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The innovation competence of repeat public sector clients in the Australian construction industry

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The role of client leadership in improving construction industry performance by increasing the rate and quality of innovation activity has been receiving increasing attention globally over the past decade. There has however been less attention given to the capability of clients to effectively perform this role. The literature suggests that the internal innovation competency of clients impacts on their potential to encourage innovation throughout the industry. Based on data collected via a large-scale survey of the Australian construction industry, the innovation competence of repeat public sector clients is examined using descriptive statistics. The results show that the clients have a relatively high level of innovation competence, compared to contractors, consultants and suppliers. The role of innovation competence is important. If public sector client agencies wish to protect and promote the role they play in encouraging industry innovation, they need to nurture their internal innovation competence.

Keywords: Innovation competence, innovation indicators, client leadership

Introduction

The literature suggests that the internal innovation competence of clients impacts on their potential to encourage innovation throughout the construction industry (following Nam and Tatum, 1997). Based on data collected via a large-scale survey of the Australian construction industry, the innovation competence of repeat public sector clients is examined, to gain an understanding of their potential leadership capabilities.

The performance of the Australian construction industry has been extensively criticised, particularly over the past 10 years. A number of government-sponsored studies have explored the challenges facing the industry, including Gyles (1992), CIDA (1995), NatBACC (1999), PWC (2002), Cole (2002) and DISR (2004). The problems include fragmented and project-based production, lowest-cost tender selection, adversarial relationships and low levels of innovation. These problems constrain the industry's performance and enhance the potential for construction projects to achieve less than expected by clients in terms of quality, timeliness and cost.

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The studies listed above reflect the commitment of key stakeholders to better performance. Certainly, many improvements have been made since the mid-1990s, yet change has been slow and the construction industry continues to perform below its potential. Many commentators believe that this can be turned around through more concerted client-led change (e.g. Latham, 1994; Strategic Forum, 2002), however clients need to be willing to accept this role, and they need to be capable of assuming it. Clients need to maintain and/or build the required capability, particularly repeat public sector clients, who have a responsibility to develop the industry, and who currently fund the majority of roads and bridges, and a significant proportion of commercial buildings, in Australia as elsewhere. In Australia for 2004–05, 21% of the value of non-residential building work was done for the public sector, while for roads the figure was 46%, and for bridges 77% (ABS, 2005b, p. 26; ABS, 2005c, p. 10). The road figure is diminished by the Australian Bureau of Statistics (ABS) allocating motorways provided under public–private partnerships (PPPs) to the private sector.

In Australia, public sector clients maintain large building and construction programmes, so that stimulating

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their willingness and ability to show effective innovation leadership is critical to improved industry performance. Unfortunately, many repeat public sector construction clients point out that manufacturing clients are not charged with a responsibility to improve industry performance, so why should construction clients assume this role? The answer lies in the size, complexity and uniqueness of construction projects. In general, construction clients have a lot more power over suppliers than have consumers of manufactured goods; as Nam and Tatum (1997, p. 263) note:

> Whereas in manufacturing the buyer's role takes the generally passive form of market demands, in the construction industry the role of the buyer (i.e. owner) is generally more active. Rather than being just buyers of finished products, owners, particularly in the building and heavy sectors of the construction industry, are often major participants in the projects.

These active construction clients have a direct stake in improving industry performance, especially repeat users who continue to benefit over time.

Recent construction research identifies effective client leadership as a prominent driver of performance improvement in the industry. Clients can promote industry innovation by:

- demanding exceptional project results (Gann, 2003);
- providing financial incentives within contracts (Rose and Manley, 2005);
- focusing on the quality of project relationships (Bresnen and Marshall, 2000; Manley, 2002);
- instituting value-based selection of tenders (Wong *et al.*, 2000);
- designing pre-qualification systems that assess innovation history (Manley and Blayse, 2003);
- employing performance-based standards and regulations (Gann *et al.*, 1998);
- sharing risks (Nam and Tatum, 1997);
- sharing authority to encourage more site-based ideas for improvement (Briscoe *et al.*, 2004).

