The impact of construction organisations' learning capabilities on collaborative projects*

Le Chen[1], Karen Manley[2], Joanne Lewis[3]

Abstract

Dynamic capability theory asserts that the learning capabilities of construction organisations influence the degree to which value-for-money (VfM) is achieved on collaborative projects. However, there has been little study conducted to verify this relationship. The evidence is particularly limited within the empirical context of infrastructure delivery in Australia. Primarily drawing on the theoretical perspectives of the resource-based view of the firm (e.g. Barney 1991), dynamic capabilities (e.g. Helfat et al. 2007), absorptive capacity (e.g. Lane et al. 2006) and knowledge management (e.g. Nonaka 1994), this paper conceptualises learning capability as a knowledge-based dynamic capability. Learning capability builds on the micro-foundations of high-order learning routines, which are deliberately developed by construction organisations for managing collaborative projects. Based on this conceptualisation of learning capability, an exploratory case study was conducted. The study investigated the operational and higher-order learning routines adopted by a project alliance team to successfully achieve VfM. The case study demonstrated that the learning routines of the alliance project were developed and modified by the continual joint learning activities of participant organisations. Project-level learning routines were found to significantly influence the development of organisational-level learning routines. In turn, the learning outcomes generated from the alliance project appeared to significantly influence the development of project management routines and contractual arrangements applied by the participant organisations in subsequent collaborative projects. The case study findings imply that the higher-order learning routines that underpin the learning capability of construction organisations have the potential to influence the VfM achieved on both current and future collaborative projects.

Keywords: Learning capability, learning routines, collaborative projects, value for money, collaborative projects.

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[1] Research Fellow, School of Civil Engineering and Built Environment, Science and Engineering Faculty, Queensland University of Technology, Australia; PH (+617) 31381151; FAX (+617) 31381170; Email: le.chen@qut.edu.au

[2] Associate Professor, School of Civil Engineering and Built Environment, Science and Engineering Faculty, Queensland University of Technology, Australia; PH (+617) 31381762; FAX (+617) 31381170; Email: k.manley@qut.edu.au

[3] Research Assistant, School of Civil Engineering and Built Environment, Science and Engineering Faculty, Queensland University of Technology, Australia; PH (+617) 31383337; FAX (+617) 31381170; Email: jo.lewis@qut.edu.au

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1. Introduction

Collaborative contracting has been increasingly adopted by the Australian infrastructure industry in recent years as a procurement method for large and complex projects (Morwood et al. 2008). Project alliances, partnering, early contractor involvement, and early tender involvement are typical delivery approaches that apply collaborative contracting principles (Chan et al. 2010; Lahdenperä 2012; Mignot 2012). Collaborative contracting approaches are constantly evolving to suit market conditions. In particular, the recent turbulent economic environment of the infrastructure sector has generated increasing pressure to improve the efficiency and effectiveness of project performance during complex project delivery (Leiringer et al. 2009; Morwood et al. 2008; Ross 2008). These circumstances demand that organisations (both clients and service providers) demonstrate high level management and technological capabilities, so as to optimise project performance when applying collaborative contracting methods (Department of Infrastructure and Transport 2011; Hartmann et al. 2010; Hauck et al. 2004; Love et al. 2010; Manley 2002).

A recent Australian based study (Department of Treasury and Finance 2009) revealed significant performance heterogeneity between collaborative contracting projects. This implies that the extent to which value-for-money (VfM) is achieved is highly variable between projects. The causes of project performance heterogeneity within the collaborative contracting context have drawn intensive attention from academics, researchers and industry practitioners. Relevant published research studies and industry reports primarily focus on the influence of project governance mechanisms such as target cost arrangements, financial risk and reward sharing regimes, project leadership structure, and integrated team selection and formation (Chan et al. 2010; Eriksson 2008; Hauck et al. 2004; Lahdenperä 2012; Love et al. 2010; Rahman and Kumaraswamy 2008). Although recent years have seen an increase in studies regarding the resources of organisations engaged in construction projects (e.g. Hartmann et al. 2010; Jin 2010; Leiringer et al. 2009; Rose and Manley 2012), there is very little that emphasises the learning routines and capabilities that enable organisations to achieve VfM during collaborative project delivery.

