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Against the odds: Small firms in Australia successfully introducing new technology on construction projects

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ABSTRACT

The methods by which small firms overcome the disadvantages of their size to implement innovation on construction projects are examined here through five Australian case studies. It is found that such methods include working with advanced clients, prioritising relationship-building strategies and using patents to protect intellectual property. Key obstacles to innovation implementation by small firms on construction projects are found to be bias in the allocation of government business assistance and regulatory inefficiencies under federal systems of government. The study's findings derive from a theoretical framework which emphasises firm capabilities and environment, and innovation typologies. Further research is recommended into the impact of government assistance and regulation on small innovative construction firms.

1. Introduction

The innovation performance of the construction industry has been the subject of much criticism by academics, policy makers and practitioners, especially over the past 10 years. Such criticism and the subsequent search for solutions have been most obvious in the UK, with investigations such as the Egan Inquiry (1998) prompting a range of related studies in the UK and in other countries. Nevertheless, progress has been slow globally, such that the industry is still perceived to be underperforming. In recent academic comparisons of innovation activity across different sectors of the economy, construction underperforms significantly compared to manufacturing (Reichstein et al., 2005). Although some authors rightly point out that such comparisons can be misleading (Winch, 2003), the cited study made adjustments to the definition of the construction industry within the Standard Industrial Classifications to ensure a fair comparison.

Continued poor performance is also reflected in the fact that construction clients globally remain unsatisfied with typical project outcomes (Boyd and Chinyio, 2006). The answer to the industry's continuing problems is said to lie in building a stronger innovation culture to improve the rate and quality of innovation across the construction system, particularly given increasing client demands for integrated services (Hartmann, 2006). The industry appears to be moving in this direction; however it faces a number of significant challenges related to the production of assets that are complex, unique, long-lived, fixed, expensive, and risky (Nam and Tatum, 1988).

It is against this backdrop that small construction firms operate. Not only do they face the difficulties summarised by Nam and Tatum (1988), they must also contend with higher levels of competition than larger firms, and with the resource disadvantages of their size.

This paper focuses on a group of small firms that were able to overcome the above challenges and introduce innovation on construction projects. Five Australian case studies are considered, all involving strategic technological product innovation that was successfully implemented on a project between 2000 and 2004. The research question

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driving the study is 'How do small firms overcome the resource disadvantages of their size and successfully implement innovation on construction projects?' Despite the challenges small firms face, it is shown that they can play an important role in driving project innovation.

2. Research gap

Analyses of innovation in the construction industry often focus on large high profile players, iconic projects and systemic innovation. A good example is the literature on public–private-partnerships (e.g., Leiringer, 2006). Taking a different tack, this paper focuses on the introduction of relatively modest innovation, by small firms, on relatively small projects. This is an important topic because 'small firm innovation is a significant and distinct entity from large-firm innovation' (Acs and Audretsch, 1991).

The definition of innovation employed here is the most authoritative and widely used definition available, which is that provided by the OECD (2005), where an innovation is a new or significantly improved product (good or service), process (production or delivery method), marketing method (packaging, promotion, or pricing) or managerial method (internal business strategies). Innovation is further categorised as being technological or organisational in nature. Technological innovations have a technical character, while organisational innovation is about advanced business practices. Technological innovation typically involves product or process innovation, while organisational innovation typically involves marketing or managerial innovation. This paper focuses on technological product innovation.

To date there has been very little attention given to the role of small firms in driving innovation in the construction industry. An important exception is the work undertaken by Sexton and Barrett (e.g., Barrett and Sexton, 2006; Sexton and Barrett, 2003a,b, 2004). These authors often employ case studies conducted in the UK, and focus on innovation implemented within small firms, rather than by them on construction projects. The research reported here complements this existing research on innovation *within* small construction firms, by looking at the role of small firms in driving innovation on construction *projects*. The current paper fills a significant gap in the literature, as at any level-firm, project, network, industry, nation, globally—"there is a dearth of research investigating innovation from the perspective of the small construction firm" (Sexton and Barrett, 2003a).

Indeed, few authors have addressed the implementation processes surrounding construction innovation by firms of any size. Key exceptions are Winch (1998), Gann and Salter (2000), Slaughter (2000) and Ling (2003). Winch (1998) and Gann and Salter (2000) drew attention to the complex environment within which construction firms innovate. The structural features they identified as impacting construction firm innovation will be reviewed here through a detailed examination of small firm innovation on construction projects in Australia. Winch (1998) also highlighted the difference between reactive and proactive innovation by firms; a distinction that is employed in the current paper.

Slaughter (2000) conceptualised the construction innovation implementation process as moving from assessment of ideas through commitment, use and evaluation. She described how implementation of project-based innovation might be *optimally planned* for particular types of innovations. The research reported here extends her work, by looking at how successful project-based innovations are *actually* implemented by small firms. Slaughter also described how the characteristics of an innovation influence the type of implementation process which is best employed. The current paper will extend this aspect of her work by looking at the implementation impact of an expanded set of innovation characteristics.

Adopting a different approach, Ling (2003) looked at the micro drivers of construction innovation success, and identified the importance of interpersonal variables. This quantitative study focused on innovation in construction projects and the determinants of innovation benefits to the project and the project team. The current paper complements her quantitative study by using a case study approach to gain a finer grained picture of how interpersonal and other variables support innovation.

3. Theoretical framework

Consideration of the above literature and related construction and general innovation contributions suggests that the firm-level innovation process can be simplified to comprise two main innovation drivers—those internal to the firm and those external (Manley and McFallan, 2006; Barrett and Sexton, 2006; Hartmann, 2006; Seaden et al., 2003; Winch, 1998). These drivers can usefully be seen to constitute the firm's capabilities (an expansion of the old technology-push innovation model) and environment (an expansion of the old market-pull model). These drivers translate into improved project and firm outcomes through a successful innovation implementation process, which is now seen to be a highly interactive, dynamic activity involving many feedback loops in the accumulation of know-how. The progression of understanding of innovation processes since the 1950s, from linear models (e.g., technology-push and market-pull) to system approaches (such as the simple one presented here), is well summarised by Rothwell (1994), with Manley (2003) providing an overview of contemporary models.

The success of a firm, regardless of its size, in implementing project-based innovation is determined by its environment and capabilities and the characteristics of the innovation. For project-based innovation, the firm's environment is critical, particularly the inter-organisational interaction environment. Fig. 1 provides a simple representation of the firm's innovation process which is broadly consistent with similar models provided by Hartmann (2006), Seaden et al. (2003), Sexton and Barrett (2003a,b) and Winch (1998).

The firm needs to strategically manage the drivers presented at Boxes 1–3, in order to successfully implement innovation on projects, at Box 4. It needs to effectively exploit its business environment, while building strong firm capabilities and developing innovations with characteristics appropriate to its environment, capabilities and