CONSTRUCTION INDUSTRY CULTURE AND INNOVATION: AN AUSTRALIAN VIEW

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The culture of the construction industry in many parts of the world can tend to be resistant to change and can consequently fail to take advantage of the gains that a specific focus on innovation can produce. Several aspects of industry structure and practice are cited as being responsible for this perceived underperformance. Among the factors frequently mentioned are: the many small businesses and sole operators involved in construction; procurement systems and client relationships; the discontinuous project-based nature of the industry; the low level of R&D undertaken; and the nature of the regulatory climate which monitors industry actions. A search was undertaken of the academic literature on construction innovation over the past two decades with a view to finding elements of consensus on factors that assist innovation. The need for a change to a more cooperative culture as well as the strong synergies that exist between organisational and technical innovation were identified as widely held to be important. The role of various industry players and the impact of the structural form of the industry were identified as areas of some disputation. A value tree has been produced which describes the main factors found to be useful for overcoming the conservative culture that dominates construction industries globally and in Australia in particular. Further research will unpack the relative contribution of these factors. In the meantime, the present study contributes to the literature by building on existing theories to provide a fresh synthesis of key themes.

Keywords: Australia, enabling factors, industry culture

INTRODUCTION

The construction industry is often described by outsiders as fractious and fiercely competitive, even belligerent. It can be perceived as having an ingrained culture of adversarial relationships and an overly aggressive negotiation style (Dubois and Gadd 2002). Risk shifting and a reliance on manipulating contractual disputes for the benefit of some parties at the expense of others has been common practice. In this climate it is difficult to develop the level of trust necessary for information-sharing let alone risk-sharing. Despite this background culture, individual construction firms are increasingly becoming aware that the social organisation of an enterprise is crucial to its rate of adoption of innovations and therefore its viability (Seaden and Manseau 2001). Nevertheless the construction industry is widely believed to lag behind manufacturing and other sectors in the adoption of innovations (Salter and Torbett 2003). Winch (2003) regards this as largely the result of the unique nature of construction and the way that industry groupings are defined by statistical agencies. While this may be part of the explanation it remains the case that individual construction firms can tend to resist change in their specific area of operation. Construction firms are largely 'project-based' coming together for a limited time to

produce a specific result, and employment is often on a contractual and temporary basis. In addition, different types of industry participants, such as developers, consultants and sub-contractors, tend to remain in their own individual firms. Although relationships between individual firms may extend over several projects, the groupings tend to coalesce and separate at project-based intervals. The result of this industry structure is that it is difficult to capture the experience gained from one project for use in future projects.

Added to this difficulty with knowledge capture is the fact that relationships between construction project participants are often adversarial. Each company seeks to profit at the expense of its co-participants. Furthermore this attitude can be encouraged by some traditional contractual arrangements. The adoption of innovative solutions and practices is also problematic because of the complex chains of command within the individual project contributors. Management theories which have worked well in manufacturing industries can fail in construction because of the generally temporary and adversarial nature of construction industry relationships. Although the construction industry may indeed be unique in its structure, it is still possible for the industry to 'lift its game' in terms of innovation and some evidence that it is attempting to do so (Anderson et al 2004).

A culture of innovation, change management and the development of intellectual capital are important goals if the industry is to achieve its potential (Steele and Murray 2004). If this change is not made, the existing industry problems could well overwhelm many of the benefits of innovation (Eaton 2001). In order to determine if any consensus academic view exists on the best way forward, a systematic study was made of refereed journal articles in construction and related fields.

METHODOLOGY

A search was made of refereed journal articles that dealt with innovation and the construction industry published between 1990 and mid 2008. Articles from these journals were reviewed using content analysis, with five clear themes emerging as reinforcing an industry culture unsupportive of innovation. The themes were: firm resources, client and end user influences, project-based conditions, industry networks and regulatory climate. In addition, several sub themes were identified under the five identified primary themes and these are illustrated in Figure 1. Ongoing research is testing the validity of the value tree shown in Figure 1 using Analytic Hierarchy Process. Preliminary results from this fieldwork will be available for the conference in September.

COMPANY RESOURCES

The available resources of a firm along with a multi-disciplinary approach to team formation are both widely regarded as critical for innovation success. The 'trial and error' nature of much innovation requires a supportive management structure and sufficient resource allocation it if is to deliver benefits.

Personal motivation

The personal motivation level of the team which generates and delivers a successful innovation has been demonstrated to have a decisive effect on the overall process. Individual contributions can be critical in several roles and at several stages of the innovation delivery process. Egbu (2004) explains that any meaningful innovation strategy should have unequivocal support from the top in order to be successful Slaughter (1998) mentions the role of 'gatekeepers' who are aware of possible solutions to a given problem. These people can also be important as evaluators of the innovation delivery process.

