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Role of knowledge in managing construction project change

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Abstract
Purpose – Unplanned changes in construction projects are common and lead to disruptive effects such as project delays, cost overruns and quality deviations. Rework due to unplanned changes can cost 10-15 per cent of contract value. By managing these changes more effectively, these disruptive effects can be minimised. Previous research has approached this problem from an information-processing view. In this knowledge age, the purpose of this paper is to argue that effective change management can be brought about by better understanding the significant role of knowledge during change situations.

Design/methodology/approach – Within this knowledge-based context, the question of how construction project teams manage knowledge during unplanned change in the construction phase within collaborative team settings is investigated through a selected case study sample within the UK construction industry.

Findings – Case study findings conclude that different forms of knowledge are created and shared between project team members during change events which is very much socially constructed and centred on tacit knowledge and experience of project personnel.

Originality/value – Building on the case study findings the paper finally offers a model that represents the role of knowledge during managing project change.

Keywords Construction industry, Project management, Problem solving, Change management, Knowledge management

Paper type Research paper

Introduction
Construction projects often undergo project delays, cost overruns and non-conformance to quality, leading to poor performance and dissatisfied parties (for example see 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. ... 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.

An understanding of the driving forces behind such problems is a priority if the performance of the industry is to be improved.

Unexpected change, which occurs throughout the design and construction phase, hinders project success to a significant degree (Construction Industry Institute (CII), 1994; CIRIA, 2001). Changes of this nature can lead to time overruns, cost overruns and quality deviations. The major cost due to change is the expense of rework and this can
amount to 10-15 per cent of contract value (Love and Li, 2000). Indirect effects of change are also considerable. Bower (2000) identifies examples of indirect effects, including loss of productivity, interruption to workflows and cash flows, which, in turn, may lead to lower moral, claims and disputes between the parties. The appropriate management of change is, thus, essential to the minimisation of the disruptive effects of change in construction projects.

In construction projects, problem solving often takes place in team environments (Anumba et al., 2001; Gunasekaran and Love, 1998). 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.” Thus, managing team knowledge is of significant importance for the effective management of project change. However, the problem with the prevailing construction change management literature is its emphasis on introducing various tools and techniques to systemise the change process without properly understanding the key role that the knowledge and experience of the participants play in managing projects. The need for a deeper and broader understanding of this was the point of departure for this research.

This paper presents the findings of a research study on managing construction project change from knowledge-based perspectives. The structure of the paper is as follows. First, the findings of a literature review are given. Second, the research problem of the study is defined. Third, the paper reports the methodology of the study. Fourth, case study findings are presented. Finally, conclusions are drawn from the case study findings.

Research issues on managing project change
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 (Construction Industry Institute (CII), 1994) and/or quality. Effective change management allows change to take place in a more controlled way so that viable alternatives are identified, developed and their impacts defined before deciding on, and implementing, the optimal solution. Change management in construction is central to the project management process. Since construction problem-solving takes place in a team setting, effective project change management does not rely solely on the role of a project manager; rather, it requires appropriate input from all relevant team members. As Cornick and Mather (1999) stress, teamwork in construction has a direct impact on project performance.

Previous approaches to construction project change management adopt a variety of different perspectives. Construction Industry Institute (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:

1. anticipate change;
2. recognise change;
3. evaluate change;
4. resolve change; and
5. 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 (but unspecified) change management process within the generic design and construction process protocol.

A common strand through these change management frameworks and principles is that problem solving is viewed essentially as an information-processing activity rather than a knowledge-intensive activity (for example, see 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 (for example, see Daft and Lengal, 1986). However, empirical research has found that information processing across organisation boundaries presents significant barriers to effectiveness. A successful project delivery requires the development and application of a diverse range of specialist knowledge located in different actors, and that different actors “know” how his or her role fits with each actor “knowing” their roles. This cognitive dimension cannot be overcome by information-processing alone. This 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. These knowledge-based views of the firm (Grant, 1996; 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, show 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). 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 (for example, see Barlow and Jashapara, 1998; Gann and Salter, 2000). However, the extant knowledge-based construction literature is arguably limited in providing an in-depth understanding on the role of knowledge during construction problem-solving and especially during managing change context.

