Innovation in Small, Project-Based Construction Firms*

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Relevant literature is synthesized to provide a holistic picture of our current knowledge of innovation in small, project-based firms, highlighting significant gaps in the broad areas of ‘focus and outcome’, ‘organizational capabilities’, ‘context’ and ‘process’. Research findings from fieldwork focused on the construction industry are offered to address these gaps. In particular, a consensus model is given of the organizational factors dynamically at play. It is shown that typically the innovations of small, project-based firms are closely tied to their operational activities and are pushed forward by owners who utilize very scarce resources to make progress in the interstices of normal business. This leads to an emphasis on taking up established technologies through ‘learning on the job’. Growth per se is not an important target. The motivation to act is generally to get past a survival mode of operating and to achieve stability by satisfying clients. These characteristics contrast with large organizations, especially in terms of the role of the owner, the close focus on niche markets and the lack of slack resources to innovate in parallel with normal business. It is hoped that these results will be of interest to other sectors where small, project-based firms operate.

Introduction

The notion of sustainable competitive advantage is increasingly interwoven with the ability of nations and firms to successfully create, manage and exploit appropriate innovation. Two key strands can be identified.

First, the enhanced understanding of the important role small firms plays in industrial markets.

Acs and Audretsch (1991, pp. 150–151) list four key contributions from small firms: ‘they play an important part in the process of technological change; . . . generate much of the turbulence that not only creates an additional dimension of competition . . . but also provide a mechanism for [market] regeneration; . . . international competitiveness in newly created product niches . . . [and] job generation’. Interest in the contribution of small firms to innovation-led wealth generation and job creation has been revitalised in recent years at national and international levels (DTI, 2001; European Commission, 1996; OECD, 2000).

Second, firms across a variety of industries are increasingly experimenting with project-based models of organization to accommodate and exploit fundamental changes in the nature and roles of markets and technologies (Ayas, 1996; Bonaccorsi et al., 1999; DeFillippi and Arthur, 1998; Kanter, 1997, 1983). Project-based organization focuses on the production and/or delivery

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side of a firm’s business (Artto, 1998, pp. 19–20), and is characterized by ‘the coexistence of a continuing organization structure, typically based on functional departments with a temporary organizational structure based on project teams’ (Grant, 1997, p. 160).

Taken together these two strands form an expanding locus of innovation and economic growth: namely, the small, project-based firm. This focus can fruitfully be addressed within the project-based context of the construction industry. The construction industry is generally driven by single and unique projects, each creating and disbanding project teams (Betts and Wood-Harper, 1994; Carty, 1995; Halpin and Woodhead, 1998; Tatum, 1986). The scale of small-firm activity in this collage of disjointed projects is considerable, with, in 1999, 99% of UK construction firms having between 1 and 59 staff (Department of the Environment, Transport and the Regions (DETR), 2000: Table 3.1), delivering some 52% of the industry’s workload (DETR, 2000: Table 3.3). Therefore any innovation-led performance improvement in this industry is significantly influenced by these small firms.

In this context the construction industry’s unusual emphasis on projects and preponderance of small firms has the potential to provide useful insights for innovation efforts in other industries. This is especially so given the fact that, as measured by relative Gross Value Added to the economy, construction has significantly outperformed the manufacturing sector over the last 25 years (DTI, 2003). This achievement is all the more impressive given the prevailing climate in the UK construction industry, where the principal determinant of competition is on price rather than value added through innovation (Gann, 1997), reinforced by Egan’s (DETR, 1998) observation that R&D investment by the UK construction industry is consistently lower than any other sector, and that in absolute terms, R&D expenditure in the industry has fallen by 80% since 1981.

Gann and Salter (2000, p. 955) observe ‘[construction] project-based, service-enhanced forms of enterprise are inadequately addressed in the innovation literature’. The aim of this paper is therefore to contribute to the development of this area of study by offering new theoretical and practical insights and models grounded in descriptive case studies and action research, focused on innovation in small, project-based construction firms. The findings will be contextualized in the broader literature to make them of relevance to policy makers, practitioners and researchers interested in small, project-based firms in general.

Key issues from the literature

Generic innovation model

A simple generic innovation model is given in Figure 1. It suggests that enhanced performance owing to successful innovation is achieved by first taking an appropriate innovation focus. This focus should reflect organizational capabilities, but must also be responsive to contextual factors, so that energy is channelled through effective innovation processes. The model is offered primarily as a way of structuring this section. The scale and complexity of the subject negates any one form of analysis providing a ‘complete’ picture (Dodgson, 1993). The discussion here presents a particular ‘lense’ to innovation (Marceau, 1992) that has its own focus on innovation with respect to small, project-based firms.

Innovation focus and outcomes

In the general innovation literature, the focus for innovation is broadly seen as being something new to the firm and beneficial; for example, ‘innovation consists of the generation of a new idea and its implementation into a new product, process, or service, leading to the dynamic growth
of the national economy and the increase of employment as well as the creation of pure profit for the innovative business enterprise’ (Urabe, 1988, p. 3). Similarly, innovation in construction is ‘the act of introducing and using new ideas, technologies, products and/or processes aimed at solving problems, viewing things differently, improving efficiency and effectiveness, or enhancing standards of living’ (CERF, 2000, p. 2).

