativity and innovation, it can represent the difference between success and failure in multidimensional and complex project environments (Cooper and Press, 1995).

In architecture, the work of Brunton *et al.* (1964) represents an early attempt to introduce managerial concepts in design (Emmitt, 1999). The search for an understanding of how people perform complex cognitive activities has been the underlying principle of design research for the past four decades (Kalay, 1999). During this period, there has been a slow but steady growth in understanding design ability. Similarly, the need to provide research and measures to encourage firms to make use of design for competitive advantage came to light (Press and Cooper, 2002). It was hoped that understanding “how designers think” would lead to the development of methods and tools to help the reliable achievement of high quality results in design (Kalay, 1999; Lawson, 2006).

In general, past research has focused on two different design management dimensions, i.e. office or practice management and individual job management (the management of the design/project in hand) (Sebastian, 2004). However, such distinction may be potentially misleading since the two interconnect, i.e. the management of people and social characteristics of staff employed will create the unique culture of the firm, which will in turn affect the way individual projects are managed (Emmitt, 1999).

From a project management or individual job perspective, the design process has been studied from two different viewpoints. The first aims to increase understanding of the nature of the design activity (e.g. Lawson *et al.*, 2003). The second proposes ways in which design should be developed at its different stages, considering both ‘hard’ activities and ‘soft’ social design interactions (e.g. Kagioglou *et al.*, 1998). Along these lines, design management has been closely related to a concern with systematic design methods, focusing on the outcome of design decisions - the product of design - and the activity of designing - the design process (Cross, 1999; Press and Cooper, 2002; Lawson *et al.*, 2003).

As a result, the need to consider the whole lifecycle of projects became apparent. Architectural management evolved from approaching design as an isolated activity at the front-end of projects to cover the project from inception through to demolition, recycle and re-use. Figure 1 describes the context in which design management happens, and demonstrates the importance of communication and collaboration with different stakeholders. These are essential design and design management skills.

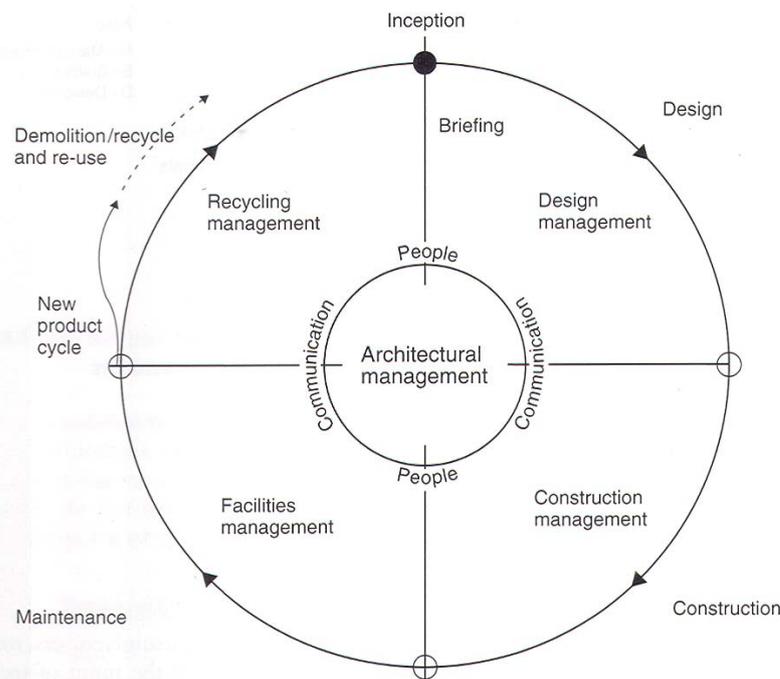


Figure 1: Architectural design management within the project framework, from Emmitt (2002:40)

Such broader pictures describe some of the different issues that need to be considered by design managers. Nevertheless, for design management to be effective, a more detailed understanding of skills needs is essential. A brief description of such skills as discussed in the literature is presented in the next section.