The general knowledge management literature provides richer insights 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 offers significant contributions in understanding knowledge creation through change events. In order for knowledge, which is generated through change experience to be useful, it needs to pass from project to organisation level and back to subsequent projects. This inter-project learning can emerge when team knowledge is stored and transferred within the organisation for re-use in future projects. Thus, knowledge transfer and learning literature brings useful insights in understanding knowledge transfer following project change events. Incorporating all these literature findings a conceptual model was first developed (see Figure 1, which offers a model that maps the research findings onto this conceptual model. This model is described in detail in a later section). From these knowledge-based perspectives of managing project change, a number of research questions were articulated.

Research questions
The aim of this research was to explore the role of knowledge during the management of unplanned change in the construction phase within collaborative team settings. The research addressed following key research questions:

- **RQ1.** What is the nature of knowledge that the project team members use in managing project change?
- **RQ2.** How does the knowledge that the project team use in managing project change, interact and form new knowledge?
- **RQ3.** How is the knowledge that is created through managing project change, transferred and disseminated within the multiple organisations for potential re-use in future projects?

The methodology adopted to approach these research questions is explained in the next section.

Research method
The research was identified as being located within the phenomenological paradigm as it deals with a complex phenomenon which is very much context specific. Considering different levels of the subjectivist stance, as explained by Morgan and Smircich (1980), the study was not considered to be at the extreme subjectivist end. Thus, case study research approach was chosen considering its appropriateness in studying such a social setting as described by Yin (1994).

The main unit of analysis in this study was the project change event. The study fixed the issue (change event) and the active stakeholders around this issue were interviewed to identify key variables and their interactions with respect to the change event at project team and organisational levels. In sample selection, the degree to which the case study firms that engaged in collaborative arrangements such as partnering and design and build were first considered. Subsequently, active project team members around a change event were considered. Change events were selected solely on the basis of project participants’ perception of the degree of impact on the construction phase (be it time, quality or cost impacts) which is consistent with the phenomenological paradigm. Accordingly, the study selected two change events within two collaborative settings with the aim of predicting similar results.
Figure 1.
Role of knowledge during managing project change
First change event was a “change in the store flooring design” in a supermarket refurbishment project under a partnering arrangement using “Design and build” (D&B). Here, the impact on the project was considered high by the case study participants as it involved six weeks of loss of trading for the client. In this, four key participants such as the D&B contractor, architect, quantity surveyor and client were interviewed. The second change event was a “change of height in whiteboards” in school building under D&B arrangement. In this, the case study participants considered this change event as significant as it created severe disruption to the project because the change incurred after the construction of whiteboard towards the latter part of project’s construction stage. Here again four key participants including D&B contractor, architect, quantity surveyor and client were interviewed.

The main research technique selected for data collection in this study was in-depth semi-structured interviews. The interview data were triangulated to some extent by analysing documentation and by participating in project team meetings. The interview guidelines, which comprised of 60 detailed questions, were designed to capture details with regard to each research question through the selected change. For example, in terms of RQ2, the interviewees were questioned on each conversion stage; each stage having about five questions. The interviews generally spanned between two to three hours and ended up with nearly 10-12 pages of interview transcriptions. The research techniques used for the data analysis were content analysis followed by cognitive mapping. The process was facilitated by computer software: NVivo and DeExplorer. See an example of a coding structure in Figure 2 and a cognitive map in Figure 3. The next section presents a summary of the overall findings of these case studies while constantly comparing the findings with the extant literature.

