

# PRO-INNOVATION BIAS IN CONSTRUCTION- ENABLERS AND RISKS

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The term innovation has become ubiquitous in modern business and political circles in recent years. Innovation is increasingly seen as essential for commercial success and as a means to increase living standards, competitiveness and productivity in a world of depleting resources. By thinking more creatively about the risks and opportunities they face, it is argued widely that individuals, organisations and nations can get ahead of their competitors. But is innovation always positive and what are the enablers of innovation which determine its success? We explored these questions through interviews and focus groups with thirty thought leaders in the UK construction sector. From our analysis we conclude that there are four main enablers of innovation in the construction sector, namely: collaboration, regulation, skills, education and research and, leadership. Recommendations are made to capitalize on them.

Keywords: innovation, bias, risk, barriers, enablers.

## INTRODUCTION

Innovation is the process of bringing new creative ideas to reality and implementing them through new work practices, processes, business models and strategic partnerships to produce new products and services which are of value to society (de Man 2008). Recent research has challenged the traditional linear models of innovation which according to Barrett *et al.* (2008) have dominated construction management literature. It is now widely accepted that the innovation process is far from linear but is messy, uncontrollable, unpredictable and full of feedback loops and setbacks. As Fuglsang (2008) points out, it is often difficult to define the beginning and end of the innovation process. Innovation is highly interactive and cyclical, involving many people and organisations with multiple interests “co-creating” new knowledge under the influence of market and many other social, political and organizational forces. The aim of this paper is to discuss the challenges in managing this process in construction and to distil a number of key enablers which might help to address them.

## PRO-INNOVATION BIAS IN CONSTRUCTION

Gambatese and Hallowell (2011) argue that there is a common perception that the construction and engineering industry is a low innovation sector. However, there is considerable evidence to demonstrate that innovation does occur, even if it does primarily emerge from the adoption of ideas from other industries (Gann 2003) and does not register in traditional scientific measures of innovation (NESTA 2007).

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Indeed, Winch (2008: 23) has questioned the continued “holding-up” of manufacturing as innovation best practice. He points out that the automobile sector also “has its incompetent back-street garages and dodgy car salesmen..” and that it is important to recognize that the construction sector at its best, displays highly sophisticated skills in addressing difficult production problems in a way that draws considerable respect from other sectors. The drivers of innovation are of course constantly changing and in construction, cost and time efficiency are often quoted as overriding priorities. However, Manley and Rose’s (2009) content analysis of construction innovation publications found that concepts of sustainability, energy, environment, people and lifestyles were far more prevalent, suggesting that drivers of innovation are more complex than we may think. As Swedberg (2006) points out, while traditionally innovation has been driven by economic imperatives, today innovation is seen as a process of bringing about social advantage as well as economic benefits and that these can be both direct and indirect. It is now accepted that innovations have important, significant and often unintended positive “spill-over” benefits for societies which were not targeted in the original innovation strategies. Although many firms try to minimize these indirect effects through mechanisms like patents, Baumol (2010) argues that the distributive implications of unplanned innovation spill-overs account for the bulk of the enormous growth in the western world’s welfare over recent centuries and the reduction of poverty and inequality in developing countries. Certainly, as Loosemore and Phua (2011) argue, this is what many construction firms would claim but in many cases the reality is very different.

Whatever the motives lying behind innovation, the literature within and outside construction reflects widespread agreement that innovation has become critical to social and economic progress, sustainable development and the battle against unemployment and productivity growth. However, while innovation can no doubt play an important role in meeting these challenges, we must be careful not to automatically assume that all innovation is positive. With all the recent hype surrounding this topic, it is all too easy to uncritically embrace the concept without considering the social, economic and ecological costs it may have to communities, nations and business. As Rogers’ (1995: 104) research revealed, most innovation literature is uncritical and heavily laden with positive value - “Innovativeness, like efficiency, is a characteristic we want all organisms to possess”. Rogers argued that innovation downsides are written about far less frequently than the benefits, largely because much of the research in this area is funded by change-agencies that have vested interests in seeing certain innovations adopted. These biases are then injected in the work of the researchers and consultants whose work they sponsor. Green (2011) and Ness (2010) and Ness and Green (2012) show that pro-innovation bias afflicts the reform agendas of construction industries around the world. These it is argued, not only mask the realities of practice within the industry driven by its dominant “enterprise culture” but also obscure the significant risks to business prosperity and employee well-being which they present. As Rogers (1995) argues, while pro-innovation bias is beneficial from the perspective of policy, financial and business considerations, the implication that an innovation should be uncritically adopted by “all” members of a social system is dangerous and ignores potential externalities for some segments of society. It is clear that if we are to fully understand the innovation process it is essential that we see innovation from a range of perspectives and not from just the perspective of the vested interested that are driving it.