2.1. DESIGN SKILLS

Design skills are essential for the activity of designing. Bloom *et al.* (2004) state that, put simply, skills are what an individual possesses, and these could be learnt both informally (on the job) and formally through training. It is important to recognise that there is a natural way in which humans develop the ability to design, e.g. by categorising different things or through activities such as changing the furniture layout in our houses. However, the development of design skills could be compared to the acquisition of a language, in that it is a continual process beginning in childhood (Lawson, 2006).

It is accepted that in order to locate design skills and competences (i.e. knowledge and behaviours) and to consider their value, one must analyse the breadth of the profession of design. Differing design professions have evolved by educational push and by corporate and consumer pull, which means that there are various perspectives from which to assess the design

and the design management profession and its future (Press and Cooper, 2002).

It is recognised that design activity includes high cognitive abilities, including creativity, synthesis and problem solving. Cross (2004) reviews the field of expertise in design, linking it to design behaviour and the design process. The author states that expert designers appear to be ‘ill behaved’ problem solvers as they do not spend much time defining the design problem. Expert designers are, therefore, solution-focused, not problem-focused. Generating a wide range of alternative solutions is a recommended strategy in the literature (e.g. Reinertsen, 1997). However, Cross (2004) points out that this may not be necessarily good, as most expert designers tend to define a single solution and then develop it further. The study of the way in which expert designers behave may provide clues as to how design management should be approached; however the links between these two areas appear to be unclear in the literature.

Design managers skills have been briefly described in the literature. It has been stated that design managers need to have the skills to understand a comprehensive set of requirements and to support their capture from the client/users and construction teams (Barrett and Stanley, 1999). They also require communication skills, both verbal and visual, to coordinate the exchanges of information throughout design development, and explain the concepts to the stakeholders whenever necessary (Press and Cooper, 2002). Therefore, design managers need to have *technical skills*, looking at design as a sequence of activities based on a rationalised approach to a technical problem; *cognitive skills*, approaching the skills and limitations of the individual designer; and *social skills*, looking at how designers interact with other stakeholders and how this influences teamwork and value generation (Cross and Clayburn, 1995).

Even though such descriptions are important, it is believed that more information is needed to support a better understanding of design management and of the skills effective design managers should possess to work. The currently poor understanding of the role of design managers within different contexts (e.g. design office, contractors, developers, etc) may be related to deficiencies in current definitions of design managers’ skills.

2. RESEARCH METHOD

The epistemological option for this study is based on the interpretative school of thought. The research uses qualitative approaches to inductively and holistically understand human experience in context specific settings. As pointed out by Silverman (1998:3), a “particular strength of qualitative research ... is its ability to focus on actual practice in situ, looking at how organisations are routinely enacted”. Thus, design management developed by contractors was analysed with an emphasis on meanings, facts and words to reach an understanding of the phenomena in practice.

Within this context, a case study approach with exploratory characteristics was used to understand the overall role of contractors in managing design, and examine the skills design managers need to perform such activity. The two companies involved in the case study are major construction contractors within the UK, and both are heavily involved with design management due to the type of procurement adopted, i.e. in both cases more than 60% of the work undertaken involves managing the design *and* construction processes. The companies were also selected because they considered design management to be of strategic importance.

Data was collected through (a) 7 semi-structured interviews with design managers – 4 at Company A and 3 at Company B; (b) participation of one of the researchers in meetings in which design management issues were discussed (6 at Company A and 4 at Company B); and (c) documentary evidence including company information over the internet and descriptions of design managers capabilities and skills. Specific documents for Company A included: design management map; map linking the design and BID processes; training programme; mistakes made and lessons learnt; designer performance review form; management system procedure; D&B guidance notes; hospital bidding documentation. Documentary evidence for Company B incorporated procurement information (e.g. <http://www.dh.gov.uk/ProcurementAndProposals/PublicPrivatePartnership/NHSLIFT/fs/en>); bidding documents; training needs for design managers; and description of the design managers' role. All interviews were tape recorded and verbatim transcribed, generating a detailed report on design management issues faced by the companies.