Yet recent research by Ivory (2005) reminds us that clients need to be willing and able to effectively encourage innovation. He argues that the literature focuses too much on an assumed positive role played by clients in promoting innovation. Through a literature review and case study research, he highlights some of the factors that limit a client's ability to drive or support innovation. Indeed it is because of such factors that construction clients traditionally have been largely ineffective in providing sources of ideas for innovation, or in championing the innovation efforts of others. To some extent the positive press given to client leadership in construction, particularly over the past 10 years, has been an attempt to encourage greater willingness and capacity building. However Ivory (2005) notes that clients still have some way to go in maximising their impact. Even the promise of objective innovation benefits, in relation to time or cost for instance, is not always sufficient to secure client support. The problems canvassed by Ivory (2005) include that:

- innovation may be contrary to clients' other priorities;
- innovation may meet long-term goals such as improving whole of life performance, but mean increased project time or costs in the short term;
- it can be difficult for clients to encourage consensus on construction projects, which are usually undertaken by multiple stakeholders with divergent interests;
- construction projects involve high levels of complexity where innovation might upset a fine balance between manageability and complexity and so be discouraged;
- there is potential for increased risks or workloads for client organisations and participants;
- there may be an absence of obvious benefit to the client; and
- there may be inadequate technical competence within the client organisation to confidently judge net benefits.

This paper focuses on the last of these issues—the competence of clients. Nam and Tatum's (1997, p. 259) influential study on leaders and champions for construction innovation, observed that 'owner's risk sharing, commitment to innovation and leadership in project planning and execution seemed to be critical for the success of the innovation process'. The current paper focuses on the 'commitment to innovation' determinant of success. The paper has an essentially empirical focus; however, it does incrementally add to conceptual understanding of client competence. Walsh and Linton (2002) acknowledge that measurement of competence is a relatively undeveloped field and Ivory (2005) observes that further research is required into the capabilities of clients needed to support innovation. This paper seeks to fill these gaps in the literature, by developing an innovation–competence construct and measuring it in relation to repeat public sector clients in Australia.

Conceptual background

Interest in an organisation's competence has developed primarily in the strategic management and evolutionary economics literature (Knudsen, 2005). Such interest is related to the resource-based view of organisations,

which is a means of understanding industry dynamics that complements both the structure–conduct–performance perspective of neoclassical microeconomics and the changing routines perspective of evolutionary economics (Barney *et al.*, 2001). These three disciplines—strategic management, neoclassical economics and evolutionary economics—all concern themselves with an organisation's resources, competency and capabilities. The debate that seeks to disentangle these concepts is important, but beyond the scope of the current paper (see Praest, 1998). Suffice to note for the purposes here that resources can be tangible (e.g. physical equipment) or intangible (e.g. routines), and that competency can be considered an intangible resource. Capabilities are considered here to be synonymous with competences, following Knudsen (2005).

Within the strategic management and evolutionary economics literature in particular, the scope for an organisation to survive and thrive is said to be driven by its possession of competency that is valuable, rare, inimitable and non-substitutable (Barney *et al.*, 2001). Such 'core' competencies facilitate sustained competitive advantage for businesses (Barney *et al.*, 2001; Drejer, 2002), and in the case of public sector clients, facilitate access to maximum value for money on construction projects. The concept of core competency was primarily developed by Prahalad and Hamel (1990, p. 81), who define it as the 'corporate-wide technologies and production skills … that empower individual businesses to adapt quickly to changing opportunities'. According to Walsh and Linton (2002, p. 64), this is the most widely used definition in the literature. Although Prahalad and Hamel were writing about private sector firms, the concept applies equally to public sector client organisations.

An organisation's core competency can be viewed as a bundle of key intangible assets, covering an organisation's management skills, organisational routines, knowledge bases, networking linkages and innovation skills (Malerba and Marengo, 1995; Barney *et al.*, 2001). This paper focuses on one of those assets—innovation skills—and is thus concerned with innovation competency. Innovation competency is perhaps more centrally concerned with an organisation's ability to adapt quickly to changing circumstances, than the other competency types, making it a particularly important skill type to review given the currently rapid pace of technological and organisational change in the construction industry globally (Manseau and Shields, 2005). Innovation competency reflects an organisation's effectiveness in understanding the environment in which it operates, and in modifying its behaviour to maximise performance (following Malerba and Marengo, 1995).

Ivory (2005) argues, quite rightly, that a strong client focus can be damaging if the quality of their demand is limiting. This is the case if the client is innovation-incompetent. For example, risk-shy clients constrain innovation activity, while a narrow concern with cost can lead to value-adding innovations being overlooked.