The theory of evolutionary economics (Nelson and Winter 1982), and the resource-based view, (Barney 1991; Wernerfelt 1984) propose that rent differentials are caused by the resource configuration of organisations. Dynamic capability studies posit that such an advantageous resource configuration is achieved by dynamic capabilities, which are purposely developed through organisational learning in response to environmental changes (Eisenhart and Martin 2000; Helfat et al. 2007; Teece et al. 1997; Zollo and Winter 2002). Based on this theoretical background, the current study seeks to explain project performance heterogeneity from a ‘learning perspective’, and specifically focuses on the learning capability of construction organisations, and the performance implications of this capability.

This task is assisted by consulting the empirical propositions of the strategic alliance literature (e.g. Das and Teng 2000; Grant and Baden-Fuller 2004; Koza and Lewin 1998), as well as those arising from construction management research (Hartmann et al. 2010; Leiringer et al. 2009). Although strategic alliance literature focuses on on-going relationships,

rather than one-off project-based relationships, it is still relevant to this study because strategic alliancing and collaborative contracting share similar governance mechanisms (Das and Teng 2000). It has been empirically supported that alliance firms' learning routines are positively associated with alliance success rates (Kale and Singh 2007). Learning routines also help to develop a firms' overall ability for effecting superior alliance performance (Heimeriks and Duysters 2007; Schilke and Goerzen 2010). The evidence derived from recent construction management studies also suggests that the development of project participants' capabilities in managing collaborative projects is driven by deliberate learning and evolves in response to dynamic market changes (Hartmann et al. 2010; Leiringer et al. 2009).

This paper has two key sections. Firstly, the paper starts with the conceptualisation of 'learning capability' as a dynamic capability, by drawing from the literature streams of the resource-based view of the firm (Barney 1991; Wernerfelt 1984), the dynamic capabilities view (Eisenhart and Martin 2000; Zollo and Winter 2002), absorptive capacity (Cohen and Levinthal 1990; Lewin et al. 2011), and knowledge management (Grant 1996b; Nonaka 1994). Secondly, under the guidance of this conceptualisation, the subsequent section reports a case study that highlights the learning routines used by the participant organisations to achieve superior VfM for an award winning Australian alliance project. The case study also explores how learning routines applied at the project level affect the participant organisations' corporate strategies for delivery of subsequent collaborative projects.

2. Learning capability

The resource-based view of the firm emphasises that value maximisation of an organisation is achieved through the configuration and utilisation of valuable resources (Barney 1991; Wernerfelt 1984). The resource configuration perspective suggests that organisations that participate in collaborative contracting may be expected to identify two primary strategic objectives, which must be fulfilled in order to optimise project delivery performance. This assertion is supported by the strategic alliance literature. The first of these objectives is to obtain valuable resources, which are imperfectly mobile, imitable and substitutable (Barney 1991), and are unavailable through other transactional forms (e.g. traditional construction contracts). The second is to use the acquired valuable resources to reconfigure a unique resource base for the purpose of sustaining competitive advantage. According to the dynamic capabilities view (Helfat et al. 2007), which focuses on resource renewal and evolution, the extent to which an organisation fulfils these objectives depends on its ability to create, extend, or modify its resource base, augmented to include the resources of its project partners. In addition, the development of an organisation's overall capability to manage collaborative contracting projects is driven by the development and use of deliberate learning routines (Carrillo et al. 2006; Hartmann et al. 2010).

Routines are perceived as the building blocks of organisational capability (Winter 2003), and may be defined as "stable patterns of behaviour that characterise organisational reactions to variegated, internal or external stimuli" (Zollo and Winter 2002, p. 340). Different learning routines are applied at different levels of organisational capability to achieve specific

management outcomes that are unique to each capability level (Grant 1996a; Sanchez 2001). Operational or 'zero-level' capabilities are those that permit a firm to generate revenue and profit in the short term (Winter 2003; Zollo and Winter 2002). Collaborative project management is considered to be an operational capability, and is reflected by the project management and operating routines a participant organisation uses to run a project. Dynamic capabilities are 'higher-level' capabilities that operate to extend or create operating routines for the purpose of enhancing profit in the future (Winter 2003; Zollo and Winter 2002). The current study focuses on a particular type of dynamic capability – that of knowledge/learning – which helps sustain the long-term competitive advantage of firms.

