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Introduction

1.1 Background

Construction projects often experience delays, cost overruns and non-conformance to quality, all of which lead to poor performance and dissatisfied parties (see, e.g., Latham, 1994; Egan, 1998). Egan (1998, p. 8), for example, laments that ‘more than a third of major clients are dissatisfied with contractors’ performance in keeping to the quoted price and to time, resolving defects, and delivering a final product of the required quality. ... [and] ... more than a third of major clients are dissatisfied with consultants’ performance in coordinating teams, in design and innovation, in providing a speedy and reliable service and in providing value for money.’ Hence an understanding of the driving forces behind such problems is a priority if ways are to be developed to overcome them and to improve the performance of the industry.

Unexpected change occurring within the design and construction phases can hinder project success to a significant extent (CII-Construction Industry Institute, 1994; CIRIA, 2001). CIRIA (2001, p. 10) defines construction project change as ‘an alteration or a modification to the pre-existing conditions, assumptions or requirements.’ These project changes are the additions, deletions or revisions within the scope of a project contract that cause an adjustment to contract price, contract time (CII, 1994) and/or quality.

Changes of this nature can directly result in a number of problems within construction projects, especially time overruns, cost overruns and quality deviations. The major cost due to change is the cost of rework, which can amount to 10–15% of the contract value (Love and Li, 2000). Further, the indirect effects of change can be considerable. Examples of indirect effects are loss of productivity, and interruption to workflows and cash flows. These effects, in turn, may lead to low morale and increased claims and disputes between project parties (Bower, 2000). The appropriate management of change is thus essential to the minimisation of the disruptive effects of unexpected change in construction projects. Effective change management allows change to take

place in a more controlled way so that viable alternatives are identified and developed, and the impact is better defined before implementation.

The impact of change increases when the project moves from the design to the construction stage (CIRIA, 2001). Lawson (1997), when explaining the design process, states that many components of the design problem do not emerge until some attempt is being made to generate solutions. Design is thus full of uncertainties, both about objectives and their priorities. Even though later changes can be reduced significantly by proactive change management approaches, they are still common in the construction phase due to these uncertainties and incomplete project information. The later a change is introduced, the more disruption and cost will be incurred.

Project change can be triggered from internal or external causes. The external causes can emerge from wider business sector and inter-organisational level forces. However, many causes of project changes are internal and are generated from the intra-project environment, which can be either design- or construction-generated (Love *et al.*, 1999). The root of these project-level causes (such as errors, omissions and poor information) can be traced back to the skills and the knowledge of project participants and how these are combined to manage construction projects (Tombesi, 2000). As Manavazhi (2004) notes, construction practitioners assess change and rework largely based on intuition sharpened by many years of experience. Hence, change management needs to address these key issues that trigger project changes.

In construction projects, problem-solving often takes place in team environments (Anumba *et al.*, 2001; Gunasekaran and Love, 1998). The manner, therefore, in which the construction project team-members are integrated and co-ordinated is important (Cox and Townsend, 1997). For example, according to Constructing Excellence (2004, p. 4) 'construction is a collaborative activity – only by pooling the knowledge and experience of many people can buildings meet the needs of today, let alone tomorrow. But simply bringing people together does not necessarily ensure they will function effectively as a team.' Construction participants (e.g. clients, architects, engineers, quantity surveyors, contractors and suppliers) are required to work effectively as a team to deliver projects successfully. This requirement has significant implications for the management of project change: effective project change management does not rely solely on the role of a project manager; rather, it requires appropriate engagement from all relevant team members. Studies in construction reveal that teamwork is significantly determined by contractual arrangements (see, e.g., Cornick and Mather, 1999). The emergence of collaborative practice in the construction industry, which includes new team approaches such as design and build (D&B), project management, partnering and other partnership arrangements provide opportunities to improve teamworking (Muir and Rance, 1995). There is a dearth of literature, however, on the management of project change within such collaborative team settings.

In summary, the effective management of change is a necessity to minimise the disruptive effects of change in construction projects. Change during the construction phase is more disruptive and costly than change during

the design phase. There is a deficiency of research on the management of change during the construction phase in collaborative team environments. The literature review (see Chapter 2) identifies that managing team knowledge is of significant importance for the effective management of project change. However, the problem with this literature is its emphasis on introducing various tools and techniques to systemise the change process without properly understanding the key roles that the knowledge and experience of the participants play in managing projects. The need for this understanding is the point of departure for this book. The next section justifies this argument while briefly explaining the conceptual issues and gaps within the literature.