Porter's (1990) highly influential work on the competitive advantage of nations develops the idea of a competitive 'diamond', the four points of which represent the determinants of competitiveness. One of these is of key importance here—the 'demand conditions' driver, which provides a lens through which to examine the sorts of clients that drive innovation.

Although the focus of Porter's work is at the national level, his observations regarding the quality of demand apply equally well at industry level. Unlike the focus in construction literature on client satisfaction at any cost, Porter suggests a more discretionary approach, encouraging firms to focus their attention on demanding buyers as an effective means of driving innovation. Demanding clients are those that give suppliers an earlier or clearer picture of emerging client needs across the industry. For instance, such demanding clients will be risk takers in the sense that they will be the first to respond to social or environmental trends, such as the need to improve sustainability outcomes.

As Porter (1990) notes, demanding clients pressure suppliers to respond to tough challenges, to innovate faster and develop competitive advantage over rivals by responding to tightly constrained requirements. 'Sophisticated, demanding buyers provide a window into advanced customer needs; they pressure companies to meet high standards, they prod them to improve, to innovate, and to upgrade into more advanced segments' (Porter, 1990, p. 79). Hence, innovation competence is a core capability of a successfully demanding client.

In a similar vein, von Hippel has consistently highlighted the value of 'lead users' in shaping innovation (von Hippel, 1988; Herstatt and von Hippel, 1992; von Hippel, 2005). Lead users are 'more demanding in their expectations and more sophisticated in the ways they express their choices' (Bessant, 2006, p. 181). Morrison *et al.* (2004) develop the concept of 'leading edge status' (LES) to assess the innovation competence of users, and conclude that users with high LES accelerate innovation diffusion.

The innovation competence of clients can also be viewed through the work of Cohen and Levinthal (1990)—particularly their 'absorptive capacity' construct. Following their logic, client innovation competence is a function of the ability of the client to adopt or absorb innovations generated by construction industry stakeholders. Cohen and Levinthal (1990, p. 128) define absorptive capacity as the 'ability of a firm to recognise the value of new, external information,

assimilate it, and apply it'. Such capacity is reliant on the level of related prior knowledge held by the firm.

This suggests that the level of an organisation's internal innovation activity will determine how effectively it can successfully adopt externally generated innovations. Although Gann (2001) introduced the notion of absorptive capacity to construction academics in 2001, his interest was the ability of firms to absorb knowledge generated by academics, rather than the ability of clients to absorb innovations put forward by firms, as is the focus here.

This discussion has shown that the innovation competence of clients is a major determinant of supplier (construction industry) innovation. 'Strong client leadership' is a phrase frequently employed in the construction industry to encourage the 'cult of customer responsiveness'. However, as Martin (1995, p. 121) notes, if clients are risk-shy (and by implication innovation-incompetent) then 'our instincts dim, corroded with safe action'. The industry needs innovation-competent clients to help maximise its innovation potential.

Methods

The research question driving this study is: Are Australian repeat public sector clients innovation-competent? The nature of innovation competence is measured by four key innovation indicators: R&D investment, innovation novelty, adoption of advanced practices, and innovation impact on business profitability/effectiveness. The four innovation competence indicators were selected by an expert group workshop conducted in Brisbane in 2004. This group comprised 10 members representing academics, senior managers of construction firms and relevant government departments. They based their selection on analysis of the academic contributions described above, together with three leading innovation surveys:

- the Community Innovation Survey (CIS) which is based on the Organisation for Economic Cooperation and Development's (OECD's) *Oslo Manual* (OECD/Eurostat, 1997, 2005), and was implemented in 1992 (based on a draft manual), 1996 and 2001 by European Union Member States;
- the Australian Bureau of Statistics (ABS, 2006, 1998, 1995) Innovation Surveys which were implemented in 1993, 1996 and 2003; and
- the Statistics Canada survey of innovation, advanced technologies and practices in the construction and related industries in 1999 (Anderson and Schaan, 2001).

These surveys represent best practice in the design of innovation indicators, and Pattinson's (2002) examination of them provided key input to the deliberations of the expert group. Such input was considered alongside relevant academic concepts in deriving the four indicators, particularly von Hippel's (1988) lead users; Prahalad and Hamel's (1990) core competencies and adaptation ability; Porter's (1990) demanding buyers; Cohen and Levinthal's (1990) absorptive capacity; and Morrison *et al.*'s (2004) leading edge status.