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**Figure 2.**
An example of a coding structure

- **Intra-project KC during change**
  - **Socialisation**
    - Need for face-to-face meetings
    - Team interactions across distance
    - Reliance-sharing of past experience
    - Utilising tacit K by socialisation
  - **Externalisation**
    - Ways to externalise K at discussions
    - Change options, as new K
    - Encourage others to express thoughts
  - **Combination**
    - Ad-hoc codification done by each org
    - Limited codification of new K
  - **Internalisation**
    - Internalising K gained via change
    - Scope for intra-project KC
    - Time intensity by parallel projects
Case study findings

The case study findings are discussed in this section around the three research questions set out above. The coding structures and the cognitive maps developed in analysing the case study data (examples are given in appendices) assisted in structuring the data presented below.

RQ1. What is the nature of knowledge that the project team members use in managing project change?

In describing the nature of knowledge, the research addressed three properties of knowledge during project change situations; namely, tacit against explicit (Nonaka and Takeuchi, 1995); collective against individual (Spender, 1996); and, situational against prompted (Sole and Edmondson, 2002) knowledge.

First, the study investigated whether the knowledge a team uses in a change situation is more tacit or explicit. The results indicated that construction project teams showed a heavy reliance on their tacit knowledge gained through past experience. For example, an interviewee explained this, “the history and our experience tell us what is achievable … you always have to relate old knowledge with the new condition, to come with a practical solution.” In another interviewee’s words, “you always bring up previous experience to discuss issues.” This necessity to find quick practical solutions in new project situations, constrained project teams from referring to explicit knowledge that is ineffectively codified in documents. This finding is consistent with the general project-based literature; for example, according to Koskinen et al. (2003), in practice a team member often relies on other team members for knowledge and advice, rather than turning to databases and procedure manuals.

Second, the study looked into the collective nature of knowledge during project change situations. The primary data from both cases revealed that team decision making was inevitable in a construction project setting, as project members’ roles were
inter-dependent. According to some interviewees, “decisions were made mainly in the design team meetings where all parties sign up for the final decision.” Hence, generally each member was given a chance to put their views across and a consensus decision was reached during team discussions. This finding can be related to Leonard and Sensiper’s (1998) claim, which is; perhaps the purest form of collective tacit knowledge can exist within teams, who are characterised by complementary individual knowledge bases and bonds of shared accomplishment that is dependant on individual contributions.

Third, the situational nature of knowledge was explored. The empirical findings revealed that in managing unplanned changes within construction projects knowledge creation was not the primary aim rather it was a by-product. The prevalent literature strengthens this finding; for example, Sexton and Barrett (2003, p. 615) stress, “innovation often takes the form of pragmatic problem-solving on site.” Egbu et al. (2003) and Tan et al. (2004) further emphasise that reactive nature of project change could trigger knowledge creation.

All these facts lead to suggest that the nature of knowledge that the project team members use in managing project change is: more tacit rather than explicit; more collective (mutual) rather than individual; and more situational rather than prompted. The empirical evidence found in case studies in supporting this statement is given in Table I.

RQ2. How does the knowledge that the project team use in managing project change, interact and form new knowledge?

In answering this research question, the primary investigation of this study looked into the knowledge conversion cycle (Nonaka and Takeuchi, 1995) as this explains how a team interact and form new knowledge using existing knowledge. In that, the study explored existence of knowledge conversion stages; namely, socialisation, externalisation, combination and internalisation.

In terms of socialisation, the case studies explored the presence of joint activities, apprenticeships, informal networks, social events, face-to-face settings and prior interactions that enabled tacit knowledge utilisation as argued by Nonaka et al. (1994). The results indicated that during change events, construction team members utilised tacit knowledge by learning from individuals of other disciplines, as well as from seniors within their own disciplines. However, one interviewee mentioned “hierarchical learning is limited [compared to horizontal learning] as there tends to be similar level people involved”. In the prevalent literature, several researchers have identified that team learning especially takes place during regular meetings involving different participants (Barlow and Jashapara, 1998; Bussi and Palmer, 2000; Egbu et al., 2003; Huber, 1996). In the case studies, teams were exposed to various face-to-face settings (especially meetings) and, in addition, they engaged in activities such as visiting sites, speaking to close colleagues and attending various social events. One D&B contractor further explained how they held informal meetings within the in-house team, “[we met] just going to the next office and sitting down for a cup of coffee. That goes sometimes for three hours or whole day ... It is the best way to do it really.” Thus, the findings suggest that during unplanned change situations team members are exposed to socialisation activities that enable them to create new tacit knowledge. The empirical evidence found in case studies in supporting this statement is given in Table I.