The dynamic capabilities' view posits that more deliberate cognitive processes are required to enhance understanding of the causal linkages between the actions taken by an organisation, and the performance outcomes it obtains (Eisenhart and Martin 2000; Zollo and Winter, 2002). Learning that shapes and develops capabilities and operating routines needs to be "deliberate" and "go beyond semi-automatic stimulus-response processes and tacit accumulation of experience" (Zollo and Winter 2002, p. 341). In this vein, ideally, learning capability is purposely developed by organisations that frequently participate in collaborative projects, enabling them to systematically create and modify their project routines, and hence ultimately drive the evolution of their collaborative project management capabilities. Moreover, according to Helfat et al. (2007), the definition of learning capability applies to not-for-profit organisations, such as public sector clients, and for-profit organisations such as private sector clients and service providers. Both not-for-profit and for-profit organisations may face and/or initiate changes (Helfat et al. 2007).

Learning capability is structured, persistent, and represented by a stable pattern of higher-order learning routines (Lewin et al. 2011; Zahra and George 2002; Zollo and Winter 2002). The underlying routines of learning capability explore, retain and exploit knowledge both inside and outside firm boundaries, and are responsible for the creation and configuration of other organisational capabilities and operating routines (Lewin et al. 2011; Lichtenthaler and Lichtenthaler 2009). Due to the complexity of cognitive learning (Nooteboom 2009) and the tacit nature of knowledge (Nonaka and von Krogh 2009), learning capability is organisation specific and idiosyncratic. Thus, learning capability constitutes a valuable resource in its own right, and ultimately a source of organisational competitive advantage and project performance heterogeneity (Barney 1991; Nelson and Winter 1982). Although organisational knowledge, in particular tacit knowledge, is a valuable strategic asset that is not easily diffused across the boundary of the firm (Spender 1998), collaborative project management serves as an instrument for inter-organisational knowledge transfer and innovation (Carrillo et al. 2006; Love et al. 2002). Hence, organisations with better learning routines are more likely to both achieve and benefit from successful collaborative project delivery because they are better able to absorb and apply knowledge generated or held by other organisations (Hartmann et al. 2010; Love et al. 2002).

Recent developments in the areas of knowledge management (e.g. Nonaka 1994) and absorptive capacity (e.g. Cohen and Levinthal 1990) lead to an integrated perspective of knowledge-based dynamic capability (Lewin et al. 2011; Lichtenthaler and Lichtenthaler 2009). From this perspective, learning capability is underpinned by the micro-foundations of

internal and external learning routines (Lewin et al. 2011; Lichtenthaler and Lichtenthaler 2009). The external learning includes three types of routines: exploratory, transformative, and exploitative, as asserted by traditional absorptive capacity theory, particularly the consideration of knowledge leveraged from external sources (Lewin et al. 2011; Lichtenthaler and Lichtenthaler 2009). The internal learning routines facilitate variation and new idea generation, dissemination and combination of internally generated knowledge, and use of the knowledge to update old routines (Nonaka 1994; Zollo and Winter 2002). In addition, complementarities between internal and external learning routines are essential to make external routines useful (Lewin et al. 2011). Knowledge acquired through external learning routines needs to be selected, codified and internalised through internal learning routines in order to result in the desired modification of operational capabilities and routines (Lewin et al. 2011). Figure 1 illustrates the capability-based theoretical assertions that have been addressed above, as well as the relationships between them. The current study acknowledges the importance of operational capabilities; however, the focus here is on higher order level dynamic capabilities.

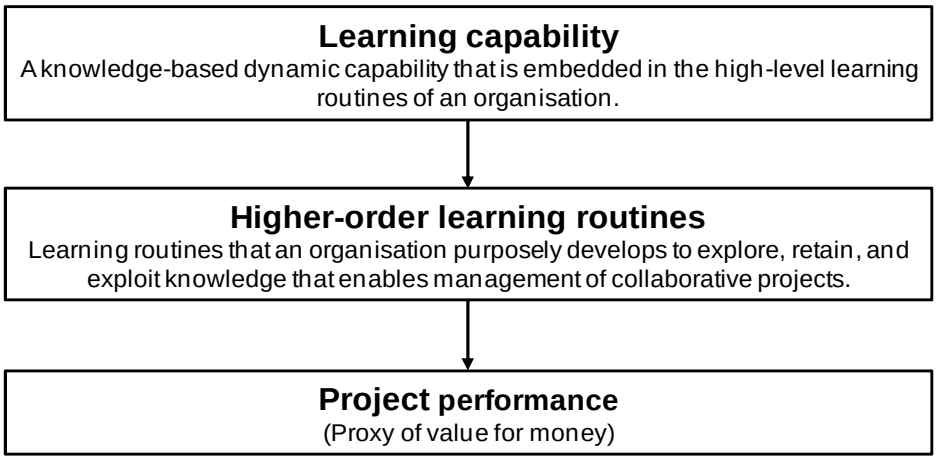

Figure 1: Learning Capability Model (Source: Authors of this paper)

3. Case study

3.1 Methods

An exploratory case study was carried out to investigate the value of the framework (Yin 2009). The objectives of the study were to demonstrate: 1) how learning routines at the project level can be applied by participant organisations to influence project VfM; 2) how project-level learning routines and knowledge affect the development of organisational (firm) level learning routines amongst participant organisations; and 3) how newly developed organisational level learning routines impact the VfM achieved on subsequent projects conducted by participant organisations.