The abstract, espoused benefits of innovation are, in themselves, insufficient to bring about innovation in firms: firms also need to be motivated to innovate. This notion is embedded in the seminal challenge by Kimberley (1981, pp. 84–85) that innovation should not be viewed in unreflective, positive terms. Innovators need ‘to be sensitive to the difference between rhetoric and reality [of innovation]’ (Kimberley, 1981, p. 100) – innovation per se is not always beneficial.

In the general innovation literature, innovation is portrayed as having a number of roles or outcomes: the renewal and enlargement of product/service ranges and their associated markets; new methods of production, supply and distribution; and new organizational and work forms and practices (European Commission, 1996). In the construction literature, Thomas and Bone (2000, p. 67) identify three key areas for innovation activity that ‘can deliver significantly improved quality and value’: supply chain management and partnering; value and risk management; and technical innovation.

In summary, within the general and construction literature there appears to be an ongoing shift from viewing innovation as an ‘end’ in itself, to innovation being a ‘means’ to achieve sustainable competitiveness. How this impacts for small, project-based firms is not clear. The following three issues appear to be significant gaps in the literature:

What is the general strategic focus for innovation, or definition of innovation, for small, project-based firms?

What is the general motivation for small, project-based firms to innovate?

What are common innovation outcomes in small, project-based firms?

**Organizational capabilities for innovation**

Organizational capabilities for innovation are defined as ‘the comprehensive set of character-istics of an organization that facilitate and support innovation strategies’ (Burgelman, Maidique and Wheelwright, 1996, p. 8). Research into innovation in small manufacturing-based firms reported that the ‘accumulation and development of resources and capabilities are the relatively most important influential factors for innovativeness. Managerial skills and capabilities, internal technological resources . . . and capabilities explain to a considerable extent the differences in innovation behaviour of small firms’ (Hadjimanolis, 2000, p. 278). From the construction literature, this view is certainly supported for large construction firms, with Tatum (1989) stressing the importance of creating an appropriate climate and capability pool for successful innovation which nurtures longer strategic horizons, risk tolerance and management, vertical integration of decision-making processes, flexible organizational structures and proper matching of personnel to roles.

The literature reviewed, however, did not extend its enquiry to the organizational capabilities for innovation in small, project-based construction firms. The following two issues appear to be significant gaps in the literature:

What are the key capabilities for innovation in small, project-based firms?

How are these capabilities developed and used in innovation activity?

**Context of innovation**

There are two main schools of thought on what drives innovation: the market-based view of innovation and the resource-based view of innovation (Coombes, Saviotti and Walsh, 1987; Mowery and Rosenberg, 1979; Rothwell, 1992).

The market-based view argues that market conditions provide the context that facilitates or constrains the direction and quantity of innovation activity by firms (Porter 1980, 1985; Slater and Narver, 1994). Two key contextual considerations are discussed here. First is the argument that the project-based nature of the construction industry is a significant barrier to innovation. Innovation often takes the form of pragmatic problem solving on site, but, taking an organizational learning perspective (Day, 1994; Dodgson and Bessant, 1996), for such ‘problem solving’ to become true innovation, ‘the solutions reached
for the particular problem faced on the project must be learned, codified and applied to future projects’ (Winch, 1999, p. 273). However, the temporary nature of the project teams and the short-term relationships between organizations makes the transfer of innovations from project to project and firm to firm extremely difficult (Construction Productivity Network, 1997).

The second consideration is the ability of firms to sense and interpret ‘precipitating events’ that stimulate or hinder innovation (Zahra, 1991). For innovative firms these events are often relate to changing market conditions (Chaganti, Chaganti and Mahajan, 1989; Cohen and Levinthal, 1990; Miller and Friesen, 1984; Venkatraman and Prescott, 1990). The extent to which the market predominates or is part of a two-way influence pattern has stimulated much debate (Calantone, di Benedetto and Devine, 1993; Tidd Bessant and Pavitt, 1997, p. 14) resonating with the findings of Nelson and Winter, 1982). In the construction literature Toole (1998) concluded that successful innovation within small firms was fuelled to a significant degree by their ability to tap into many trusted sources of information, such as other contractors, subcontractors and in-house expertise.

The perception of a potential market-driven opportunity or imperative is a necessary condition for innovation, but not a sufficient one (Dosi, 1984). The resource-based view of innovation considers that a market-driven orientation does not provide a secure foundation for formulating innovation strategies for markets which are dynamic and volatile; rather, firms’ own resources provide a much more stable context in which to develop its innovation activity, and to shape its markets, to a limited extent, in its own image (Andreu and Ciborra, 1996; Grant, 1997; Prahalad and Hamel, 1990).