Data analysis was developed with the aid of content analysis. According to Krippendorff (1980:21) '*content analysis is a research technique for making replicable and valid inferences from data to their context*', and its purpose is to provide knowledge and new insights through a representation of facts. The analysis focused on identifying the perceived role of contractors and its design managers in managing design, the problems faced, as well as the perceived skills design managers should have from the contractor's perspective.

3. FINDINGS

Case study findings are presented for Companies A and B. The background of each company is discussed, followed by a description of its role in managing design. Interview quotes are provided to enrich the discussion. Finally, the role of design managers is discussed. The discussion section presents the cross-case analysis and draws major conclusions.

3.1. Case study construction Company A

Company A is a major civil engineering and construction contractor. The company's turnover is around £450 million a year, with staff about 1,200

in the UK. The company works in different business streams and 70 to 80% of the contracts are procured through D&B or PPP. The company has main offices in 18 different regions in the UK.

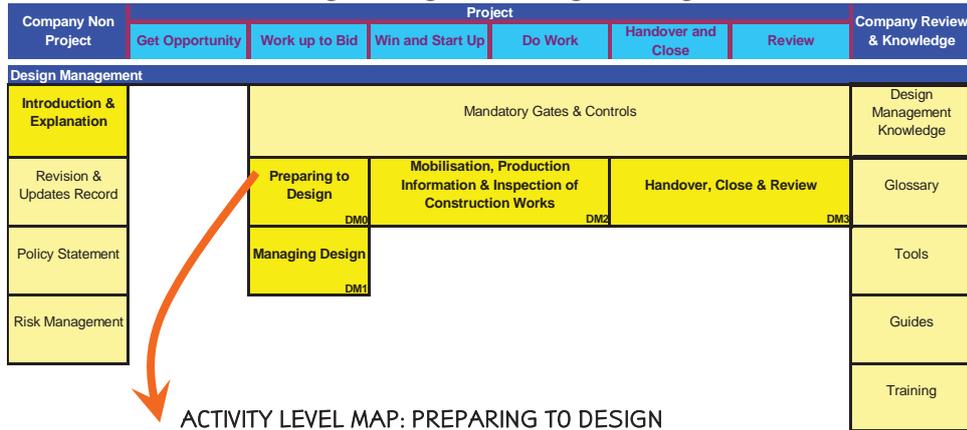
3.1.1. Background

Company A was involved in an improvement programme called “Implementing Best Practice”. As part of such programme, a design management process model was developed. The model describes the design process focusing on the activities to be performed by the contractors’ design manager. The model aims to improve design management skills and therefore bring all company design managers to a minimum standard.

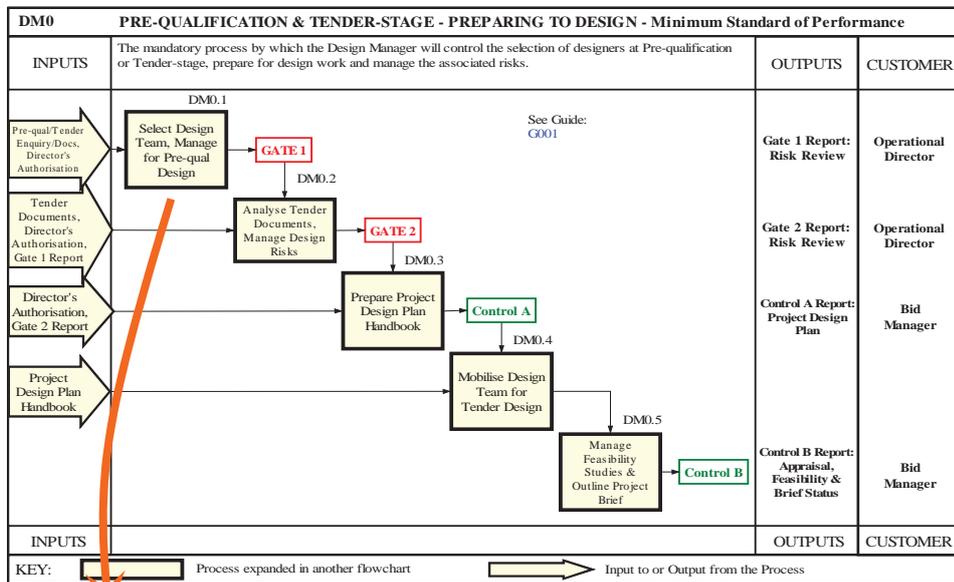
The model is a prescriptive ‘to-be’ generic model (see Winch and Carr, 2001 for a definition) developed at the firm level, presenting six project phases: (a) **get opportunity**; (b) **work up to bid**: involves all design stages; (c) **win and start up**: includes the award of the contract, mobilisation and production information; (d) **do work**: construction; (e) **handover and close**; and (f) **review**; as described in Figure 2. The figure also presents the hierarchical structure of the model, which presents three different levels of detail, i.e. project stages, activities and tasks.