### **Barriers to innovation in construction**

Over the last decade or so, numerous research projects have sought to identify barriers to innovation in the construction industry. For example, Barrett and Lee (2004) cited: clients and industry bodies protecting their own interests; low awareness of improvement initiatives; poor education and training; lack of R&D; poor strategy and implementation procedures; lack of clear benefits; resistance to change; insurance issues; lack of government leadership; inappropriate legislation; complacency and; the temporary nature of projects. Every country has its unique barriers and in Australia, one of the greatest is its complex, cluttered and fragmented regulatory environment (BEIIC 2011). In Australia there are over 70 overlapping bodies which regulate the industry and central to this network are governments which as BEIIC (2011) pointed out, play a critical role in the innovation process in their capacity as regulators, sponsors, clients and policy makers. However, in qualifying this, Gann (2003) argues that as governments increasingly outsource innovation to the private sector, the leadership skills to drive innovation are too often missing. In Australia, other important but highly contentious institutions include the construction unions. While some argue that they protect traditional trade demarcations and prevent change (RCBCI 2002) others argue that Union activities have had a positive impact on industry reform, especially in areas like safety and equal opportunities (Ferguson 1999). Finally, there is the education sector and professional institutions and trade associations which protect and reinforce the industry's traditional discipline-based knowledge domains. As Pan *et al.* (2005) point out, innovation is likely to challenge and even destroy traditional knowledge domains and is therefore likely to be resisted. In particular, Locke and Spencer (2011), argue that fundamental changes in universities over the last two decades have made them less relevant to business's and society's needs and that stronger university, business and community partnerships are needed to fulfil their potential in a national innovation system.

Cultural impediments to innovation also exist in construction industries around the world. In general, innovation is perceived as an academic activity, which in most instances, produces theoretical results of little commercial value (Lenard 1996). Dodgson and Gann (2010) argue, that clients can play an important role in reversing this perception. However, as Ivory (2005) found, many clients are unwilling and unable to effectively encourage innovation, because of: competition with other priorities; short-term capital costs involved in innovating; internal politics and difficulties in achieving consensus between project stakeholders; increased risk exposure and workloads in managing innovation; indemonstrable benefits and; inadequate competence to confidently manage the process and judge net benefits. Qualifying this further, Sexton *et al.* (2008) point out, there are many client types and while some prominent clients take their leadership responsibilities seriously, the majority of construction clients play a passive role in the innovation process. For example, Manley's (2006) large-scale survey of the Australian construction industry, showed that repeat public sector clients have a relatively high level of innovation competence, compared to contractors, consultants and suppliers. However, more recent research by Loosemore and Phua (2011) provides evidence to show that despite many private firms wanting to innovate, many clients, even apparently sophisticated clients, represent a significant barrier to innovation. This is largely because they do not understand the relationship between their buildings and their core business and see buildings as a tradable short-term asset rather than a long-term investment. Furthermore, Brandon and Shu-Ling (2008) argue that relying on clients as drivers of

innovation is a “cop out” by the industry. They contend that relying on clients to drive innovation discourages firms from investing in their own new ideas and recognizing their collective responsibility for the advancement of the industry. Similarly, Bresnen (2008) argues that there is a problem in assuming that clients have a coherent innovation agenda which means that client-led innovation can cause more problems than it solves.

Another way in which clients inhibit innovation is through their employment practices and research indicates that non-traditional relational procurement methods such as alliances and partnerships would seem to benefit innovation (Walker and Maqsood 2008). However, alliance contracts are often undermined by the culture of the industry in which they have to exist and ultimately, alliance contracts like any other project are staffed by people who have been educated and instilled in the confrontational and fragmented traditions on the construction industry. Furthermore, the PPP literature shows, many new forms of partnership are partnerships in name only (Akintoye and Beck 2009). Such projects are often misused as a mechanism for the public sector to transfer risks to the private sector without regard for capacity to manage it and that this encourages special purpose vehicles to adopt tried-and-tested solutions rather than to experiment with innovative ones.