An Australian rail infrastructure alliance was chosen as the case example. The Alliance was a project collaboration between five participant organisations, including two government

owners, and three non-owner participants, comprising a contractor and two design consultants. The Alliance was formed in 2007, with construction commencing during 2008 and project completion occurring in 2010 (Alliancing Association of Australasia 2012). The project was completed four months earlier than the target date, under budget, and in spite of numerous challenges including scope, political and procurement strategy changes (Alliancing Association of Australasia 2011; 2012).

Multiple sources of data were used to inform this case study. This enabled data triangulation so as to ensure the validity of the findings (Neuman 2003; Yin 2009). Sources of evidence comprised: (i) discussions with representatives from the Alliance during the Alliancing Association of Australasia Annual Convention in 2011; (ii) a presentation given by representatives from the Alliance team during the convention; and (iii) project information provided by the participant organisations in corporate brochures or web sites. At the AAA 2012 annual convention, further discussions were conducted with industry specialists in the field of collaborative contracting. These discussions assessed the existence of bias arising from the self-reports gathered the year before. No bias was revealed, and this was attributed to the gathering of data from both sides of the owner/non-owner divide.

The types of project-level learning routines that occurred in this project have been categorised as (i) joint learning, (ii) continual learning, (iii) learning governance and (iv) learning evaluation. This categorisation is the result of content analysis applied to the empirical data, viewed through the lens of the learning capability model. The final categories are the result of thematic grouping and coding undertaken independently by each of the three researchers involved, with refined common themes informing the final categories. This cross-referencing ensures the reliability and trustworthiness of the categories.

3.2 Case study findings

This section of the paper will outline the project-level learning routines developed and applied in the case study project, and how these routines impacted on the project VfM.

Joint Learning

The non-owner participant organisations of the case study Alliance team had worked together on a previous project. This enabled learning routines that had been developed jointly on the previous project to be applied from inception of the new project, whilst providing a strong platform for continuous improvement of those routines. The shared prior learning experiences also helped the team to bond rapidly and work together to design and price the Total Cost Estimate (TCE) (Alliancing Association of Australasia 2012). This was critical for managing the challenges of the complex scope. Learning routines such as detailed workshops consolidated the learning outcomes of the initial stage of the project, which were reflected in the resultant project proposal and the detailed TCE. Furthermore, a unique learning challenge faced by the Alliance team was to integrate the often conflicting product standards of the two owner organisations (Alliancing Association of Australasia 2012). All owner and non-owner participants worked together to develop a hybrid standard.

This involved learning routines such as discussion and negotiation, supported by the use of operational simulation technologies.

Continual Learning

The learning in this Alliance occurred continually throughout the project delivery period. The case study revealed that in line with the work of March (1991), the learning routines that were developed combined exploratory learning that allowed the Alliance team to experiment with new knowledge, and exploitative learning that helped the team to refine and extend existing routines and technologies. The complementarity between exploratory and exploitative learning was reflected in the process adopted by the Alliance team for the establishment and reinforcement of collaborative values within the team. Values represent essential knowledge that help to build organisational culture, leadership styles, and more formal governance mechanisms such as performance evaluation schemes (Foss and Michailova 2009; Nooteboom 2009). The Alliance team recognised the challenge of developing collaborative values to integrate the team, given that the team was formed by organisations representing intrinsic differences due to the nature of their work (e.g. designers vs. constructors) or the nature of their organisation (e.g. public vs. private sector).

