



## NEW ZEALAND BUILT ENVIRONMENT RESEARCH SYMPOSIUM

*Shaping future directions for collaborative built environment research and practice in New Zealand*

### **Procurement of non-incremental sustainable technology innovations - the case of small entrepreneurial firms supplying New Zealand construction & building industry**

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#### **ABSTRACT**

##### **Motivation**

Traditionally, the construction industry in New Zealand and in other countries has seen a low productivity and a low track record for successful innovations (Fairweather, 2010). The industry also lags in sustainability (e.g. Nemry, 2008) when seen from a broader or lifecycle perspective. This has a negative impact on private and government spending, on quality and health/wellbeing, and on the environment.

This paper posits that the construction industry needs non-incremental (disruptive or discontinuous, i.e. modular, architectural, system or radical) sustainable technology innovations to make drastic improvements in sustainability. Such innovations are often procured (acquired) and (co-) developed by small entrepreneurial firms thus introducing such innovations into the construction and building industry. *However it is unclear exactly how entrepreneurial small firms procure non-incremental sustainable technology innovations.*

##### **Knowledge gap from extant research**

Often entrepreneurial small firms from outside the industry or at the beginning of supply chains play an important role in procuring innovations (e.g. Baumol, 2002; Johnsen 2011; Gambatese, 2011, Pries, 1995, 2005). There is a wealth of literature on how *large* organisations procure their goods and services but it often remains unclear how *small* firms procure these (e.g. Hagelaar, 2014). There is Australian literature (e.g. Hardie, 2006; Hardie 2013) on small firms successfully introducing sustainable innovations in the construction industry. Likewise, there is a growing body of literature (e.g. Johnsen, 2011; Philips 2004) on how large organisations procure non-incremental innovations.

There is some literature on non-incremental sustainable innovations in the construction industry (e.g. Hardie, 2013; Sheffer, 2010, 2013). There is research on innovation types in the construction industry (Slaughter, 2000, Hardie, 2006). Literature also suggests (e.g. Hardie, 2011) several barriers to adoption of innovations on a meso (industry) level and on a macro (systemic) level in the construction industry. Utterback (1994) suggested that such (infrequent) non-incremental innovations would trigger more frequent process and incremental innovations, and would hence deliver large benefits to stakeholders. Manley (2008) concluded that despite the importance of product innovation there is not much research within the construction industry.

Small firms are not miniature versions of large firms (e.g. Torres & Julien, 2005) and small firm innovation and procurement processes will differ from those of larger firms. Processes are likely to be more informal, holistic, and centred round the firm owner although Meijaard (2004) suggested a wide variety of organisational structures within small firms including formal and complex structures. Entrepreneurial small firms are a small subset of small firms but realize growth and renewal (OECD, 2010). In general there is a research gap on *how*



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*entrepreneurial small construction firms procure non-incremental sustainable technology innovations.*

**Key words:** construction & building industry; entrepreneurs / small firms; New Zealand; non-incremental sustainable technology innovations; strategic procurement.

### **Aims and objectives**

The research question is: *How do entrepreneurial small New Zealand construction firms procure non-incremental sustainable technology innovations?* The related research aims are:

1. Determine how current procurement activities (i.e. acquisition practices and strategies) interact with innovation activities (i.e. related to non-incremental sustainable technology innovations) within small entrepreneurial New Zealand construction firms.
2. Determine the effect of dominant variables.
3. Determine value-adding procurement activities in economic, social and environmental terms within small entrepreneurial New Zealand construction firms when interacting with innovation activities.
4. Operationalize such value-adding procurement activities into best practices (or even into management instruments).
5. Develop and communicate these new insights to firms and other participants involved in this research, and via academic journals and conferences.
6. Provide recommendations on further research, and on generalisations of insights.

### **Research method**

The focus of this research is the New Zealand construction industry and this paper is explorative by nature. It is based on a literature review and expert interviews. The paper develops a conceptual framework on strategic procurement and innovation activities of entrepreneurial construction firms in the New Zealand context and identifies clusters of dominant variables. It describes hypotheses from the dominant variables. The hypotheses and related research questions will be tested in three rounds of focus studies (e.g. Hoffmann, 2011; Schiele 2010) alternating with two rounds of multiple case studies (e.g. Eisenhardt, 1989).