Finally, construction occurs through complex and often unwieldy constellations and networks of firms. The way that the risks and benefits of innovation are distributed through these networks is often problematic in not fairly reflecting the proportion each firm’s contribution to the process (Winch 2008). Lamborde and Sanvido (1994) argue that this is one of the construction industry’s major barriers to innovation – the separation of potential innovators from the potential benefits of their innovations. For example, a domestic sub-contractor’s lack of involvement in design means that any technological innovations must be offered through a principal contractor who is likely to filter the potential benefits to the innovating sub-contractor. Another problem with construction supply chains is the lack of integration of manufacturers (Slaughter 1983). For example, while a builder’s benefits are project-specific, manufacturer's benefits are product-specific. This introduces the dilemma that while builders are best placed to identify innovations, material/product manufacturers have little incentive to respond in a time-frame which enables builders to benefit from them. However, as Dodgson and Gann (2010) argue, traditional boundaries between manufacturing and services are fast becoming obsolete as new boundary-spanning technologies (such as BIM) emerge enabling firms to develop new integrated systems solutions which provide customers with a single point purchase and ongoing support for buildings and structures.

## **METHOD**

While the barriers to innovation in the construction sector have been widely researched and documented, less has been written about the enablers of innovation that might counteract their negative effects. To this end, we undertook semi structured interviews and focus groups with thirty of the UK’s recognised political, institutional, organisational and academic leaders. Our respondents were chosen because of their prominent role in influencing UK innovation government policy and reform within the UK. Our rationale in selecting these people was to harness their collective tacit and explicit insights, knowledge and experience in influencing policy reform this area. The interviews and focus groups lasted between one hour and three hours and were guided by one simple question - "What would enable more innovation to happen in

the construction sector?" . In managing our discussions we deliberately took an unstructured "constructivist" approach which enabled our respondents to follow their own path through the subject but under our guidance as we sought to follow any leads we considered important. Our pursuit of leads was guided by our own conceptual mind-map of enablers which we did not show our respondents but which had derived from the innovation literature. As the interviews progressed we gradually adjusted and refined this conceptual map to reflect the combined schemas of our respondents and this in turn guided subsequent interviews. Recognising that this method mean later respondents were guiding in their thinking more than earlier respondents, we distributed our map for feedback and comment after our final analysis was completed.

## **DISCUSSION OF RESULTS**

A simplified version of our conceptual map is shown in Figure 1 and shows four main innovation enablers, namely: collaboration; regulation; skills, education and research; leadership. It is important to point out that opinions of our respondents were wide, varied and sometimes opposing. However, these themes (illustrated in Figure 1) emerged as dominant in our transcripts and are a discussed in more detail in the sections below.

### **Collaboration**

The basis of the collaboration argument is that few firms in the construction industry have the full range of competencies necessary to innovate. So they must collaborate to do so. Collaboration not only creates the necessarily broad knowledge and skills-base to generate and convert new ideas into reality but also spreads the significant risk associated with innovation. To drive innovation, collaborative arrangements must extend beyond the traditional boundaries of the construction industry. This is because few firms within it have the necessary cultures, systems, attitudes, skills, capabilities and resources to innovate. Furthermore, traditional knowledge domains have been inappropriately narrow given the close relationship between the industry's activities and wider society (in social, economic and ecological terms). These new and poorly understood interdependencies will present managers with new problems which are messy and cannot be clearly defined and resolved. Solutions to these challenges will also causes us to question the efficacy of vertically hierarchical and integrated business models (which have a strong tendency to create internal boundaries between disciplines, functions, units, departments and regions), in favour of horizontally dispersed network models with permeable boundaries. This idea of strategic communities of practice of course introduces new governance challenges of managing such dispersed structures. First they will require a more reflective and non-linear way of thinking in a more collaborative environment which involves construction business, communities and governments working in new organizational configurations which are likely to challenge traditional competitive relationships and perceptions.

Increasingly, to deal with these new challenges, individuals, firms and governments are going to have to innovate and it is in new relationships and at the intersection of different knowledge domains, that the solutions to today's challenges lie. Innovation happens when people are exposed to multiple ways of thinking by looking into other cultures and disciplines including the physical and social sciences, arts and humanities. The most enlightened organisations realize this and build this into their business structures and strategies. To them, notions of interdisciplinarity and collaboration are replacing traditional competition as a way to share complementary ideas, resources and capabilities to mutual advantage. This can be facilitated by the development of

knowledge sharing networks underpinned by rigorous evidence-based analysis which is inclusive of all firms within the industry - not just the larger firms. New communication technologies can help facilitate this process as can new design technologies like BIM which potentially enable firms to work in a more integrated and collaborative fashion. However, the key is how these technologies are deployed and used, not the technologies themselves. Procurement reform is also critical to this process. Partnerships, alliances and relational contracting are seen as particularly important mechanisms to enable more integrated working.