The collaborative values of the Alliance team were developed by 20 core people when the alliance was formed (Alliancing Association of Australasia 2012). The knowledge associated with the new values was disseminated to over 100 people within a month to ensure that a distinctive collaborative culture was established (Alliancing Association of Australasia 2012). Through the project operations, the values were refined by the broader Alliance team. Exploratory learning routines were used to highlight the most common and important aspects of the values, and exploitative learning was carried out to disseminate and reinforce the values within the team. For example, weekly team briefings were usually carried out in morning tea settings to facilitate continuous knowledge externalisation and new idea generation. Team building activities were often integrated into the briefings for the purpose of forming a sustained integrated team spirit, and reinforcing alliance vision and values. According to Nooteboom (2009), these activities create cognitive focus within an alliance team, which enable the team to apply the project values and new knowledge in project operations more efficiently over time.

Learning Governance

The Alliance deployed governance mechanisms to facilitate and enable project-based learning. A typical example was the development of the Business Improvement Group (BIG), which was formed to coordinate the continual learning of the project (Alliancing Association of Australasia 2012). BIG committee members were professionals (e.g. project engineers) drawn from a range of functional areas including commercial and construction, design, quality, safety, community and environment. They were able to distribute the learning outcomes to their fellow workers at the operational level. For instance, learning outcomes were identified in early project operation activities, in particular those associated with repetitive works, such as earthworks, piling and concrete structures. Through the BIG mechanism, new experiences and best practices were actively shared to improve the

efficiency and quality of the works. BIG also disseminated learning through special learning workshops within an informal lunch setting, and distributed a regular newsletter to share problem-solving solutions.

Learning Evaluation

The construction management literature argues that learning outcomes are much more effectively disseminated if the review process and project performance evaluation embrace benchmarking and other continuous improvement approaches (Bresnen 2007; Love et al. 2002; Robinson et al. 2005). In line with these arguments, the case study found that the Alliance team integrated these types of learning routines within the reporting and evaluation process, which codified data on practices that resulted in both over and under performance. The team adopted an ongoing cost-planning process that facilitated a routine measure of productivity at a detailed level (Alliancing Association of Australasia 2012). In addition, monthly reviews were undertaken to assess the actual project progress versus the estimates. Every month the Key Result Areas (KRAs) (e.g. quality and traffic management) were evaluated against high standards to support the achievement of client goals. On a monthly basis, the evaluation results were recorded, reported and discussed with the alliance management team to generate continual improvement strategies for project operations. It was commented by a representative from the Alliance team that continual learning evaluation enabled the team to achieve an 'outstanding' overall performance. Completion of the project ahead of time fortuitously enabled the provision of essential services to the community following the floods in South-east Queensland in early 2011. The case study thus revealed that project learning indeed modified and improved the project management and operational routines which enabled the team to achieve superior VfM in delivery of the project.

4. Conclusion

Building upon the review of extant literature, this study conceptualises learning capability as a knowledge-based dynamic capability that a construction organisation purposely develops to improve the management and operation of its collaborative projects. Learning capability is built upon the organisation's high-order learning routines. Based on this conceptualisation, an exploratory case study was carried out within the context of an award winning infrastructure project alliance team in Australia. The findings of the study suggest that project-level learning routines might constitute the most essential and dynamic micro foundations for the learning capabilities of construction organisations which are involved in collaborative project delivery. Their project-level learning routines have the potential to provide an essential contribution to the development of corporate knowledge and corporate learning routines which ultimately configure their corporate strategies for managing collaborative projects.

In addition, the learning routines that have assisted one project to achieve VfM are highly likely to be applied in other projects based on either collaborative or conventional contracts. The case study findings show that the learning within a collaborative project is undertaken together by both owner and non-owner participants. Joint learning is a continual process,

which is: influenced by the prior collaborative learning experiences of participant organisations; carried out continually to deal with the challenges of the current project; and impacts on the learning practices of future collaboration in project delivery. Moreover, it is to be expected that collaborative project learning outcomes impact on the collaborative practice of other construction organisations through external learning mechanisms such as industry forums and conventions.

The generalisability of the case study findings is limited because the data sources were all official in nature, suggesting that personal views were overlooked. Nevertheless, this exploratory case study has prepared a good foundation for further empirical investigations with larger scope. Such research is planned by the authors for 2013. The concept of learning capability will be expanded by identifying highly disaggregated learning routines, based on the literature. A large-scale survey will be carried out to examine the extent to which these learning routines influence project outcomes in the construction context. The authors expect that the future empirical investigations will identify the fine-grained learning routines that maximise VfM on collaborative construction projects.

While the conceptual discussion in the current paper extends the theoretical basis for understanding organisational learning in the construction project context, the case study results provide interim guidance for project managers seeking to improve Vfm on collaborative contracts. As discussed, both these contributions fill important gaps in construction management literature.

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