A more holistic, dynamic approach is the dominant ‘coupling’ model of innovation (Rothwell and Zegveld, 1985), which recognizes that innovation needs both technology-push and market-pull (Coombes, Saviotti and Walsh, 1987; Freeman, 1982; Rothwell, 1992); with the implication that independent market-based or resource-based analysis cannot satisfactorily illuminate the diversity of factors affecting the innovation process and output (Dosi and Malerba, 1996). What is sought is an appropriate balance in the particular circumstances faced, in this case, by small-project-based firms.

In summary, the general innovation literature provides abundant, if somewhat fragmented, material on the contextual factors of innovation: precipitating events; market-led innovation; and resource-based innovation. The construction literature is far more limited in its treatment of these critical issues, particularly from a small, project-based construction firm perspective. The following three issues appear to be significant gaps in the literature:

What are the key events external and internal to small, project-based firms that trigger innovation activity?

What is the appropriate emphasis between market-based innovation and resource-based innovation in small, project-based firms?

What conditions dictate this emphasis?

Process of innovation

Numerous models of the innovation process have evolved over time, all focusing on improving our understanding of how to manage innovation projects (Rothwell, 1992, 1994; Sundbo, 1998). These endeavours can be broadly categorized into two schools of thought: the rational school and the behavioural school. The rational school of the innovation process is the most dominant, and considers innovation as multi-stage and linear in fashion (Drucker, 1986; Maidique, 1980; Zaltman, Duncan and Holbek, 1973). Similar thinking underpins the construction literature’s view of innovation process (CERF, 2000, p. 3). These rational conceptualizations of innovation processes are criticized widely as not accurately portraying the process of movement, interaction and feedback of knowledge and resources within uncertain and dynamic environments (OECD, 1991). This challenge has attracted endeavours to more adequately couple the innovation process with the ambiguities and uncertainties of organizational reality. This emphasis has led to behavioural perspectives which argue, in the general innovation literature for example, that innovation is essentially ‘controlled chaos’ (Quinn, 1985). Generally, our review of the construction innovation literature revealed scarce consideration of behavioural approaches to innovation in construction firms; and, in particular, small, project-based firms.
The following issue appears to be a significant gap in the literature:

*Are the processes of innovation in small, project-based firms rational and/or behavioural in nature?*

**Summary**

The above review of the general and construction-specific innovation literatures has highlighted a number of research gaps, which are summarized in Table 1.

**Research methodology**

This paper draws on the results of an 18-month project focused on innovation activity in seven small, construction firms. The project had at its centre two distinct, six-month phases, bound together by a series of integrating workshops mounted every three months and by continuous engagement with relevant literature. The first phase took a grounded (Strauss and Corbin, 1990; Glaser and Strauss, 1967) case-study (Yin, 1989) approach to identify the major themes concerning innovation from the perspective of these small firms. The second phase moved into an action research approach (Lewin, 1947) through the identification and development of a particular innovative initiative with each firm. This enabled the more general themes from the case study phase to be tested for relevance and the practical connections between the parts to be

**Table 1. Research ‘gaps’ identified**

<table>
<thead>
<tr>
<th>Focus and outcome of innovation</th>
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<tbody>
<tr>
<td>1. What is the general strategic focus for innovation or definition of innovation for small, project-based firms?</td>
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<td>2. What is the general motivation for small project-based firms to innovate?</td>
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<td>3. What are common innovation outcomes in small project-based firms?</td>
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<th>Organizational capabilities for innovation</th>
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<td>4. What are the key capabilities for innovation in small project-based firms?</td>
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<td>5. How are these capabilities developed and used in innovation activity?</td>
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<th>Context of innovation</th>
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<td>6. What are the key events external and internal to small project-based firms that trigger innovation activity?</td>
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<td>7. What is the appropriate emphasis between market-based innovation and resource-based innovation in small project-based firms, and what conditions dictate this emphasis? Process of innovation</td>
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<td>8. Are the processes of innovation in small project-based firms rational and/or behavioural in nature?</td>
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**Table 2. Key characteristics of participating small construction firms**

<table>
<thead>
<tr>
<th>Company</th>
<th>Est. No. owners</th>
<th>Turnover (1999)</th>
<th>Staff No.</th>
<th>Principal business focus</th>
<th>Main fields of expertise/clients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant A</td>
<td>1997</td>
<td>4</td>
<td>£1.25 m</td>
<td>26</td>
<td>Architectural design and project management</td>
</tr>
<tr>
<td>Consultant B</td>
<td>1998</td>
<td>2</td>
<td>£0.44 m</td>
<td>11</td>
<td>Quantity surveying and construction cost consultancy</td>
</tr>
<tr>
<td>Consultant C</td>
<td>1981</td>
<td>3</td>
<td>–</td>
<td>20</td>
<td>Survey, design and building contract administration</td>
</tr>
<tr>
<td>Consultant D</td>
<td>1990</td>
<td>4</td>
<td>£0.5 m</td>
<td>20</td>
<td>Building services engineering</td>
</tr>
<tr>
<td>Contractor A</td>
<td>1981</td>
<td>2</td>
<td>£2 m</td>
<td>25</td>
<td>General building contracting</td>
</tr>
<tr>
<td>Contractor B</td>
<td>1996</td>
<td>2</td>
<td>£3.2 m</td>
<td>15</td>
<td>Management of building and engineering contracts</td>
</tr>
<tr>
<td>Contractor C</td>
<td>1985</td>
<td>2</td>
<td>£2.12 m</td>
<td>25</td>
<td>Renovation and refurbishment.</td>
</tr>
</tbody>
</table>
better understood from an assessment of actual, dynamic innovation processes. The whole project was underpinned by a reflective, critical realism paradigm (Johnson and Duberley, 2000) in which the identification of multiple perspectives was central (Checkland and Scholes, 1990), twinned with the search for underlying, generative regularities (Sayer, 1992).