HIGH-LEVEL PROCESS MAP

Design Management Navigation Page



ACTIVITY LEVEL MAP: PREPARING TO DESIGN



TASK LEVEL MAP: SELECT DESIGN TEAM AND MANAGE FOR PRE QUALIFICATION

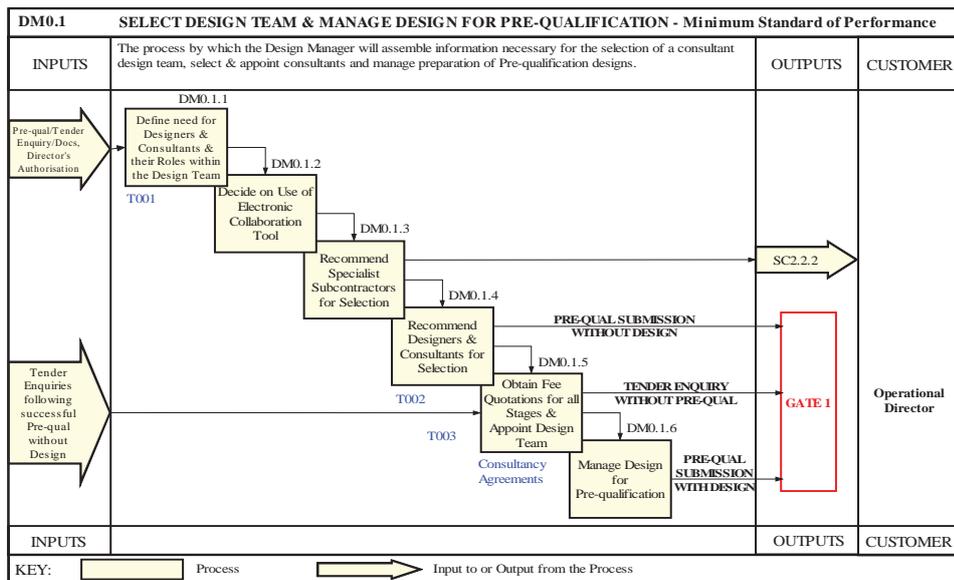


Figure 2: Design management process model – hierarchical structure

The model defines project deliverables as well as information needs in terms of activities, technology and people. The discussion here presented focuses on the role of design managers within the firm, as well as the problems faced by the company in managing design, which triggered the process model development.

3.1.2. Design management problems: the role of design management

In Company A, design management is perceived as a significant risk due to the fact that badly managed design can cause increased construction costs, rework, changes and time delays. More importantly, poor design can cause failure in bidding, affecting competitiveness. Even though its importance is clearly recognised, design is the most inconsistently managed process across the company. Inappropriate planning, poor reviews, poor resource availability and poor quality were issues identified. As stated by a senior design manager interviewed:

'this is where the problem is, processes are inconsistent at the moment, and design is the one we are most inconsistent, and that's the best way of describing it'

Design work is always sub-let to external consultancies. Progress is usually monitored against high-level milestones. However, milestones do not focus on the information that should be produced but rather on major activities such as getting planning approval. Furthermore, there is a belief that the detail design phase should be pulled from construction planning (as, in most cases, design and construction are developed concurrently), but this does not happen due to poor information transfers with external designers. As a consequence, many design decisions are taken on site.