Fieldwork

The survey upon which this study is based covered the non-residential building and civil sectors of the construction industry, in the Australian States of New South Wales (NSW), Victoria (Vic.) and Queensland (Qld). These three states have the highest gross state product across the seven states and territories in Australia (ABS, 2005a). The industry was defined broadly to include five sectors—main contractors, trade contractors, consultants, suppliers, and clients from the public sector who undertake ongoing work (the peak private sector client association was unwilling to participate).

Data were collected via this large-scale survey covering 38% of key construction organisations in the population. Overall, 1,317 questionnaires were distributed by standard mail, with 383 usable responses returned, equating to a response rate of 29%.

The sampling unit was at organisational level. Key organisations were defined as government clients, members of six selected industry associations, and organisations appearing on the pre-qualification lists of clients (such lists are maintained individually by Australian public sector clients to ensure that firms have the required financial, managerial and technical resources to tender for certain classes of work). The associations chosen for surveying were identified as those consultants, trade contractors and suppliers that made the most significant contribution to road and commercial building projects by proportion of total project cost.

The survey was distributed to the contact person on the industry association membership lists and government agency pre-qualification lists. These people were mainly managers. For the government clients, forms were sent to managers in the civil and building agencies of the three states. The results presented here are from the survey questions on the relative innovation competence of clients, compared to the rest of the industry. Table 1 shows key survey data.

Table 1 Key survey details

Industry sector	Number of firms sent survey forms	Number of completed survey forms returned	Response rate	Population size by number of firms	Population definition	Percent population sampled	Sampling method
All sectors	1317	383	29%	3476		38%	
1. Main contractors	300	93	31%	1122		32%	
Non-residential building contractors	150	55	37%	740	Pre-qualified firms	20%	Random
Civil contractors	150	38	25%	382	Pre-qualified firms	39%	Random
2. Consultants	409	130	32%	1549		26%	
Non-residential building consultants	150	48	32%	675	Pre-qualified firms	22%	Random
Civil consultants	150	52	35%	874	Pre-qualified firms	17%	Random
Quantity surveyors	109	30	28%	200	Firm-level association members	55%	Random
3. Clients: public sector	44	23	52%	44		100%	
Civil: Qld	14			14	District directors	100%	Census
Civil: NSW	6			6	Regional managers	100%	Census
Civil: Vic.	6			6	Regional managers	100%	Census
Non-residential building: Qld	7	Client responses were not coded for location or sector.		7	Key government clients	100%	Census
Non-residential building: Vic.	11			11	Key government clients	100%	Census
4. Trade contractors	236	74	31%	346		68%	
Electrical and communication contractors	172	48	28%	282	Major association members	61%	Census
Air-conditioning and mechanical contractors	64	26	41%	64	Major association members	100%	Census
5. Suppliers	328	63	19%	415		79%	
Glass	150	23	15%	222	All association members	68%	Random
Plaster	139	21	15%	139	Plaster/plaster board suppliers/ manufacturers	100%	Census based on 'Yellow Pages'
Asphalt	26	15	58%	26	All association members	100%	Census
Steel	13	4	31%	28	Major association members	46%	Census

Results and discussion

The results for the four innovation competence indicators, R&D investment, innovation novelty, adoption of advanced practices, and innovation impact on profitability/effectiveness, are now discussed.

R&D indicator of innovation competence

Respondents answered the following survey question regarding their R&D:

> Q. Which of the following business strategies do you consider are highly important to the success of your

business? … 'Investing in research and development (R&D)'

The results show that businesses valuing R&D strategies, as a percentage of sectoral respondents, were: clients 61%, suppliers 29%, consultants 28%, main contractors 20% and trade contractors 14%. The client sector has the highest incidence of R&D strategies, by number of businesses valuing them, with at least twice the incidence compared to other sectors (chi-square=23.14; df=4). This reflects the emphasis placed by Australian government agencies on technical development, and the reversal in recent years of downsizing in the 1980s/90s. The strong supplier result reflects the fact that approximately one-third of the 63 supplier respondents were not just simple suppliers, but manufacturers as well, and manufacturers are well known for their strong involvement in R&D compared to other industries (e.g. ABS, 2005d). The even better result achieved by clients here is probably not typical of global trends, but more likely to be the result of atypical public policy decisions in Australia (resisting down-sizing), and the structure of the survey, which covered regional client agencies involved in materials testing work.