Broad descriptive characteristics of the firms that took part are given in Table 2. For this project small firms were defined as having between 10 and 49 staff (Loecher, 2000). It can be seen that the firms vary in size, time established, nature of business and types of client served. As the aim was to increase understanding of innovation in small firms through a detailed, grounded approach, this variety was essential to achieving robust findings.

The case-study data was collected via a series of four semi-structured interviews with the senior figure in each firm. The topics progressively and cumulatively covered were: general fact-finding about the firm, the main factors affecting innovation, the organization of the firm and a specific example of an innovation. The interviews were recorded and transcribed into verbatim records that were sent back for checking by the interviewee to avoid misinterpretations. These confirmed records were then kept separately so that they could support immediate analysis, but also subsequent analyses revealing additional insights as the theoretical sensitivity of the researchers to the issues increased through the project. There were two research assistants working on the project and they provided a degree of triangulation (Denzin, 1970) by carrying out the initial analysis of the data independently and in parallel. They then compared their analyses and a powerful way of visually summarizing a consensus of the major themes emerging from this initial stage was found to be via cognitive mapping using ‘Decision Explorer’. This also facilitated cross-case analysis, through which common themes were identified. Whilst remaining true to the grounded theory approach by being driven by the data, the approach was finessed by introducing insights from relevant literature once the key themes were evident (Barrett and Stanley, 1999). This hybrid approach, ‘Grounded + Wn’, loosens the disadvantage of grounded theory, that it can be unduly limited by the cases and the researchers’ perspectives and makes the exercise richer and informed from even more perspectives.

The action research phase was a participatory, cooperative, co-learning process through which self-sustaining organizational developments were sought via a learning cycle adapted from Susman (1983). Given the relatively short duration of this phase of the research it was necessary to find suitable foci for innovation that were ready to go and could be completed quickly enough while the research team was still in place. Table 3 lists the innovations activated and the outcomes achieved by the end of the project duration. Building on the consensus ‘integrating framework’ from the case-study phase, action plans for the innovations were developed with the firms. The university team actively worked with the firms during implementation, but also collected data through interviews, which were recorded and analysed as for the case studies. Having only six months for the interventions was limiting; however, the consistency of the insights revealed by the cross-firm analysis gave confidence in the findings.

Throughout the case-study and action research phases, workshops were held between representatives of all of the firms and the research team. At these workshops it was possible for the researchers to bring forward summaries and descriptions of relevant issues around a key issue drawn from across the companies. This stimulated good discussion between the industry partners and led, eventually, to consensus on a set of more general positions regarding innovation in small construction companies, but these were still firmly rooted in the everyday experience of the firms taking part (Hansen and Sjoholt, 1989). We did endeavour to create more continuity between the workshops by using the notion of a group-building ‘workbook’ approach between the meetings (Vennix, 1996). However, our small companies found this too time-consuming and the approach was scrapped. For all that, the workshops were a pivotal aspect of the project and the creation of shared insights.

**Summary of research results**

**Introduction**

The literature review identified eight important research ‘gaps’ pertaining to innovation in small, project-based firms (see Table 1). These research questions are addressed below drawing upon the rich findings from the research project. The
Gap 1: What is the general strategic focus for innovation or definition of innovation for small, project-based firms?

The practitioners involved in the project viewed successful innovation as: *the effective generation and implementation of a new idea, which enhances overall organizational performance*. This definition was developed originally by (and for) large construction firms (Barrett and Sexton, 1998), but was considered by the practitioners to be sufficiently inclusive to accurately define innovation in small, project-based construction firms. Various assumptions are emphasized. ‘Ideas’ are taken to mean the starting point for innovation (Thompson, 1965) and can be administrative in nature, such as restructuring [Contractor B], or technical, such as computerization [Contractor C]. However, not all ideas are recognized as innovations and it is accepted that ‘newness’ is a key distinguishing feature (Zaltman, Duncan and Holbek, 1973). The idea only has to be new to a given firm, such as the use of mobile phones to improve site-based communications [Contractor A]. The examples of innovation offered by the firms tended to be the adoption of established ideas or technologies and/or their incremental adaptation as predicted by Storey and Sykes (1996) and Rosenberg (1992).

For the small firms studied, an innovation had to lead to successful implementation or it would be rapidly dropped (Monk, 1989; Thompson, 1965). Furthermore, it was vital that the impact improved organizational performance, either individually, or collectively through the supply chain (Kimberley, 1981). This is evident in the assertion [by Contractor B] that they used CD-ROM technology to improve overall performance, not just their marketing.