With respect to externalisation, construction project team members externalised their tacit knowledge in different ways at discussions, especially by visualisation
<table>
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<th>Attributes</th>
<th>Case study evidence via selected change events</th>
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**RQ1**
- Tacit than explicit
  - Reliance on previous knowledge
  - Limited chance to use explicit knowledge
- Collective than individual
  - Giving everybody a chance
  - Dependency
  - Consensus decision
- Situational than prompted
  - Limited scope for new ideas
  - Solve practical problem

**RQ2**
- Presence of socialisation activities
  - Regular meetings
  - Special meetings
  - Site visits
  - Social events
  - Seating arrangement
  - Observing other members
  - Seniors accompanying juniors
- Use of different techniques to externalise
  - Diagrams and pictures
  - Previous example projects
  - Stories
  - Presentations
  - Brainstorming sessions
  - Give everybody a chance
  - Encourage others
  - Listen to others
- Limited combination
  - Lack of details in minutes of meetings
  - Recording only the final decision in CRF
  - Limitation of drawings as a change record
  - Absence of project review reports
  - *Ad hoc* codification by individual parties
- Superficial internalisation
  - Learnt technical issues

**RQ3**
- Learnt how to deal with client
  - Became flexible and understanding of change
  - Can handle a lot quicker and better next time
  - Time intensity through parallel projects
  - Limited experiments such as tests and samples
  - Limited client requests to consider new ideas
- Transfer to future projects via individuals
  - Less chance to re-use explicit knowledge
  - Members applying knowledge in other projects
- Dissemination via personalisation
  - Monthly meetings
  - Annual conferences
  - Seated closely/open-plan layout
  - Meetings with other firms
  - Project review meetings
  - Social functions
  - Absence of specific knowledge in intranet

Table I.
Evidence from case studies
though pictures, diagrams or sketches. This reliance on visualisation techniques to externalise thoughts is consistent with the construction literature (for example, see Perry and Sanderson, 1998). Other techniques included use of examples of previous projects where appropriate. Further, externalisation was supported through the creation of brainstorming environments while listening and encouraging each other. These findings suggest that project teams, who actively use visualisation techniques during team discussions that arise during managing project change, are good at expressing and externalising their tacit knowledge. The empirical evidence found in case studies in supporting this statement is given in Table I.

In looking into combination aspect, the case study results revealed that ideas and thoughts that were expressed at discussions were not effectively codified during the management of managing project change. The limited records of project changes (such as minutes of meetings, change order forms, drawings, letter correspondence and progress reports) did not provide a detailed account of change processes. One D&B contractor affirmed this point, “meeting minutes are a way of bringing things that we discussed together. But a drawback is the discussions are not reported in detail at these minutes. We talk for about 40 minutes and include in the minutes what we agreed at last and not the pathway of reaching that decision.” Lessons learnt from project changes were not formally compiled into a project review report and the evidence showed ownership issues of maintaining such documents. These findings led to propose that project teams are unlikely to effectively combine and codify the tacit knowledge that is externalised, during team discussions that arise during managing project change (see Table I for case study evidence). This limited codification and lack of details in the codified project documents is consistent with other project-based literature. For example, Schindler and Eppler (2003) state that the relevant project documentation is often superficial and lacks records such as reasons for failure, how solutions were built and implemented.