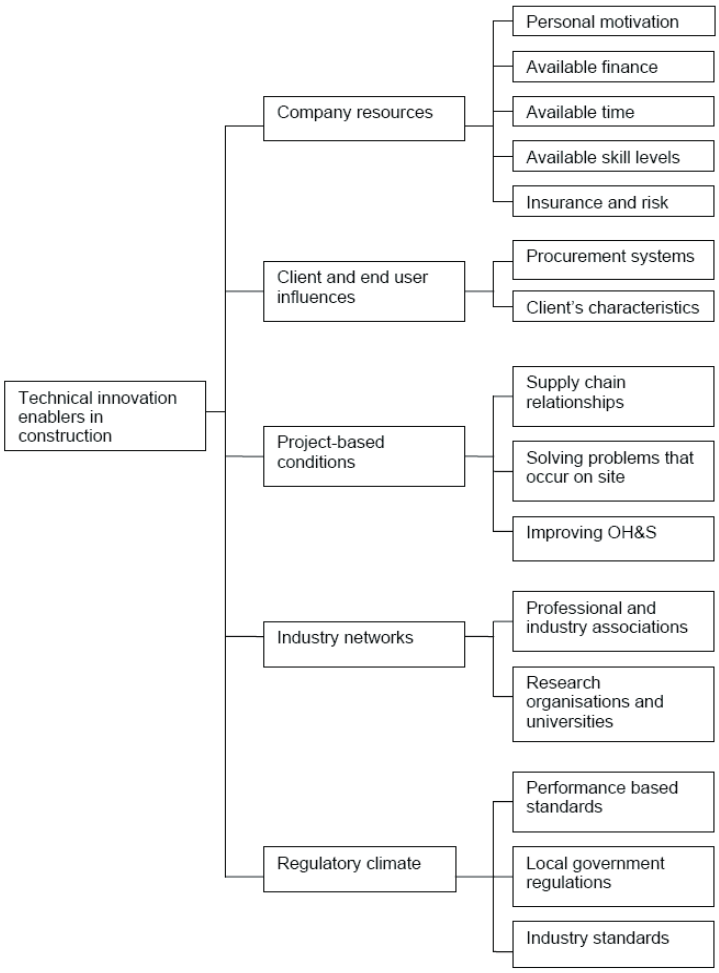

Figure 1 – Enablers of technical innovation in construction

Mitropoulos and Tatum (2000) identify 'champions' as the people who absorb the risk of an innovation and drive the change. Top management's aspirations and proactive attitude towards technology are seen as a major source of competitive advantage.

Available financial resources

Slaughter (1993) reported that builders commonly innovate when technology is easy to modify and the costs of doing so are low. Barrett and Sexton (2006) noted that

small companies, in particular, often lack sufficient 'slack resources' in order to attempt innovative activities. The difficulties that small businesses encounter in trying to survive, let alone innovate has been well documented (Sexton and Barrett 2003; Sexton et al. 2006; Manley 2008). Such companies certainly depend more heavily on scarce resources than do larger firms and they can be constrained by their financial circumstances.

Miozzo and Dewick (2002) found that contractors are more likely to invest in new assets and their complementary knowledge if this can be financed from reserves or cash flow rather than from borrowing. This innate risk aversion can limit the potential for innovation.

Available time

It is an industry axiom that construction companies exist under constant pressure to deliver their projects on time and under budget. This can result in avoidance of new ideas because there is perceived to be no spare capacity to test new products or systems. Shortage of resources contributes to a perceived lack of interest in innovation especially in small construction firms (Davidson 2001). Even in large firms, groups such as designers often feel that insufficient time is allocated to their role in the project delivery process and consequently innovation may be stifled or curtailed (Salter and Gann 2003). This is a short sighted position, however, as it leads to the inability to adapt to potential positive changes and efficiencies.

Available skills

Knowledge retention and transfer within construction firms has tended to be problematic due to the competitive nature of much construction activity. Ben Mahmoud-Jouini (2000) describes how innovative construction products and processes can be generated when project management skills are linked with technical skill development. In a study of the Swedish construction industry Brochner (2008) found that those construction managers, who diversify into the facilities management area tended to be more proactive in identifying business opportunities, were more collaborative in style and put a higher value on education and training in their workforces. This skill set enabled them to be more innovative in their original endeavour.