The literature contains empirical evidence suggesting internal R&D programmes improve an organisation's ability to exploit external knowledge sources (Gambardella, 1992; Mowery *et al.*, 1996), and that R&D together with 'knowledge openness' improves the pace of innovation across organisations (Foray, 1997). The findings presented here, combined with this literature, suggest the clients examined may be well placed to evaluate innovation ideas put forward by the industry in an informed manner.

By maintaining R&D programmes, these public sector clients are upgrading the sophistication of their subsequent demands to industry, reducing their risk aversion and promoting their absorptive capacity (following Griffith *et al.*, 2003). Further, a study by Leahy and Neary (2004) shows that when innovation ideas are difficult to absorb, the value of internal R&D programmes is even greater. At a time when construction projects are becoming increasingly complex (Barlow, 2000; Manseau and Shields, 2005), there is heightened demand for innovation that might be challenging for clients to comprehend, particularly in the absence of their own internal R&D programmes.

Novelty indicator of innovation competence

Survey respondents answered the following questions about innovation novelty:

Q. Has your business introduced any new or significantly improved technologies during the past three years? (including new or significantly improved services, materials, products, plant, equipment, advanced computer software/hardware, etc, but excluding routine changes)

Q. Were any of these technologies new to your business and:
New to the industry?
New to the world (previously unseen)?

For businesses introducing 'new to industry' technological innovation, as a percentage of sectoral respondents, the results were: trade contractors 24%, clients 21%, suppliers 19%, main contractors 18% and consultants 14%. For businesses introducing 'new to world' technological innovation, as a percentage of sectoral respondents, the results were: consultants 13%, suppliers 10%, clients 4%, trade contractors 1% and main contractors 0%.

These data show that trade contractors are more likely than clients to develop innovations that are new to the industry, although for this level of novelty, client performance exceeds that of all other sectors. For the 'new to world' level, consultants (chi-square=11.23; df=4) and suppliers are more likely to implement innovation than clients. It may be that clients are investing in incremental improvements which have cumulative value, without being highly novel. Incremental innovation is considered in the literature to be a key component of innovation competence, leading to growth opportunities often as considerable as those arising from more radical innovation (following Thorburn and Langdale, 2003).

The trade contractor result is very interesting, reflecting as it may the role such contractors can play as a go-between for suppliers and site-based activities. This notion, that trade contractors play an important role in adapting and passing on ideas belonging to others, rather than focusing on developing their own highly novel innovations, is reinforced by the R&D data, by which they are the poorest performers.

It is perhaps unsurprising that world-first innovations are likely to arise from the supplier and consultant sectors, as both score highly in terms of R&D strategies. Manufacturers are known for their ability to run large R&D programmes, as costs can be spread over large-scale standardised production runs, while the consultant result reflects the R&D activity of engineers required to meet sophisticated contextual challenges.

Adoption indicator of innovation competence

The adoption of advanced practices indicator drew on 18 advances which were listed in the survey, as shown in Table 2.

The advanced practices shown in Table 2 are an updated version of those employed by Statistics

Table 2 Advanced practices listed in the survey

Advanced practice
3-D CAD
Alliance contracts
Computerised project management
Computerised systems for estimating, inventory control, modelling, asset analysis, project management, etc.
Computer networks (LAN or WAN)
Design and construct contracts
Design/build/fund/operate (DBFO) contracts or public–private partnerships (PPPs)
Digital photography
Documentation of technological/organisational improvements developed by your business
Intelligent systems
Long-term collaborative arrangements with other businesses
Managing contractor
Online-remote-construction-management
Partnering on projects, or other relationship forms of contractb
Quality certification (e.g. ISO 9000)
Risk-sharing/performance-incentive contracts
Staff training budget
Website

Source: Survey for this study.

Canada in their large-scale innovation survey conducted in 1999 (Anderson and Schaan, 2001). Revision of the Canadian list was informed by an expert focus group workshop comprising senior industry representatives, conducted in Brisbane, Australia in 2004. The original list was adjusted to reflect the passage of time and the construction sectors being reviewed in the current study.