At the internalisation stage, evidence supported the claim that the knowledge created during change is internalised by team members. For example, project teams generally learnt technical issues; causes and solutions for change; dealing with people; and, were confident in handling such situations more effectively in future projects. However, as the primary data supported, the internalisation process is not further strengthened through reflection and experimentation, especially due to time pressures. Project team members moved to a next project immediately after completion of a project and sometimes they worked in parallel projects which gave them very little time to reflect. The architect stated: “commercial practices are moving so quickly. You might sometimes reflect on past project experience, but not to the extent that you are setting here”, This finding is consistent with the general construction literature. For example, Egbru et al. (2003) state that “time pressure” is the largest barrier in construction settings to effective reflection on project experience; and Disterer (2002) stresses that project review stage often has to be dropped because of time constraints and members immediately moving on to other projects. These facts confirmed that project teams are more likely to acquire superficial learning through the change experience, during managing project change, rather than effective internalisation through reflection (see Table I for case study evidence).

In summary, the above discussion suggests that a full knowledge conversion cycle, as Nonaka and Takeuchi (1995) explain, does not arise during managing unplanned change within construction projects. Even though there is evidence of new knowledge creation during the process, it is difficult to identify the exchange of tacit knowledge
into explicit knowledge. What generally happens is that team members exchange their tacit knowledge gained from previous experience by socialising through face-to-face settings. This tacit knowledge that resides in individuals' heads could become explicit during discussions. This tacit knowledge that is expressed during discussion is sometimes recorded in project documentation. Team members internalise this whole experience and increase their tacit knowledge-base which they carry to future projects. The findings reveal that tacit knowledge is playing a key role during the whole process. This knowledge-creation process is consistent with Snowden's (2002) explanation of natural knowledge flows, where knowledge can be created without necessarily going through a codification stage. These findings confirm that project teams are more likely to create new knowledge based on the existing knowledge, during managing project change, through a natural flow of knowledge rather than through a full cycle of knowledge conversion process.

RQ3. How is the knowledge that is created through managing project change, transferred and disseminated within the multiple organisations for potential re-use in future projects?

The study further looked into how new knowledge that is created through change events is transferred in the multiple organisation level; whether through personalisation strategies or codification strategies (Hansen et al., 1999).

The empirical data confirmed that the knowledge that construction project teams learn from change experience passes to other projects when they engage in parallel and future projects. The tendency is to use the knowledge held within team members' heads in future change events rather than refer to codified documents. An architect mentioned this at two instances: “you retain that knowledge [change experience] on a personal level and use that in future projects” and, “there is a certain amount of information that isn’t written down anyway and just contains in the head.” The data further showed how the limited availability of codified documents and limited details in the available codified documents erode their interest in using the encoded, explicit knowledge in future projects. This confirmed that new knowledge created during managing project change is re-used in future projects through the individuals involved during the process, rather than through the codified documents. This is strengthened by construction literature that state that knowledge generated within projects is mostly limited to individuals (Winch, 2002; Barlow and Jashapara, 1998) and lessons learnt generally become individual tacit knowledge (Gieskes and Broeke, 2000).

Similarly, the findings revealed that new knowledge created during project changes is informally disseminated to a wider community in the multiple organisations through face-to-face settings such as regular meetings, annual conferences, social functions and conversations with colleagues. Use of codification strategies is limited for this wider dissemination of knowledge, as individuals usually shared general knowledge through intranet facilities, rather than specific lessons learnt through project changes. The findings, therefore, confirmed that new knowledge created during managing project change is disseminated and made available to the wider organisation for potential future re-use, through interactive settings between the organisational members, rather than through effective dissemination of codified documents.

In summary, the case study findings suggest that new knowledge which is created during managing project change is transferred to multiple organisations, for potential re-use in future projects, through personalisation strategies, rather than through codification strategies. Bresnen et al. (2003, p. 165) had revealed similar findings; in
that, “processes of knowledge capture, transfer and learning in project settings rely very heavily upon social patterns, practices and processes in ways which emphasise the value and importance of adopting a community-based approach to managing knowledge.”