The key implication of the definition of innovation given is that not all innovation *per se* is beneficial; rather, appropriate innovation is.

Gap 2: What is the general motivation for small, project-based firms to innovate?

The project indicated that the motivation to innovate in small, project-based firms follows a fluid hierarchy of ‘motivational needs’. Because of the type of markets they operate in and their lack of organizational resources and slack, this type of firm concentrates at best on project-based innovation, focusing on survival. For example:

If we are struggling . . . the first thing to go is any time spent . . . innovating; you just do what you can, the best you can, with what you’ve got’ [Consultant C].
It is only once survival has been confidently achieved that firms are motivated to look towards consolidating, stabilizing and developing their market and/or resource position to ensure steady-state conditions over the medium term.

Once we get a sustainable level of throughput ... then we will look to trying to refine and improve the service. [Contractor B]

and

Long term stability would allow us to plan for the future and, perhaps, have a formal development budget. [Consultant C]

This type of hierarchy is consistent with arguments located in the stage theory research literature. Churchill and Lewis (1983) describe five stages through which small firms pass: existence, survival, success, take-off and resource maturity. The findings of this project, however, depart from this literature, by emphasizing that survival, stability and development stages are not rigidly linear in progression, but cyclical in response to dynamic imbalances between external demands and internal capacity. For example: ‘It just changed overnight ... turnover has probably just grown back to what it was in the late 1980s’ [Consultant C]. This dynamic and cyclical behaviour confirms that small, project-based firms remain more open to their external environments compared to large firms owing to their comparative lack of market and resource buffers.

Furthermore, there is a tendency in the stage theory literature to assume that small firms strive for growth per se. These project findings indicate that the motivation to innovate is not solely to grow, but can be directed at creating a sustainable, steady-state position. ‘In terms of ... expansion ... we probably have very low expectations ... the more turnover you make the more partners you need, so you’re sharing more money out’ [Consultant C].

The principal implications of these findings on the motivation for small, project-based construction firms to innovate are threefold. First, small, project-based firms are not always motivated to innovate; when in ‘survival’ posture, firms will generally want to limit their exposure to the costs and risks of innovation as much as possible. Second, the hierarchy of motivational drivers for innovation are dynamic and cyclical; not a linear progression. Third, not all small, project-based firms want to grow indefinitely in size; firm size will stabilize at a level that is compatible with the owner’s aspirations.

Gap 3: What are common innovation outcomes in small project-based firms?

The findings provide numerous and diverse examples of innovation outcomes: client relationship development innovation; organization and management innovation at firm and project levels; technological innovation and so on. The principal outcome of innovation activity can be usefully grouped into two areas: improving the effectiveness of the firm, i.e. making sure that the firm is doing the right activities; and, improving the efficiency of the firm, i.e. making sure that the firm’s activities are done well. However, the overriding, immediate concern is to satisfy clients: ‘If we don’t provide the service that clients want then we don’t get repeat business’ [Contractor C].

Gap 4: What are the key capabilities for innovation in small, project-based firms?

The project resulted in a consensus model of the main organizational factors critical to successful innovation (see Figure 2). This differed from the researchers’ initial ideas and emerged through debate in the workshops and repeated attempts to reflect the reality found in the fieldwork as simply, but comprehensively as possible. This section is longer than most as various characteristics of small, project-based firms are outlined, however, the subsequent sections can be briefer once this background is established.

The variables which make up the model are defined and described as follows.

The ‘given’ and ‘interaction’ environments are, respectively, that part of the business environment which firms are influenced by, but which they cannot influence themselves and that part that firms can interact with and influence. For the ‘given’ aspect, ‘There’s not a lot you can do about the Government ... it’s an “across the board” thing’ [Contractor B], whereas for the ‘interaction’ aspect action can be taken such as diversifying away from areas where work seems to be getting risky [Consultant D].

‘Business strategy’ is concerned with the overall purpose and longer-term direction of the firm and its financial viability. This can be relatively
rigid, ‘otherwise you do not really know where you are going’ [Consultant D], but for small firms is more normally typified by: ‘every so often, perhaps quarterly, the Associates and us, just go out for a pizza somewhere. We then say, “Right, where are we going? What do we need to do? Any thoughts?”’ [Consultant B]. The strategies as well as being fairly informal, often carried mainly in the heads of the owners of the firm, are also quite short term and very externally driven, but consequently are flexible and dynamic. This approach is reinforced by the lack of formal management education, but centrality of the owners to the strategy: ‘when you have 19,999 shares out of 20,000 you don’t have resistance’ [Contractor A].

