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Beyond ‘business as usual’: Capability challenges in earthquake reconstruction in Christchurch, New Zealand

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Abstract

Four years on after the February 2011 earthquake in Christchurch, New Zealand, the pace of reconstruction of the damaged built environment has gained momentum. In spite of the various stakeholders involved and different funding mechanisms and organisational structures applied for reconstruction, capability issues have emerged over time which posed unique challenges to the region’s construction industry. By using a longitudinal approach to studying the resourcing practice of the construction companies, this paper revealed that the earthquake effects have compounded pre-existing resource shortages in the construction sector. Capability constraints on disaster recovery projects were caused by factors, such as the limited skills base, logistics for labour supply, delays in the consenting process, inconsistent workflows and lack of coordination across the recovery sectors. To improve the performance of the construction industry in the longer-term reconstruction and in coping with future events, there is a need for the construction sector to adopt a capability approach to addressing resource challenges in a concerted manner. The results are informative in the context of a large-scale natural disaster where resources and capacity play a critical role in attaining successful post-disaster reconstruction.

Keywords: *Canterbury earthquakes, construction industry, capacity, resourcing, longitudinal study*

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Introduction: Background to effects of capability limitations on reconstruction

The impacts of resource shortages on recovery following a major disaster are profound when time is tight and the government is under political pressures to rebuild quickly (Olshansky, Hopkins et al. 2012). Demand surge is a prominent feature following large-scale disasters, one which entails higher repair or rebuild costs. Although the circumstances contributing to increased reconstruction costs are disaster-specific, there are common explanations for demand surge across events. Research in this area suggests the increased cost of reconstruction labour and materials is the most common explanation for demand surge (Olsen & Porter, 2013). When the resourcing of labour and materials is not handled well, the adverse market responses can worsen local economies, causing time and cost effects on disaster reconstruction projects (Jayasuriya, Steele et al. 2005, Chang et al., 2010).

As a result of these resource-related capability constraints, many post-disaster housing projects suffered problems, such as funding shortfalls (Comerio 1993, 1997, Peacock et al., 2007), further strains on government expenditure (Skoufias 2003, Freeman 2004) and revised scope of projects (Chang et al., 2011, 2012). This can be an insurmountable issue and, in some cases, result in a waste of resources when projects are left half-constructed (Chang et al., 2012, Chang-Richards et al., 2013). The Victorian Government, Australia, for example, found that they had to step in four years after the 2009 'Black Saturday' bushfires and provide financial assistance for those whose house was half constructed due to fund shortfalls as a result of cost escalation (Freame et al., 2013).

Literature suggests that restoration costs of housing have increased between 20% and 80% following past disasters. Following the 1994 Northridge earthquake, insurers observed a 20% increase in the costs to settle property claims (Kuzak and Larsen, 2005). The 2006 Cyclone Larry in Queensland, Australia saw an increase of 50% in house reconstruction costs (Australian Securities and Investments Commission, 2007). Rebuilding damaged houses in Sichuan, China had a cost increase by 80% in the six months of Wenchuan earthquake in 2008 (Chang et al., 2012). Increases of 60% in the costs of house reconstruction were also observed in the affected areas after the 2004 Indian Ocean tsunami (National Construction Association of Sri Lanka 2005, Steinberg 2007).

The ongoing reconstruction in Christchurch, New Zealand following earthquake sequence that happened in 2010 and 2011 also raised concern about potential cost increase for rebuilding houses, especially in relation to the lack of capability (Chang et al., 2012). However, there is little empirically longitudinal research on identifying the factors that influence the capability constraints faced by construction companies over the period of post-disaster reconstruction (Drabek and McEntire 2003). In particular, what mechanisms will play together to limit the reconstruction capability in Christchurch and its effects on wider recovery remains an unsolved question.



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Research methodology

The research seeks to empirically investigate the critical factors that contribute to capability constraints in reconstruction following the Canterbury earthquakes. To achieve this goal, two research questions are formulated:

- What are key factors in post-earthquake Christchurch that limit the capability and capacity building of construction organisations during post-earthquake reconstruction?
- How do different factors affect the resourcing ability of construction organisations?

A triangulation method was adopted for data collection, including an online questionnaire survey of construction organisations, field-based observations and interviews within case studies (See Table 1.1). Specifically, the research questions were addressed in the following three steps.

- 1) Collecting the statistical data which include the construction organisations' opinions on the perceived capability constraints in Christchurch through a questionnaire survey from October 2011 to January 2012
- 2) Identifying the critical factors and interplay effects of those factors that influence the capability of construction organisations in rebuilding over time through long-term case studies of 15 selected construction organisations
- 3) Empirically validating research results through the method of expert judgement.