Design review meetings occur less often than it would be appropriate. Design fixity (see Kagioglou *et al.*, 1998 for a definition) should be sought through these reviews, but the concept of fixity seems to be poorly understood, and there is no clarity on how it could be achieved. Moreover, defining and controlling the brief is considered a challenge, as designers have their own agendas which often conflict with the contractor interests, as clearly stated on the following interview extract:

'designers want to reduce their own costs... and are not so much [concerned] with reducing construction costs'

Further difficulties occur when design is novated to the company. This is generally problematic as the proposed design does not consider the company building standards, and there is no financial flexibility to obtain design changes or details. In addition, it has been stated that sometimes designers are inflexible in terms of not being able to respond to the

company requests due to the small size of most design consultancies, which lack slack resources¹.

The company has in total 12 design managers which, in general, get involved in large D&B construction projects. From those, 3 are designers and 9 come from different backgrounds, e.g. planning, programmers or quantity surveyors. Therefore, it appears that most design managers do not have appropriate knowledge, and possibly do not have the necessary skills to manage design. This is evidenced by the following interview extract:

'we have people doing design management but they don't actually know how to do it, they are not qualified to do it, ... because they don't really understand the design process ... so the only thing that they can check it for is if it is buildable, and relatively simple plans, quality plans. So most of them ... tend to operate as information coordinators, its just pushing drawings out of the people, without really analysing quality or the process...'

Finally, the company design managers suffer difficulties with external architectural consultancies as, in many cases, the latter believes the contractor to be taking over their responsibilities. This demonstrates tensions with regards to who should manage design, designers as service providers, or contractors as the internal client.

3.1.3. Skills required

Company A have difficulties in defining the role of design managers and consequently the skills required to perform the activity. Company offices in different regions work independently and this generates problems in implementing a unified approach. Furthermore, some of the company managers believe that as design work is subcontracted, so should be design management. Others believe that design is of strategic importance and, therefore, its management should be taken over by the company for its own benefit, as well as for the benefit of its clients.

Even though there was not an agreement with respect to subcontracting or developing design management internally, work was conducted as part of the process model design to establish basic design management skills. Seven key skills for design managers were established, i.e. design procurement, commercial interface, project standards, design coordination, design verification, programme and performance measurement, and project systems (IT focused). Those skills were further defined through a list with 35 items presenting what was called a summary of the design managers' role, described as follows.

Firstly, the design manager should map the specific project process, based on the generic model. The project process should form the basis for planning and controlling design development, including the delivery of work by external consultants and subcontractors. Weekly meetings should

¹ Slack resources are surplus resources necessary to address unexpected work, threats or opportunities – see, for instance, Daniela et al., 2004

be held to ensure work is developed to schedule, and the design manager should have authority to coordinate the participants and activities of each phase. Secondly, the design manager should appoint appropriately skilled design consultants. Thirdly, s/he should be the communications link between the clients, designers and subcontractors, and therefore be responsible for controlling the briefing process and requirements management. In this sense, s/he should be able to have a fast and effective decision making over design matters. Fourthly, issues of design aesthetics, buildability, costs, quality and programme constraints should be appropriately balanced. Drawings should be checked and approved for compliance to the contractor's regulations. Finally, soft human skills are mentioned in terms of providing leadership and establishing teamwork.

However, it seems that the development of an overarching standard approach to design management within the firm remains a major challenge. This is partially a consequence of the divergent perspectives over design management within the company, which has been evidenced through discussions observed by the researcher about the implementation of the design process model. These focused much more on 'what is a design manager' than on the implementation process itself. This demonstrates the importance and lack of clarity on the design management approach at Company A.

3.2. Case study 2: Construction Company B

Company B is an international construction group with capability in the design, procurement and delivery of major projects. Its turnover is around £1.6 billion, with about 9000 staff in the UK. The company has a major track record in working through initiatives like Private Finance Initiative and Design Build Finance and Operate schemes with the public sector.