In contrast to this ‘soft focus’ on strategy, the firms have a ‘hard focus’ on their ‘market positioning’, that is their chosen (or emergent) orientation towards desired target markets for the purpose of achieving sustainable profitability. This is based on in-depth knowledge of their, typically local, client base, which leads to repeat business and referrals based on strong dynamic relationships with clients. For example: ‘tends to have rolling relationships with . . . at least three or four agents . . . developed through trust and track record’ [Consultant A], and ‘a lot of repeat business, via recommendations’ [Contractor C], although the level of repeat business tended to be lower for contractors than consultants. An emphasis on declaring, knowing and keeping to their strengths also came through, doing work that is: ‘a variation on a theme; its all stuff we’re well capable of, and understand, and we run with it all the time’, whereas for opportunities arising in unfamiliar areas the same firm’s reaction was ‘No, so we killed it there and then. We didn’t waste time on it. We have to be selective’ [Contractor C]. They do, however, try to spread their risks across various clients and sectors with counter-cyclical demand albeit within their, often tightly declared scope of competence.

The ‘technology’ in the figure is the machines, tools and work routines used to transform material and information inputs (for example, labour, raw materials, components and capital) into outputs (for example, products and services). For small, project-based firms it is apparent that IT is an important focus for innovation in itself and as an enabler of other innovations. The pervasiveness of this is shown by ‘The beauty of any CAD system is that once you have drawn something you never draw it again . . . you can copy a whole project across and alter / adapt it’ [Consultant A]. Also evident is a complementary combination of really quite rigid work routines providing stability in the administrative core, whilst project processes are rapidly adapted to external demands. ‘We keep a record of how jobs are progressing, and then we’re fairly flexible in how we respond to new information’ [Consultant B]. Much of the knowledge in the firm about clients and work activities is tacit and efforts are made to transfer this knowledge around via meetings, databases and ‘purposefully mix[ing] it up all the time’ [Consultant D] to make the firm less vulnerable should someone leave and so that the, ‘immediate need to delegate and have confidence that others can carry out the given task’ [Consultant A] can be met.

The ‘people’ of the firm are viewed as possessing knowledge, skills and motivation to perform a variety of tasks required to do the work of the firm. In small, project-based firms the appropriate ability and motivation of, especially key, staff is crucial to the firm’s capacity to innovate. ‘The people in my company are very important, particularly the good ones, because we are so small’ [Contractor A]. Furthermore, staff must have a broad range of skills and be very flexible across multiple tasks so that the firm can be agile despite limited resources. ‘I think that with any small firm people have to turn their hand to
whatever is the panic of the day’ [Consultant B]. For all that, little value is placed on formal learning and the emphasis is heavily on ‘learning through experience’. ‘The rare commodity, the most expensive commodity, is experience [it] rubs off on people that have less experience . . . its just a gradual process’ [Consultant C].

‘Organization of work’ involves the creation and coordination of project teams and commercial networks both within the firm and across its business partners. For the firms studied there was a fairly simple and uniform pattern of allocating work down the hierarchy with attendant reporting and communication structures at company and project levels. So, ‘there are layers of management . . . we set out the parameters, the targets, we do an analysis and then we give them the tasks. One is to appoint a senior team leader and he would organize at a local level’ [Consultant C]. At this latter level resourcing and organization are flexible in the face of limited staffing and the volatile nature of construction projects: ‘they do mix and match and change around all the time’ [Consultant C].

Gap 5: How are these capabilities developed and used in innovation activity?

The model in Figure 2 emphasizes and embraces both the holistic and systemic dimensions of innovation. Small, project-based firms are likely to have ‘soft focused’ strategies driven by the owner/s. If they are myopic it can be disastrous for the firm, but if they are lively, energized and insightful these firms can quickly respond to events. Considerable effort goes into developing client relationships and these are an important influence on many innovations. A preponderance of the firm’s resources are invested in project activities and there is very little time spare for reflection so that initiatives tend to be pursued incrementally to minimize risk. Often IT itself will be the focus of such innovations, but if they require new expertise, then ‘learning on the job’ is favoured, reinforcing the low level, risk averse, step-at-a-time approach that is a natural consequence of such firms having very few ‘slack resources’ with which to speculate. Conversely, should an innovative effort be heading for failure this is likely to be spotted by the owner very quickly, an assessment made and, if appropriate, the initiative stopped immediately.

Gap 6: What are the key events external and internal to small, project-based firms that trigger innovation activity?

Innovation activity in small, project-based firms is triggered predominantly by precipitating events in its external business environments, rather than within the firm itself. Innovation activity is stimulated in particular by changing client needs and unpredictable project-specific conditions. Drawing upon Malerba and Orsenigo (1996) classifications of firms’ innovation activities, these drivers suggest that the prevailing pattern of innovation is more aligned with the Schumpeter Mark 1 pattern of innovation, which is characterized by dispersed and turbulent innovation activities; rather than the Schumpeter Mark II configuration, which is characterized by a concentrated and stable innovation activities. Furthermore, these triggers for innovation are predominantly filtered and prioritized by the owner(s) of the firm. This significant role of the interaction environment is discussed more fully in the next section.

Gap 7: What is the appropriate emphasis between market-based innovation and resource-based innovation in small, project-based firms, and what conditions dictate this emphasis?

The project findings identified two principal modes of innovation, shown in Figure 3, which provide a better understanding of the shifting balance between market-based and resource-based innovation.