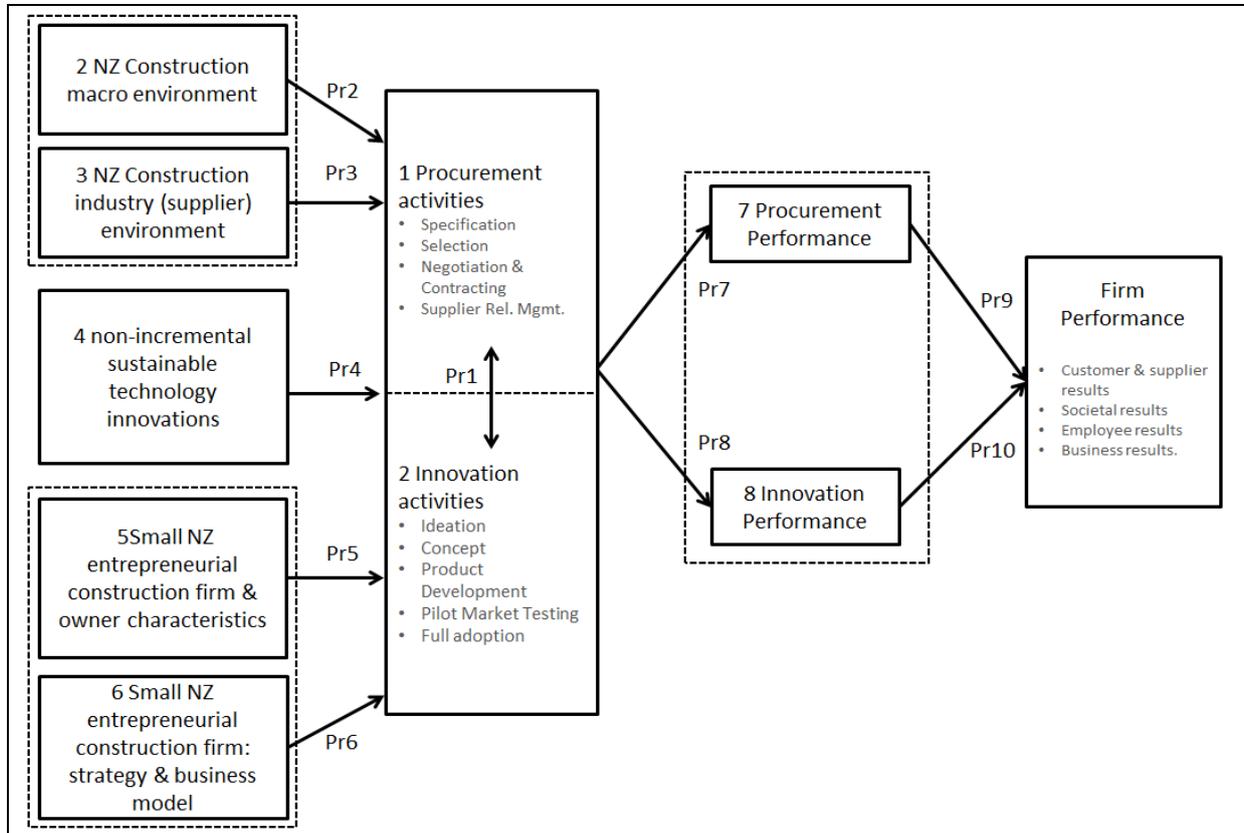
This research starts with introducing a conceptual framework. The framework shows two independent concepts of *strategic procurement activities* and (internal and external) *innovation activities* of the small entrepreneurial New Zealand construction firm. These procurement activities must be aligned with innovation activities for an optimal firm performance. The resulting *small firm performance* is the dependant concept. The independent and dependant concepts are affected by four concepts which describe the *firm's meso and macro environment*, the *characteristics of the innovation*, the *characteristics of the owner and the small firm*, and the *firm's strategy and business model*. For classifying the strategic procurement activities this research proposes the procurement process framework of Van Weele (2010). For classifying the innovation activities this research proposes the framework of Cooper (1995). Both validated frameworks are on a sufficient high level to account for *informal and iterating* procurement (acquisition) and innovation processes within small firms.



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**Figure 1: Conceptual framework for this research**

The paper discusses the Resource-Based View (RBV) in combination with the Resource-Dependency Theory (RDT) perspective and has the small firm with its (external and internal) procurement and innovation activities as a unit of analysis. When using this perspective and unit of analysis, extant literature provided a number of dominant variables of each of the four moderating concepts. These variables have been used to describe clusters of hypotheses related to the strategic procurement and innovation activities. The paper ends with questions for further research.