3.2.1. Background

Company B is involved with the LIFT initiative (Local Improvement Finance Trust). LIFTs are Public Private Partnerships set up to allow NHS Primary Care Trusts and their local partner organisations to develop primary healthcare facilities. Through LIFT a number of schemes are clustered and delivered by a single private sector partner. Company B is the private sector partner in two major LIFTs in the UK, being responsible for designing, building, financing the facilities and providing facilities management and support services over a 25 year period.

Company B was responsible for procuring designers and managing the design process in the development of LIFT schemes. The design of such schemes is challenging, as buildings are innovative and complex. Complexities lie within the need to provide therapeutic environments supportive of the healing process and the need for a patient-centred service model (Gesler *et al.*, 2004). The functional level of the buildings and the operating conditions are complex, as different services need to be delivered

jointly, and the service mix and ways of operation are varied and unknown at the outset.

3.2.2. Design management problems: the role of design management

Company B considers effective design management essential in controlling the front-end of the majority of its projects. Furthermore, design quality is considered paramount to maintain and increase competitive advantage. However, the company faces design management difficulties. Poor clarity with regards to who should capture and manage requirements, poor control of design changes, difficulties in managing exchanges of information between clients, designers and contractors, and poor alignment between design solutions and clients' requirements were issues identified. The occurrence of these issues is illustrated through the description of problems that have occurred on a specific primary healthcare project.

There was no appropriate ownership and control over clients' requirements at the project environment. These were partially managed by the clients, partially by Company B' design managers, and partially by the architects. Requirements were not ranked nor was the ability to deliver analysed. As a consequence, there were difficulties in trade-offs between users 'wants' and a prioritisation of project needs. In addition, the design managers/designers were not present at all requirements capture meetings, therefore the expected support to the client was not provided, and communications between clients and designers were inappropriate.

Furthermore, there was no audit trail for design changes in place. Requirements changes have been dealt with directly by the architects, and requests from users were generally included in design without considering affordability or the effects that the changes had in terms of time delays. The amount of changes in the project is clear from the following interview transcript:

...I do remember some late change requests, and I kept saying, do you {client/user} realise what this is going to cost you? And when they did, then they managed to refine their requirements. And there had been design solutions that had cost a fortune that had to be removed as inappropriate design solutions. So it was an unstructured, ill disciplined process...

As it was the case in Company A, Company B design managers come from a variety of professional backgrounds, i.e. engineers, architects, building services and planners. Most importantly, many design managers did not have all capabilities necessary to appropriately perform their role. Both design managers interviewed did not have previous training or experience in design, as one had a degree in construction management and worked as a production coordinator, and the second had a building degree and had worked with construction planning. It is believed that this might have influenced some of the problems that occurred at the project level.

Interview data also made clear that design managers in Company B tend to approach their work from personal, and sometimes contrasting

perspectives. For instance, one design manager believed that as he was representing the contractor, he should not be involved in requirements capture and management. However, it was on the remit of the contractors work to provide support to the clients in managing requirements. On the other hand, a second design manager believed that he should manage requirements and provide an appropriate link between clients, contractors and designers. Unfortunately, he has faced problems in performing such activities due to his skills level and due to his poor bargaining power with both the client organisation and the designers. Such different managerial approaches make explicit the lack of clarity in design management roles and responsibilities at the company level.

3.2.3. Skills required

Company B has stated the design management skills it requires in terms of different issues. Design managers are expected to have appropriate professional qualification (e.g. RIBA, MICE, MIOB, etc.) and to be able to demonstrate competence in the role. There is a belief that good design managers must understand the project's needs, budgets and aspirations, making decisions and communicating these appropriately. Furthermore, s/he must be capable of understanding processes within both the design and construction environments. Also, the design manager is considered to be key in creating a seamless link from design, through procurement into construction, commissioning and handover.

In this sense, design managers are expected to play an active part within the wider project team, liaising and coordinating the design team, the client, trade designers, statutory authorities and other interested parties e.g. fire officers, police, disability advisors, etc. Therefore, it is believed that design managers need listening, communicating and asserting skills, in addition to a thorough practical and technical knowledge.