1.2 Need for the Investigation

Previous approaches to construction project change management adopt a variety of different perspectives. CII (1994) and CIRIA (2001), for example, take a general change management perspective by providing best practice guidelines on project change management. These guidelines are based on five principles: anticipate change; recognise change; evaluate change; resolve change; and learn from change. These principles aim to mitigate the disruptive effects of changes by suggesting a change management framework established at the start of the project. Love *et al.* (1999) take a more technical perspective by addressing the rework effects of project change. Their work confirms the complexity and the interdependence of project changes with the identification of various causes and effects of project changes. Other studies have approached project change from a process management perspective. Kagioglou *et al.* (2000), for example, introduce a separate change management process within the generic design and construction process protocol.

Drawing from the previous construction project change literature, it is evident that problem-solving has been viewed essentially as an information-processing activity rather than a knowledge-intensive activity (see, e.g., Winch, 2002). The information-processing perspective on organisation originates from the work of Simon (1957) and Galbraith (1974), which asserts that the key feature of organisation is to process information to enable managers to make better decisions. The assumption underpinning this perspective is that organisations should match their information-processing activities to their information needs (see, e.g., Daft and Lengal, 1986). However, empirical research has found that information processing across organisation boundaries presents significant barriers to effectiveness. Successful project delivery requires the development and application of a wide range of specialist knowledge located in different actors, and that actors mutually 'know' how their roles fit with each other. This cognitive dimension cannot be overcome by information processing alone. The limitation of the information-processing view has stimulated the development of an alternative theory of the firm, which recognises that 'knowledge is the key asset' and 'knowing is the key process', in delivering organisations'

competitive advantage. On the 'knowledge as an asset' perspective knowledge is often viewed as an objectively definable commodity, which can be managed and controlled by certain mechanisms. For 'knowing as a process' views, knowledge is a social construct, developed, transmitted and maintained in social situations. These knowledge-based views of the firm (Grant, 1996a, 1996b; Spender, 1996; Empson, 2001) open new avenues to approach effective project change management in construction.

The construction literature that addresses knowledge management, learning and innovation, shows a trend towards identifying construction problem-solving as a knowledge-intensive activity. Egbu *et al.* (2003), for example, identify project problem situations as a key trigger of knowledge production in construction. Winch (2002) explains that knowledge and learning are generated in solving problems that involve team discussions and dialogues during the construction process. For such problem-solving to become true innovation, the solutions reached for particular problems should be learned, codified and applied in future projects (Sexton and Barrett, 2003; Lu and Sexton, 2009). Similarly, other learning and innovation literature in construction identifies the importance of integrating project experience to the organisational business processes, to generate learning and innovation (see, e.g., Barlow and Jashapara, 1998; Gann and Salter, 2000). However, the extant knowledge-based construction literature arguably does not provide an in-depth understanding of the role of knowledge during construction problem-solving, especially during managing change.

To this end, the general knowledge management literature aids in understanding the fuller role of knowledge during problem situations that is facilitated by team interactions. Accordingly, during shared activities, such as problem-solving, individuals bring various forms of knowledge that could be shared and converted into new knowledge (Nonaka and Takeuchi, 1995; Leonard and Sensiper, 1998). When considering team knowledge during change events, the theory of knowledge creation (Nonaka and Takeuchi, 1995) shows how a team can advance knowledge and learning through team interactions. However, as Snowden (2002) argues, tacit knowledge need not necessarily go through a costly codification process to create new knowledge. This understanding on knowledge creation offers significant contributions in understanding the role of knowledge during shared activities. In order for knowledge to be useful it needs to pass from project to organisation level, and then back to parallel and subsequent projects. This inter-project learning can emerge when team knowledge is stored and transferred within the organisation for re-use in future projects.

In summary, this book identifies the problem of construction projects with disruptive effects due to unplanned changes. Previous approaches to managing project change adopt an information-processing view, without appreciating the significant role of knowledge in managing change. This led to the exploration of the role of knowledge during team interaction as explained in the knowledge management literature. From this knowledge-based perspective of managing project change, the research problem is articulated below.

1.3 Questions to Research

The aim of this book is to explore the role of knowledge during the ‘management of unplanned change in the construction phase within collaborative team settings’ (referred to in this research as ‘reactive change process’). This aim is progressively developed through the following research questions:

- RQ1: What are the key contextual factors of the reactive change process?*
- RQ2: What are the properties of knowledge that the project team members use in the reactive change process?*
- RQ3: How does the project team identify and utilise this knowledge during the reactive change process?*
- RQ4: How does the knowledge that the project team use in the reactive change process, interact and form new knowledge?*
- RQ5: How is the knowledge that is created through the reactive change process, transferred and disseminated within the multiple organisations for potential re-use in future projects?*

1.4 Summary and Link

This chapter has set out the background and principal focus for this book. The next chapter will contextualise the outlined research issues within the relevant general and construction-specific change management literature.