### Research significance

This research wants to learn what the role is of procurement in successful disruptive waste-reducing technology innovations in small entrepreneurial New Zealand construction firms. This will be beneficial to innovating construction firms and their business partners, to owners and occupants of buildings, and to the wider environment. Hence this research has a scientific and business relevance, and a social and environmental relevance.

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### References

*(For brevity sake the main text only mentions first authors)*

- Baumol, W. J. (2002). *The free-market innovation machine: Analyzing the growth miracle of capitalism*. Princeton university press.
- Cooper, R. G., & Kleinschmidt, E. J., 1995. Benchmarking the firm's critical success factors in new product development. *Journal of product innovation management*, 12, p. 374-391
- Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of management review*, 14(4), 532-550.
- Fairweather, J. (2010). *Can building and construction sector innovation be improved? BRANZ report*, Lincoln University.
- Gambatese, J. & Hallowell, M. (2011). Factors that influence the development and diffusion of technical innovations in the construction industry. *Construction Management and Economics*, 29, 507-517.
- Hagelaar, G. Staal, A. Holman, R. Walhof, G. (2014). An integral framework for studying purchasing and supply management in small firms. *Competitive Paper 24th IPSERA Conference*, South Africa.
- Hardie, M. (2011). *Technical Innovation Delivery in Small and Medium Construction Enterprises* (Doctoral dissertation, University of Western Sydney).
- Hardie, M. et al. (2006). Innovation performance and its impact on profitability among groups in the Australian construction industry. *Australian Journal of Construction Economics and Building*. Vol 6, No 1.
- Hardie, M., Allen, J., & Newell, G. (2013). Environmentally driven technical innovation by Australian construction SMEs. *Smart and Sustainable Built Environment*, 2(2), 179-191.
- Hoffmann, P. (2011). *Innovative Supply Risk Management. The Development of Comprehensive Innovations with Suppliers*. PhD Thesis, Technical University of Twente, ISBN: 978-90-365-3278-5, the Netherlands.
- Johnsen, T., Calvi, R., & Phillips, W. (2011). *Purchasing and supplier involvement in discontinuous innovation: a literature review*.
- Manley, K. (2008). Against the odds: Small firm s in Australia successfully introducing new technology on construction projects. *Research Policy* 37, 1751-1764.
- Meijaard, J., Brand, M. J., & Mosselman, M. (2005). Organizational structure and performance in Dutch small firms. *Small Business Economics*, 25(1), 83-96.
- Nemry, F., Uihlein, A., Colodel, C. M., Wittstock, B., Braune, A., Wetzel, C., ... & Gallon, N. (2008). *Environmental improvement potentials of residential buildings (IMPRO-building)*. JRC report (ftp. jrc. es/EURdoc/JRC46667. Pdf).
- Phillips, W., et al. (2004). *Discontinuous Innovation and Supply Relationships: Strategic Dalliiances*.
- Pries, F. & Janszen, F. (1995). *Innovation in the construction industry: the dominant role of the*
- Pries, F., & Dorée, A. (2005). A century of innovation in the Dutch construction industry. *Construction Management and economics*, 23(6), 561-564.
- Schiele, H. (2010). *Unveiling the importance of being a preferred customer in order to develop innovations with suppliers*. Twente Technical University, the Netherlands.
- Sheffer, D. A., & Levitt, R. E. (2010). *The diffusion of energy saving technologies in the building industry*:
- Sheffer, D. A., Katila, R., Levitt, R. E., & Taylor, J. E. (2013). *Innovation of unique, complex products*. In *Proc., Academy of Management Conf., Academy of Management, Briarcliff Manor, NY*.
- Slaughter, E. (2000). *Implementation of construction innovations*. *Building Research and Information* 28(1): 2-17.
- Taylor, J. E., & Levitt, R. E. (2004) *A new model for systemic innovation diffusion in project-based industries*. In *Project Management Institute International Research Conference*.
- Torrès, O., & Julien, P. A. (2005). *Specificity and denaturing of small business*. *International Small Business Journal*, 23(4), 355-377.
- Utterback, J.M. (1994). *Mastering the dynamics of Innovation: How companies can seize opportunities in the face of technological change*. Harvard Business School Press, Boston.
- Weele, A., van (2010). *Purchasing and Supply Chain Management*. Cengage Learning, 5th revised edition, London.