Finally, design managers must be able to control costs of the emerging design solutions and be capable of ensuring that the delivered design meets contractual and construction requirements. Hence, there is an emphasis on planning and controlling the design process in a project management 'command and control' style (Tzortzopoulos, 2004), i.e. defining the work that needs to be done and pushing it to the design team, and controlling design development solely through the production of deliverables. However, such emphasis appears to not be producing the expected results.

3.3. Discussion

Design managers need to have appropriate skills and capability to lead design development (Mozota, 2003). Therefore, clarity of roles and responsibilities, the availability of appropriately skilled design managers, and a clear vision of what the company is trying to achieve through design management are main issues. However, research results demonstrate poor clarity on all these issues at both case study companies.

There were divergent and sometimes conflicting perspectives on design management by the top management, regional managers and design managers throughout Company A. Furthermore, there was a lack of agreement on the potential benefits from managing design from the contractor's perspective. The lack of a clear and agreed company wide design management strategy, coupled with the lack of clarity on the design managers' role created difficulties at the company.

Similarly, at Company B each design manager appears to be taking a personal view on how design should be managed. This is evidenced by the fact that design managers took conflicting approaches to the management of requirements. Poor control of design changes and difficulties in managing communications and delays were also identified.

Therefore, difficulties in managing design can be a consequence of the poor definition of the companies' role (and that of their design managers) in the process. Generally speaking, the design managers from both case study contractors appear to have an inappropriate understanding, skills and knowledge about design. These issues raise questions that need to be answered through further research.

Firstly, should the management of the design process be the responsibility of developers, contractors, designers or clients? Market trends indicate that major contractors in the UK are involved with design management, research needs to be developed to clarify what should be the most appropriate role for contractors throughout design development. Clarity on the design managers' skills and competence needs to allow them to effectively act during design should be sought in alignment with the contractors' role in the process.

Secondly, how to balance tensions between designers wanting to manage design and contractor's design managers? Finding means to appropriately empower design managers working for contractors and engage designers by demonstrating benefits would be essential to ease such tensions. Thirdly, can stakeholders from varied non-design backgrounds achieve the necessary capabilities to manage design without appropriate training? Would the establishment of a unified conceptual approach to design management reduce the occurrence of problems in practice?

Finally, the appropriate managerial strategies to be adopted by contractors need to be established. Is it appropriate for design to be managed solely with a basis on personal beliefs? In effect, an appropriate level of process control should be sought, allowing efficiency and reliability of stable process activities to be achieved throughout the different company projects (Barrett and Stanley, 1999). However, at the same time, design managers should retain the capability to identify situations which require change, ensuring effectiveness and responsiveness throughout the process. This would support improvement and innovation, allowing for managerial autonomy at each project. It also allows the 'design' of the best possible

way of managing the process by considering good practices and also the structure of physical, political and cultural settings of design action at each project context.

4. CONCLUSIONS

The importance of appropriately managing the design process has been long recognised. In the current context of contractors taking managerial responsibility over the design process, such issue becomes even more important as a new design management directions emerge.

This paper emphasised a research gap in which poor attention has been given to the management of design from a contractors' perspective. Case study data evidenced shortcomings in practice in terms of establishing the role of contractors in managing design as well as poor clarity on the skills and competences that design managers working for contractors should have. Based on these issues, questions for further research were proposed.

The lack of a clear theoretical foundation for design management influences the problems faced in practice. The challenges involved in managing design have long been recognised, however research has failed to date to provide an overarching framework that could support improvements in practice. This is related to the fact that the main research focus to date has been on managing design from a designers perspective only. Also, due to the great diversity of design practice, poor consideration has been given to the importance of context, organisational and project issues in design management. Poor clarity at any of these would lead to problems in design management practice.

Therefore, we put forward the need for a more critical reflection on design management's purpose and direction within the construction industry. More specifically, clarity is needed as to how different stakeholders should approach design management so that the best value and most effective processes could be achieved.

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