The two modes of innovation are shown in the centre portion of the diagram: Mode 1 innovation focuses on progressing single project, cost-orientated relationships between the client and the firm – this mode of innovation is more driven by rapid change and uncertainty in the interaction environment, and the innovation is more market-based. The pervasive emphasis in construction on lowest cost and low risk was very clear, ‘lowest price wins’ [Contractor A] and ‘they want to go down set routes, because of the requirement of accountability. Clients don’t like too much risk’ [Consultant B].

Mode 2 innovation concentrates on progressing multiple project, value-orientated relationships between client and the firm – this mode of innovation is more aligned to improving the effectiveness of a firm’s relationship with its clients and stimulates a more equal balance between
market-based and resource-based innovation. ‘I think the partnering arrangement is very innovative. It's the first time we have ever had an arrangement like this with a client’ [Consultant C].

The right-hand side of the diagram reinforces the notion that the mode of innovation is substantially determined by the nature of the interaction environment: an enabling interaction environment encourages Mode 2 innovation; and a constraining environment is conducive to Mode 1 innovation. An enabling interaction environment is one that the firm can influence to a significant extent, enabling the firm to innovate within a longer term and more secure context. A constraining interaction environment is one that the small firm can only influence to a limited extent, constraining the firm to innovation activity undertaken within a shorter time scale and more insecure context.

The left-hand side of the diagram identifies which factors of the organizational model are the primary focuses of (and levers for) innovation activity: Mode 2 innovation involves innovation in the ‘business strategy/market positioning’ variable which, in turn, will have implication for the remaining variables; Mode 1 innovation is where the ‘business strategy/market positioning’ variable is relatively fixed, and the focus of the activity is in the ‘organization of work’, ‘technology’ and ‘people’ variables.

Mode 1 and Mode 2 innovation present the ends of a continuum, rather than a choice of two discrete types of innovation activity, i.e. ‘hybrid’ modes of innovation can be located between Mode 1 and Mode 2.

A key implication for small, project-based firms is that they should not ‘flip’ from Mode 1 innovation to Mode 2 innovation without careful analysis of their interaction environment to make such a move. Small, project-based firms need to nurture or move incrementally into supportive enabling interaction environments. This is achieved through careful and integrated consideration and development of all the variables in the ‘organizational factors of innovation’ model (Figure 2). It would be potentially disastrous, for example, for a small, project-based firm to enter into a partnering relationship with a client without the necessary ‘organization of work’, ‘technology’ and ‘people’ to fully satisfy client and firm needs and expectations.

Gap 8: Are the processes of innovation in small, project-based firms rational and/or behavioural in nature?
The findings portray the process of innovation as being predominantly behavioural and characterized, as shown in Figure 4, by an interplay between forces of ‘action’ and ‘reaction’ over time which progress or inhibit the closing of the ‘innovation gap’ between the current level of performance and a desired level of performance. In effect initiatives ricochet around the ‘organizational factors’ model (Figure 2) with some aspects acting positively and others negatively, the art being to steer a way through.

Examples of action and reaction forces are: strong senior management support for the innovation (action), resistance to change from staff (reaction), allocation of capital to purchase needed technology (action) and lack of appropriate work routines to coordinate and channel the innovation activity (reaction). Figure 4 presents a situation where the innovation is successful, i.e. the ‘action’ forces, over time, have overcome the ‘reaction’ forces. It is just as feasible, of course, for the ‘reaction’ forces to be stronger than the ‘action’ forces, and for the innovation to fail, maybe because it was not such a good idea after all.

The innovation process is thus often not an orderly, neat process, but a process that is subject to peaks and troughs as the progress of the innovation competes with day-to-day variability of workload and the often acute pressures on finite staff and financial resources.

Conclusions

The main focus of this paper has been to broaden and deepen our understanding of innovation in small, project-based firms. The literature reviewed identified eight research gaps to be investigated. The research results presented to address these gaps have been drawn from the construction industry, in which the presence of small firms with a project emphasis is more accentuated than in any other major industry sector. Table 4 summarizes the main findings against each of the research gaps.

These findings highlight the following aspects as being significant in influencing the motivation for, and ability of, small construction firms to successfully innovate.

The owner(s) of small construction firms have the necessary power to ensure that quick decision-making and innovation activity take place in response to rapidly shifting market conditions and client demands. These triggers for innovation are predominantly filtered and prioritized by the owner(s) of the firm. The dominant role of the owner, however, can constrain innovation activity if the owner does not have the necessary vision and systemic thinking when diagnosing and progressing innovation activity. Innovation in one part of the business often has significant implications for other parts of the business, which need to be considered and brought together in an integrated way.

The type of innovation undertaken, and the different organizational factors that are brought into play depend to a significant extent on the characteristics of the interaction environment in which the firm is operating. The ‘modes of innovation model’ identifies two principal scenarios: Mode 1 – Single-project, cost-orientated client relationships; and Mode 2 – Multi-project, value-orientated client relationships. The mode of innovation is substantially determined by whether the interaction environment is enabling or constraining. The key implication for small construction firms is that they should not ‘flip’ from Mode 1 innovation to Mode 2 innovation. Small construction firms need to incrementally nurture, or identify and move into, supportive enabling interaction environments. This is achieved through careful and integrated consideration and development of all the variables in the ‘organization model of innovation’ in an integrated fashion: ‘business strategy/market positioning’, ‘organization of work’, ‘technology’ and ‘people.’