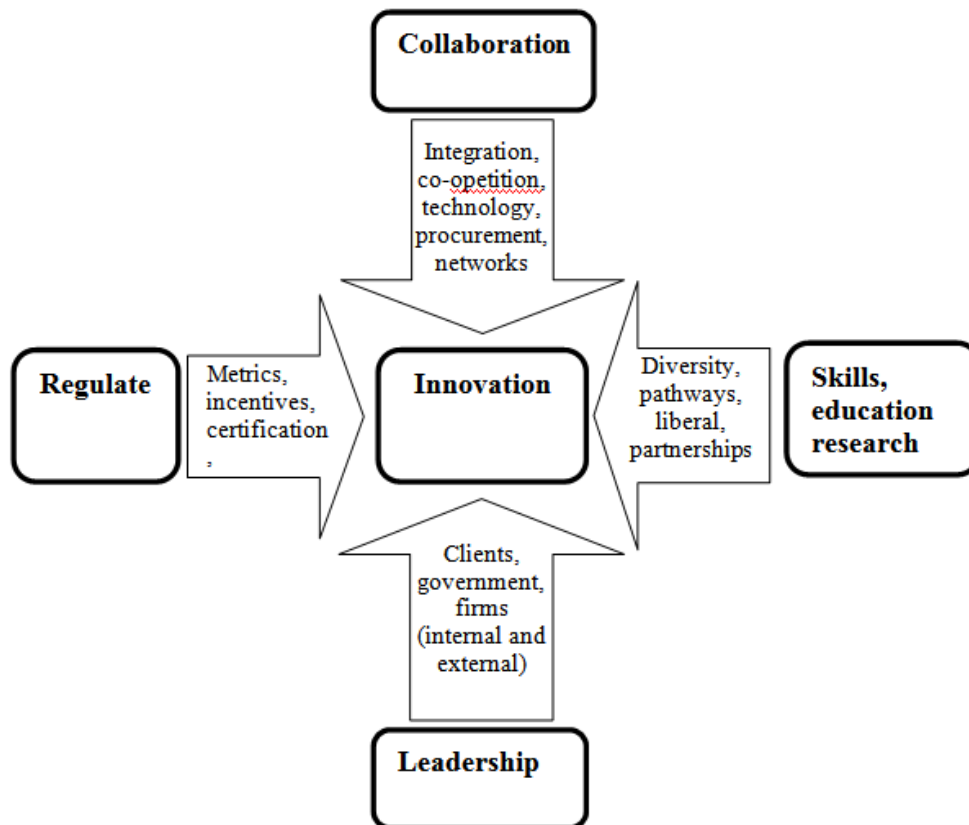


Figure 1 Key enablers of innovation in construction

However, currently there is little history of innovation in the construction industry which means that venture capitalists are reluctant to invest the resources necessary to bring new ideas to reality. Instead, innovation in construction sector will likely depend largely on collaboration with highly capitalized, risk taking, research intensive companies with demonstrated success at innovation. In other words, innovation is more likely to occur “around” the industry rather than within it and in this environment, the unique partnerships a firm creates to capture and ring-fence the intellectual property that arise from such partnerships will be critical to its competitive advantage. At another level, collaboration in an increasingly globalised world, where the size of many projects exceeds the capacities of individual firms to deliver them, may also require firms to “hunt as a pack” for work in overseas markets and to embrace the idea of co-opetition where competitors share common resources and capabilities in a way which provides mutual advantage. In essence, what is being advocated is a “deeply” integrated business model which breaks down the traditional institutional, professional and disciplinary silos which have been recognized to artificially create inefficiency in the construction industry. In simple terms, a “deeply”

integrated business model is one where suppliers, manufacturers, designers, contractors, sub contractors, operators and clients work collectively to share the risks and rewards associated with innovation in an open, transparent and collaborate environment of collective responsibility where personal interests are put aside in the interests of the whole and where resources are shared and used where they best fit. Deeply integrated supply chains create a single point of responsibility for innovation, improve communication and allow the early involvement of firms in the development process preventing solutions being locked-in before all available knowledge has been brought to bear on them.