The average number of advances adopted by sector was as follows: clients 13, consultants 10, main contractors 10, trade contractors 7 and suppliers 5. Client performance in terms of the average number of practices adopted exceeds that of the other sectors. This finding, combined with the dominant performance of clients in R&D, supports the findings of the absorption capacity literature, that internal R&D capacity provides the capability necessary to successfully adopt and modify innovations that have been developed externally (Cohen and Levinthal, 1990).

Several progressive forms of contract that provide greater scope for innovation by the construction team were included in the advanced practices list. These were: alliances, design and construct, design/build/fund/operate (DBFO) or public–private partnerships (PPPs), managing contractor, partnering on projects, or other relationship forms of contract, and risk-sharing/performance-incentive contracts. Client provision of such advanced contracts reflects 'lead user' status and the possession of strong innovation competence. These contracts facilitate two-way innovation flows, with firms having greater flexibility to pursue creative solutions to project requirements or problems, and clients making a greater commitment to the process. Although there is little direct evidence, the literature suggests that in the Australian construction industry context, repeat public sector clients lead other client types in providing innovative contracts such as those listed in the survey (Gyles, 1992; Manley and Hampson, 2000; ANAO, 2000; Walker and Hampson, 2003).[1]

Impact indicator of innovation competence

Survey respondents answered the following question about innovation impact:

> Q. Thinking about an innovation that 'stands out' in your mind as the most successful for your business over the past three years: To what extent has this innovation impacted the profitability/effectiveness of your business over the past three years? No effect/sustained/moderate improvement/significant improvement/great improvement.

For the innovation impact indicator, it was found that the proportion of businesses in each sector achieving a significant or great impact on profitability/effectiveness from their most successful innovation over the period 2002–04 was: clients 22%, trade contractors 20%, consultants 15%, main contractors 14% and suppliers 13%.These results indicate that innovation was more likely to offer clients a significant or great impact than other sectors, although only marginally so

compared to trade contractors. The performance of trade contractors may reflect their effectiveness in matching the innovations of manufacturers in other industries to the specific needs of building and construction. The data presented in this paper suggest their innovations are likely to be adaptations of externally generated ideas.

In terms of innovation competence, the client result indicates effective absorption capacity and the superior ability of these clients to transform key innovation inputs, such as R&D, into improved organisational performance. The result would seem to show a strong client core competence in managing the innovation process, although the absolute dominance of clients by this measure should be tempered by the observation that the survey asked about 'profitability/effectiveness'. It is probable that the public sector clients responded to the 'effectiveness' element, while businesses in the sample may have responded more to the 'profitability' element. It would be easier to claim a significant or great impact on effectiveness, than profitability.

Nevertheless, except for the innovation novelty measure, all these indicators show that clients have a high level of innovation competence compared to the other sectors. Nam and Tatum's ground-breaking research suggests a link between a client's competence and its ability to overcome risk aversion, 'sometimes even lead[ing] to an unusually progressive stance' (Nam and Tatum, 1997, p. 265). They also suggest a link between competence and 'timely approval of innovative ideas' (Nam and Tatum, 1997, p. 265). In combination, the survey data presented and these observations in the literature suggest that the Australian construction industry and government policy makers can be confident that repeat public sector clients are well qualified to promote innovation throughout the industry.

Conclusions

Australian repeat public sector construction clients have been shown to be innovation-competent, which, according to the literature, should mean that they have significant capability to drive industry innovation. The role of innovation competence is important. If government client agencies wish to protect and promote the role they play in encouraging industry innovation, they need to nurture their core competence and internal innovation capabilities.

The evidence presented here and the results of the literature review can be used by client agencies to resist any moves by funders that may compromise their internal skill levels. The research also has immediate benefits in giving the Australian construction industry more confidence in the quality of leadership shown by repeat public sector clients.

Future research plans involve applying the promising 'leading edge status' construct developed by Morrison *et al.* (2004) more comprehensively to the construction context. Further research is also required to compare the innovation competence of public and private clients; and repeat and one-off clients. This would help determine which client types were most innovation-competent. In the research reported here, how important was the fact that the clients were from the public sector with a mandate to develop the industry, or the fact that they were repeat clients, with more experience than one-off clients and better able to spread risk across projects? Indeed, it seems to be a glaring gap in the literature that there is not more analysis of the impact on industry innovation of different types of clients.

Notes

1. Note that PPPs and DBFO respond primarily to the needs of public sector clients and are typically offered by them.

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