The process of innovation is behavioural in nature, being a cyclical process of diagnosing, action planning, taking action, evaluating and specifying learning. The cycle starts with sensing an opportunity or need to innovate in response to
Focus and outcome of innovation

1 What is the general strategic focus for innovation or definition of innovation for small, project-based firms?

Consensus definition the same as for big firms, but stressing that innovation must lead to improvement ‘on the ground’ through the use of established technologies, normally introduced incrementally.

2 What is the general motivation for small project-based firms to innovate?

If can get past survival mode, then aim to achieve stability and the development of improved services. But can easily be thrown back to simply coping. Growth per se typically not an objective.

3 What are common innovation outcomes in small project-based firms?

Great variety of managerial and technical examples. Overriding concern is to satisfy clients and outcomes are judged against this.

Organizational capabilities for innovation

4 What are the key capabilities for innovation in small project-based firms?

Strong consensus on a ‘model of organizational factors’, linking: people, technology, organization of work and business strategy / market positioning. Notable features are the ‘soft’ strategic focus twinned with a ‘hard’, local, market position. This is complemented by the ‘hard’ administrative core linked to flexible/dynamic organization at the project level.

The ‘soft’ strategic focus enables rapid responses to opportunities if the owners of the firm are convinced. However, lack of ‘slack resources’ and a heavy operational emphasis means incremental change is favoured with staff ‘learning on the job’.

5 How are these capabilities developed and used in innovation activity?

Context of innovation

6 What are the key events external and internal to small project-based firms that trigger innovation activity?

The triggers are mainly from the external business environment, filtered by the owner/s of the firm. The resulting innovation activities tend to be dispersed and turbulent.

7 What is the appropriate emphasis between market-based innovation and resource-based innovation in small project-based firms, and what conditions dictate this emphasis?

The major determining factor is the nature of the ‘interaction environment’. If it is aggressive then this pushes firms into reactive behaviour, with the emphasis on how to use the people, technology and methods of working to best effect (termed Mode 1). If the environment is more stable and enabling then the business strategy/marketing positioning aspects come into play as longer-term, value-orientated relationships are sought (Mode 2). Any move from one mode to the other needs careful planning give the systemic implications throughout the ‘factors’ of the firm.

Process of innovation

8 Are the processes of innovation in small project-based firms rational and/or behavioural in nature?

There is a heavy behavioural emphasis, with owners central to any initiative, which must be moved forward through a minefield of action and reaction forces, exploiting what scarce resources there are. If the owner loses confidence that the initiative is beneficial then it is rapidly stopped.

market, project and/or client conditions. These triggers for innovation are predominantly filtered and prioritized by the owner(s) of the firm. The ‘action and reaction in innovation’ stresses that the innovation process is often not an orderly, neat process, but a process that is subject to peaks and troughs as the progress of the innovation competes with day-to-day variability of workload and the often-acute pressures on finite staff and financial resources.

Looking a bit more broadly, the project findings show that the characteristics and needs of small construction firms are distinctive from those of large construction firms. Comparing with an early project focused on innovation in large construction firms (Barrett and Sexton, 1998), it is apparent that there is shared agreement on the definition of innovation – regardless of firm size, practitioners view innovation as needing to be action-orientated and delivering overall performance improvement. However, there is significant difference in emphasis in the areas of motivation, capacity and capability to innovate between large and small construction firms. In particular:

- the pivotal role of the owner(s) of small construction firms in triggering innovation compared to the less agile bureaucracy of large firms;

- the small-firm focus on niche markets in contrast to the broader market segments which large firms occupy;

- the lack of organizational slack that small firms have judged against large firms, which hamper their
capacity for experimentation and for committing to investment strategies which will not give a return until the medium to long term.

The implications for government and institution policy is that any initiatives geared toward improving performance of construction firms needs to appreciate and actively manage these differences; policies that are appropriate for large construction firms are not necessarily appropriate for small construction firms, and vice versa.

The generalizability of these results to small, project-based firms in other industrial sectors needs to be treated with due caution (Cox and Townsend, 1998, p. 8). However, the ‘research gaps addressed are of general interest as indicated by the treatment of the literature earlier and the key concepts and models emerging from the project results are considered sufficiently generic to be of interest to other industries.

In conclusion, we maintain that research focusing on innovation in small, project-based firms is very much in its embryonic stage. At present, the research domain is drawing innovation theory and practice from established bodies of innovation knowledge, but has not been sufficiently envisioned, embedded and evaluated in the context of small, project-based firms to form a robust, grounded body of innovation knowledge in its own right. The research results offered in this paper, we hope, contribute to this fledgling agenda. Further detailed research across a number of industries is required in order to test the validity and robustness of the concepts and models presented here. An interesting question will then be, to what degree larger organizations can beneficially create some of the characteristics exhibited by the best small, project-based firms.

References


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