Insurance/Risk

The capacity to assess innovation risk requires both a broad knowledge of economic conditions and a specific knowledge of the potential benefits and pitfalls of a particular proposed innovation. At the same time that this hard commercial assessment must be made, the potential innovation manager needs to ensure that there is certain openness in the firm's capacity to develop beneficial changes. Seaden et al (2003) found that in general, innovative behaviour varies with the size of the firm and small firms are largely risk averse. Nevertheless firms that are able to overcome this challenge are likely to achieve significant gains from innovative practice. Creating the conditions in which individuals can freely engage in innovative processes requires a certain level of open exchange both within and between organisations. It may be that the temporary loss of exclusive possession of a profitable idea can be

compensated for by the generation of many more profitable ideas. Creativity only flourishes in an atmosphere of openness and overly cautious risk aversion can stifle the potential of innovative suggestions.

CLIENT AND END USER INFLUENCES

Clients have been clearly identified as key drivers of performance improvement and innovation. Blayse & Manley (2004) noted that clients are key drivers of innovation because they have the ability to influence firms and individuals involved in building and construction projects in a way that either fosters or impedes innovation. Clients exert this influence through a number of means, including the design and implementation of contracts, pre-qualification schemes and regulations (Fernie et al 2003). It has often been pointed out that the greater the power of the client, the greater the impact of the outcome of their relationship on suppliers and consultants (Sidwell et al 2001; Walker 2002; Ivory 2004).

Procurement systems

Client-based interventions such as the movement towards partnering and relationship contracting is one attempt to address industry problems (Chan et al 2004; Ingirige and Sexton 2006; Walker et al 2002; Kumaraswamy et al 2004). Procurement systems in the construction industry influence innovation because they set the parameters for knowledge sharing and risk management. Systems such as alliances specifically address the traditional adversarial culture of construction and seek to alter its course. Alliance contracts are themselves organisational innovations and one of their principle effects is to encourage further innovation through a supportive environment and a fair distribution of economies gained.

Client's characteristics

Manley (2006) has demonstrated that a high level of technical competence in the client body is a significant enabler for construction innovation. Both the client's core competence and their internal innovation capabilities need to be maintained if they are to foster and encourage innovative thinking at levels of contractors who have input into the construction industry.

Nam and Tatum (1992) have pointed out that client values are not necessarily as conservative as they are often perceived to be by other industry participants. Some clients who actively foster innovation within their own organisations are able to accept and encourage innovation in the building projects which they commission. This openness means that technology availability can drive technical innovation without the presence of 'market push' factors from the outset. In order to increase contractor contribution to innovation and value creation, clients need to take a long term perspective and actively encourage an innovation-friendly climate on projects. A collaborative project climate and a 'best for project attitude' among all project participants is only likely to occur if the client who is the project generator values such an atmosphere and makes support for it explicit.

PROJECT-BASED CONDITIONS

The nature of project-based activity can sometimes mean that companies lack the stability and continuity necessary to develop complex innovations which require time and many iterations. This discontinuity of effective problem solving is a factor in the move towards more integrated supply chains in construction (London and Kenley 2001; Love et al 2002).

Supply chain relationships

A great deal of research in recent times has focussed on the benefits of integrated supply chains for a diverse industry made up of many small players (Dainty et al 2001; London and Kenley 2001; Love et al 2002). Along with the efficiency and productivity benefits is also the possibility that a more integrated supply chain can foster innovation. Establishing good feedback loops between manufacturers, fabricators and installers can bring their differing perspectives together for the delivery of a higher quality product. Manley (2008) has shown that manufacturers have the potential to deliver construction innovations if knowledge flows and cooperative relationships are supported. Stable supply chain relationships can also smooth out the disruption caused by the temporary nature of project based work.

On site problem solving

Mitropoulos and Tatum (2000) identify 'process problems' as one of the four forces which drive construction innovation. Doree and Holmen (2004) present a case study where a significant technical innovation was delivered by a contractor as a result of particularly severe project conditions. Individuals as well as companies can generate innovative ideas as a result of analysing problems that occur on construction projects. A great deal of practical knowledge is held in the minds of the individuals who work on site, yet this experience is often not documented and made consequently be undervalued (Vakola and Rezgui 2000).

OH&S improvement

Sarshar et al (2004) stresses the need for better risk mitigation, post project reviews and improved induction programs to improve construction project performance. The potential consequences of the largely poor OH&S record of the industry are now of such economic importance that the need to improve safety standards is itself becoming a push factor for construction innovation. Despite the undeniable difficulties inherent in a temporally organised project-based industry which produces long-lived products, it is nevertheless possible to successfully deliver technical innovation (Doree and Holmen 2002).