The empirical evidence found in the case studies in relation to each research question is summarised in Table I.

**Role of knowledge during managing project change**

Based on the case study findings, the conceptual model that was built on literature findings was modified as depicted in Figure 1 to represent the role of knowledge during managing project change. In this, the change process is considered as an input-transformation-output model. The observed knowledge creation cycle is illustrated at the centre; and, the inter-project knowledge transfer is represented by arrows that link project to the multiple organisation layer through the project team layer. The context is shown in four layers: change process; project team; multiple organisations; and construction environment.

In terms of *RQ1*, the findings showed that the knowledge that the project team members use in managing project change is more tacit rather than explicit; more collective rather than individual; and, more situational rather than prompted. This is depicted in the model at the transformation stage.

In terms of *RQ2*, the study concludes following in relation to each knowledge conversion stage:

- Project teams, who interact with other team members regularly through face-to-face settings, during managing project change, are better at utilising existing tacit knowledge and creating new tacit knowledge, compared to project teams who do not interact regularly through face-to-face settings.
- Project teams, who actively use visualisation techniques during team discussions that arise during managing project change, are better at expressing and externalising their tacit knowledge, compared to project teams who do not use such techniques.
- Project teams are more unlikely to effectively combine and codify the tacit knowledge that is externalised, during team discussions that arise during managing project change, rather than effective combination and codification of this knowledge.
- Project teams are more likely to acquire superficial learning through the change experience, during managing project change, rather than effective internalisation through reflection.

Overall, in answering *RQ2*, the findings show that the project teams are more likely to create new knowledge based on the existing knowledge, during managing project change, through a natural flow of knowledge rather than through a full cycle of knowledge conversion process. This is depicted in the core of the model under knowledge conversion.

In terms of *RQ3*, the findings show that the new knowledge that is created during managing project change is transferred to multiple organisations, for potential re-use in future projects, through personalisation strategies, rather than through codification strategies. This is depicted at the input and output stages. The next section offers the conclusions of this study.
Conclusions

Overall, the aim of this research was to investigate how knowledge is captured, created and used during unplanned change situations in the construction phase within collaborative team settings. The research investigated this problem through a particular case study sample and the results should be treated as theoretically generalisable to this selected sample population which is a key limitation in the case study method.

Case study results indicated that different forms of knowledge are captured and shared between project team members during problem-solving activities connected with change events. Generally team members exchange their tacit knowledge gained from previous experience by socialising through face-to-face settings. This tacit knowledge is often visualised during discussions, when team members share their previous experiences with each other. This visualised tacit knowledge is codified in project documentation in an ad hoc manner. The limited availability of codified documents and limited details in the available codified documents hinder transfer and dissemination of new knowledge, which is generated through reactive process, through codification strategies, for example, through information technology. On the other hand, team members internalise new knowledge that is generated through managing project change and increase their tacit knowledge-base. This new tacit knowledge is generally transferred and disseminated at an organisation level and, thereby, to future projects through personalisation of individual members.

Hence, the overall findings indicate that these knowledge flows are very much centred on tacit knowledge and experience of project personnel. This social construction and use of knowledge in change management challenges the prevailing codification knowledge management solutions based on “hard” IT approaches, which do not appreciate and accommodate this social phenomenon. Thus, it is argued in this study that there is a need to balance codification knowledge management strategies with “soft” personalisation strategies to stimulate and support appropriate social interaction between team members and, thereby, enhance the creation, dissemination and shared understanding of tacit project experience. It is through the balance of “appropriate codification” and “enhanced personalisation” strategies that collaborative teams can successfully resolve and learn from change events in the construction phase of projects.

The results and conclusions reported here are drawn from a particular case study sample. Further research is encouraged to develop (or contest) the degree to which these results can be generalised across a variety of different case study settings – for example, different procurement regimes, building types and national contexts.

References


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