Table 1.1 A triangulation method of data collection

Data collection methods	Time	Profile of participants
Online questionnaire	Between October 2011 and January 2012	<i>61 organisations responded to the survey</i> 2 Design companies 28 Consulting companies 17 Construction contracting companies 1 Consenting organisation 4 Building supplies organisations 9 Construction project client and project manager
Interviews for case studies	May 2012 December 2012 May 2013 April 2014	<i>15 case study organisations</i> 6 Engineering consultancies (3 large-sized and 3 SMEs) 5 Contractors/builders (2 large civil contractors, 1 subcontractor, 1 home builder, 1 large construction company) 2 Building supplies companies (2 large building product manufacturers) 2 Project Management Offices (1 for infrastructure reconstruction and 1 for residential repairs)

Invitations to participate in the online survey were sent via the New Zealand Construction Industry Council internal mail system, targeting the CIC member organisations in Canterbury region. Of a sample of 155 CIC Canterbury construction organisations, 61 responded to the survey with a response rate of approximately 39%. Of 61 surveyed organisations, 15 were selected for longitudinal case studies (see Table 1.1). A case study method was adopted for this research due to its theory-building nature (Eisenhart, 1989; Yin, 2003). Lorch (2005) also

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highlighted the importance of a longitudinal research for evidence-based post-disaster recovery decision-making.

Results and discussion

Analysis of questionnaire survey and longitudinal case studies revealed the key factors and how they have influenced the capability building of construction organisations in post-earthquake Christchurch. They are discussed below:

Limited skills base

Emergency repairs and land zoning issues post-earthquake had posed an initial demand for engineering technical professionals such as structural engineers and geotechnical engineers. Repairs of damaged houses were also proceeding well, which placed a burden on the availability of architects and essential trades such as electricians, painters, and carpenters. Longitudinal case studies showed that quality control personnel became essential emerging skills that were needed by construction organisations as Christchurch moved to a stage of reconstruction. The perennial paucity of skills with experience in quality control, site supervision and project management has been a lingering issue in New Zealand construction (Lobo and Wilkinson 2008). The available pool of these essential skills nationwide was not able to satisfy the large proportion of demand for reconstruction due to pre-existing skills shortages, the losses caused by retirements and movements to other industries. Furthermore, the effects of aging and retirement have also had an impact on skills levels post-earthquakes.

Logistics for labour supply

One of the important implications posed by the earthquakes is that they imbued a specific component to the labour supply problems in reconstruction. Given that the habitable housing stock has been greatly reduced in the earthquakes, Christchurch City has found it difficult to ensure that the market provides enough affordable housing for displaced residents. Compounding this shortage was the need to house a large number of additional rebuild workers. A lack of temporary accommodation has been an on-going concern which has constrained labour supply. An estimated minimum of 10,000 homeowners and occupants will have to relocate to temporary accommodation while further repairs are carried out (MBIE 2013). As the rebuild proceeds, construction-related inflation as a result of this rent inflation is likely to put extra pressure on the Canterbury labour market, community recovery and regional economic development. The logistics aspect of labour supply, oftentimes, appears to be missed out on the post-disaster recovery and reconstruction agenda (Baroudi and Rapp 2014).

Delays in the consenting process

Another emerging constraint on construction organisations' effective participation in reconstruction is the speed at which local territorial authorities can issue consents. The research participants had concertedly been expressing a significant level of concern over the time needed for consent which impeded their ability to assess their skills needs and plan for staff allocation.

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The frustration experienced by home owners and recovery agencies over the delays for consent processing was reflected in a decision in July 2013 by the International Accreditation New Zealand (IANZ) to revoke Christchurch City Council's capacity as a building consents authority.

Inconsistent workflows

Longitudinal case studies highlighted that the delays caused by complexities around land zoning decisions and insurance pay-outs created an information 'vacuum' for the construction industry. The discontinuous nature of construction jobs has sometimes tended to influence maintenance of the status quo at the expense of readiness strategies for the future (Dainty, Grugulis et al. 2007). There were inconsistent workflow figures released by government and recovery-related agencies to the construction organisations operating on Christchurch reconstruction projects. In particular, the slow pace of reconstruction was affecting construction businesses' cash flow and further affecting the pace and number of people they could employ with a detrimental effect on workforce planning in the construction sector.

Lack of capacity for workforce growth

A lack of operational capacity of construction organisations in response to workforce growth was another key factor identified by most studied organisations. Workforce capacity expansion across the interviewed organisations was 30% on average above the pre-event level. In many cases, smaller companies increased their number of workers by more than 50%. This result is significant especially to construction industry with majority businesses being SMEs and agrees with other findings about the orientation of the industry, which mainly focuses on the organisational level capacity building (Allan and Yin 2010, Chang, Wilkinson et al. 2012).

Conclusion

The research is of value not only in improving the understanding with regard to the dynamics of capability building of construction industry in participating in post-disaster reconstruction, but also to policy makers towards addressing those capability challenges in order to expedite recovery from large events. The paper has identified the critical factors that affect capability building of construction organisations in Christchurch following the 2010/11 earthquakes. These factors should be considered the basis for a new capability approach as one of the means for addressing resource challenges in a concerted manner.

The results are informative in the context of a large-scale natural disaster where resources and capacity play a critical role in attaining successful post-disaster reconstruction. Future research could be directed towards comparative studies of the element of capability building of construction industries across different countries that have had major disasters. Such a cross-country comparison will be essential to consolidate the theory of capability building of disaster recovery projects.



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Author's Biography



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