INDUSTRY NETWORKS

Tatum (2005) has identified the need to increase technical support for construction while Harty (2005) has pointed out the need to consider the social and organisational context in which innovation is located.

Professional and industry associations

Innovation in the building and construction industry is widely believed by industry observers to be heavily influenced by the structure of relationships in the industry (Reichstein et al. 2008). As noted in Blayse and Manley (2004), relationships are important because they have the ability to facilitate knowledge flows via transactions and interactions between individuals and firms. 'Word of mouth' can be an extremely powerful means of encouraging innovative practice. Joint problem solving is an effective framework for encouraging the sharing of tacit knowledge and the development of trusting relationships. In particular, the sharing of information technology may assist in breaking down inter-firm barriers of secrecy and mistrust.

Within the Australian context, Manley (2003) reports on four key approaches for construction industry relationships, namely systems, networks, value chains and clusters. All are capable of providing the framework for innovation but the critical issue is their integration.

Research organisations and universities

According to Barrett and Barrett (2003) integration and risk sharing needs to spread from project firms to research institutions if a culture of innovation is to develop. Formal and informal research networks assist in encouraging innovation through providing a forum for discussion and through the dissemination of new ideas. Participation in such networks is a good entry point for an individual firm wanting to develop a system of innovative practice. Actually implementing such a system is likely to involve an awareness of means of developing a culture of innovation in an enterprise or an industry.

REGULATORY CLIMATE

The approval and regulation system under which the construction industry operates can have the effect of either encouraging or discouraging innovative activity (Gann and Salter 1998; Slaughter and Shimizu 2000; Dewick and Miozzo 2002). This may be due to the structure of the industry, its ability to respond flexibly to challenges or even to more esoteric factors such as how national culture values originality.

Performance based standards

Several authors have pointed to the restrictive role that building regulators may have on innovation (Gann and Salter 2000; Dubois and Gadde 2002). As a response, a widespread trend in recent years in many countries has been the move away from prescriptive building regulation towards regulations that are 'performance based'. These are open-ended and therefore more responsive to context.

Local government regulations

Not only is the construction industry itself characterised by many small entities, in some countries like Australia governance and regulation is similarly diverse and local in nature. In places where construction is not regulated by a unitary national government but may be devolved to smaller local government entities, particular issues with consistency and verification can arise (Bell and Lowe 2000). This local

focus also runs contrary to the move towards market globalisation and international competition for construction projects. Local regulations can protect sensitive local cultures and practices but their downside is a possible failure to adapt to change and potential gains brought out through an innovation culture.

Industry standards

Both environmental performance and occupational health are areas where community desire for improvement is pushing the industry to raise standards. Both environmental groups and social activists are pressing the industry to change long held cultural attitudes and improve its outcomes on these matters. Responsive companies are achieving market gains by being incorporating these ideals into their own agenda.

CONCLUSIONS

There is a considerable body of evidence in the literature to lead to the conclusion that innovation requires a cooperative atmosphere and that the construction industry needs to abandon its adversarial practices if innovation is to flourish. There is also considerable inertia in the current system but, nevertheless, the movement towards a new culture is already becoming apparent. Innovation can be fostered through management practices that encourage multi-disciplinary teams and idea sharing practices. There is also widespread agreement that construction firms need to develop systems for providing continuity between projects so that knowledge gained is retained and disseminated. The equitable sharing of risk and reward through all project participants is another measure widely believed to aid innovation.

The changes required in current practice are not small and are likely to involve considerable effort in their implementation. The project-based and largely adversarial nature of construction contracts is slowly being replaced by innovative management initiatives which share risk and foster collaboration. Systems of knowledge management and empowerment of participants are providing encouraging results for those organisations which actively pursue these goals. Robust networks of contacts within the industry increase the likelihood of innovation generation and innovation diffusion. Initial sources of innovative practice are many and varied. Creative individuals can lead innovation provided they are given an environment conducive to the exercising of their talents. Innovations can stem from the identification of a newly recognised need such as increased environmental performance.

A technological development itself can inspire innovation in the form of new applications. An organisational structure that encourages monitoring of new ideas and practices and the careful evaluation of innovations creates an atmosphere in which further innovation is quite likely to occur. While the industry leaders are actively adopting innovations both in organisational as well as technological matters, there remains some disagreement about the best way to encourage innovation in those areas of the industry which currently see no benefit to themselves in partaking in the process. There is also disagreement about who should lead the process and what structures will best promote the necessary change. It is nevertheless clear that measurable improvements in performance, quality, time saved and in profitability can be demonstrated as having resulted from construction innovations. A culture which

favours and fosters innovation is widely regarded as crucial to the continued growth and prosperity within the industry and the larger economy.

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