### **Leadership**

Our respondents identified four sources of leadership which were seen as important to innovation in construction. First, firms in the construction industry have a responsibility to lead by driving innovation through their supply and demand chains. They must do this by increasing investments in R&D, educating clients about the benefits of innovations, being more willing to support new ideas, helping smaller business partners to do so and continuously striving to improve performance on their projects. Second, and in contrast to this supply-led view of innovation, clients must also take a lead and demand more innovation. Major clients in particular must show leadership and create a competitive environment for innovation to flourish. However, there is a point at which too much competition stifles innovation by eroding margins and reducing industry performance to the lowest common denominator. Instead of focusing on price alone (which often disadvantages innovative firms), they must recognize the value delivered over the life cycle of their investment, enabling supply chains to have a stake and a say in the way it is designed, constructed and performs. The third source of leadership is external to the industry. According to our respondents, innovation is more likely to be driven by the adoption of innovations from outside the industry than from within it. Finally, at an industry level there is also a need for a champion to catalyze innovation and change, in the way that Latham did in the 1980s and Egan did in the 1990s in the UK. These people caught the imagination of the industry and engendered a universal appetite for reform never seen in the UK construction industry before. However, it is critical that any reforms are evidence-based and that new ideas must not be transplanted from other industry contexts without recognizing the unique cultural and organizational attributes of the industry which differentiate it from other industries.

### **Skills, education and research**

The basis of the skills, education and research agenda is to deepen and broaden the industry's gene pool. The point here is that diversity in knowledge, culture and gender is the key to innovation. But the industry also needs to deepen the gene pool by attracting the very best people. Attracting the best people is not an easy task given the competition from other industries for human resources and will essentially come down to improving the industry's image through strong leadership and highlighting the important and positive contribution the industry makes to the economy, culture, environment and society. Furthermore, it will require the industry to address the under-representation of minority groups at senior levels. For example, women are grossly under represented at senior levels in the industry and there are few education and career pathways formalized for people to work their way up from operational to management roles. To alleviate this problem, education needs to be more flexible to enable people to learn at work, we need to recognize and accredit prior and

experiential learning on-the-job and there need to be clearer pathways and transitions between all levels of education in the industry. We should also ensure that education is relevant to what the industry needs and contributes to the performance of firms in the industry, while at the same time providing the broad-based liberal education needed to think differently. Finally, there needs to be stronger ties between universities, governments and commerce to ensure the industry can independently monitor the benefits of innovation and learn lessons to improve future processes. Stronger ties will also ensure that the results of research better contribute to industry performance and satisfy industry needs while at the same time recognizing the critical importance of basic research for longer term prosperity and innovation.

### **Regulation**

While the inability of regulation to bring about cultural change was widely recognised by our respondents, the basis of the regulation argument is that the construction industry will not innovate voluntarily. Rather, construction has repeatedly shown that it is a compliance-based sector which must be forced to change through regulation and legislation which mandates standards and create incentives to innovate. Certification schemes can also be used to force firms to comply with certain minimum standards and to “cut-off” what is a very long underperforming tail. But regulations should not be penal. They should also drive structural reform within the industry and provide incentives for those firms which wish to innovate. The industry also needs standard methods and metrics for measuring and demonstrating the benefits of innovation and incrementally improving targets need to be set to drive performance up across the industry. However, the need for regulation must be balanced with the dangers of over-regulation which is widely known to stifle innovation by increasing the risk of noncompliance, restricting the boundaries of “legal” innovative activities and by making innovation more dependent on time consuming approvals external regulatory agencies.

### **CONCLUSIONS**

The aim of this paper was to discuss the enablers to innovation in the construction sector. Our interviews demonstrate that there is much that can be done to improve levels of innovation in the industry. However, it is important to bear in mind that these findings are based on opinion only and that they follow nearly two decades of contentious industry reform which has produced mixed results. It is also important to recognise the many risks associated with the strategies summarised in Figure 1 and discussed above. It must be said that these are not well understood although some were noted by our respondents in our interviews. For example, due to the breakup of traditionally vertically integrated firms and increasing regulatory and technological complexity, we now face a world with multiple and potentially cascading interdependencies and uncertainties which did not exist in the past. As the global financial crisis has vividly illustrated, an isolated problem in one part of the world is now capable of spreading and magnifying uncontrolled to previously remote and unrelated businesses and societies in other parts of the world. As a result of these changes, and indeed, some of the strategies suggested here, we have also seen the emergence of what is being called the “hollowed out” firm and the ‘invisible worker’. It is also important to point out the divergence between the vision presented here and the reality of the construction industry where traditional knowledge domains and working practices remain firmly in place. The reality of the construction industry is a highly fragmented and casualised one, where firms are forced to focus on price, profit



and contracts rather than innovation and collaboration. While the discourse of innovation in some segments of the industry is intended to modernise its working practices, the unknown and unintended externalities associated with their implementation need to be better understood before they are implemented in practice.

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