

DEVELOPING RESILIENCE IN SUBCONTRACTING ORGANISATIONS DURING DISASTER RECOVERY

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The large-scale reconstruction in Christchurch following the 2010/11 earthquakes has generated a substantial demand for construction employment. Given the fact that subcontractors execute up to 90 per cent of the on-site jobs in most construction projects, subcontractors exert a strong influence on the outcome of reconstruction projects. Based on case studies of subcontracting businesses involved in the reconstruction of the Christchurch City, this study investigates the workforce resourcing strategies adopted in subcontracting construction businesses. Research findings revealed that the subcontractors' workforce resourcing is highly vulnerable to labour market changes and competition in securing projects. Business agility and resiliency have been seen as critical for the survival of the subcontracting businesses, especially during recovery operations. In producing resilient business, subcontractors enhance their business survival by strengthening their core businesses, diversifying their business operation, maintaining good relationships with main contractors and outsourcing work to provide flexibility. In this study, a simplified version of the workforce planning is provided to suit the needs of the construction companies. The interdependency between the subcontractors' business environment and their organisational strategic planning has been developed. The suggested workforce resourcing strategies could benefit small and medium-sized businesses in strategizing their workforce needs and sustaining their competitiveness in a complex and uncertain construction market.

Keywords: Christchurch earthquakes, post-disaster, reconstruction, workforce resourcing

INTRODUCTION

The Canterbury earthquakes series-Darfield earthquake (September 4, 2010), Lyttleton earthquake (February 28, 2011) and Christchurch earthquakes (June and December 2011)-have taken a severe toll on the built environment of the Canterbury region (Potter *et al.*, 2015). The destruction equated to NZD40 billion dollars, approximately 20 percent of the New Zealand Gross Domestic Product (GDP) (Potter *et al.*, 2015; Stevenson *et al.*, 2015). The physical destructions reduced the operative capacity of the affected businesses and constrained the businesses' operation routine (Parker *et al.*, 2012). The Canterbury earthquake series affected the sustainability of small and medium enterprises in Christchurch. Some businesses survived and thrived in the post-earthquakes environment while many small and medium-sized found it more difficult to sustain their businesses (Inland Revenue Report, 2014). Stevenson *et al.*, (2015) showed that resource adequacy and strong inter-organisational networks reinforced organisations' business continuity in an altered post-disaster environment. The Christchurch construction sector

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grew in the post-earthquakes but the high demand for skills and costs to rebuild Christchurch led to significant skills shortages in the labour market. Consequently, the complexity of post-Christchurch earthquakes presents a challenge for accurate forecasting of the workforce (Chang *et al.*, 2015b). Skills shortages in the Christchurch subcontracting businesses are attributable to the lack of matching skills within the sector (Piri *et al.*, 2015, Chang *et al.*, 2015a; Chang *et al.*, 2016), workforce fluidity (Chang *et al.*, 2015a), ageing workforces (Chang *et al.*, 2015a) and fluctuations in the workflow outlook (Chang *et al.*, 2015a).

The mainstream literature reported the universal relevance of workforce resourcing strategy in large construction organisations (Loosemore *et al.*, 2003; Raiden *et al.*, 2003; Dainty *et al.*, 2005). However, small and medium-sized construction organisations face wider challenges and there is little empirical research on this sector. Collective workforce planning is affected by the limited subcontractor financial capacity (Chang *et al.*, 2016), constraints in the subcontractors' internal knowledge base (Chang *et al.*, 2016) and the subcontractors' vulnerability to the construction market fluctuations (Ng *et al.*, 2009). Despite the subcontractors' domination in the construction industry, there is a dearth of research exposing their resourcing capacity in the construction projects (Shash, 1998; Dainty *et al.*, 2001; Asgari *et al.*, 2014). Based on case studies of subcontracting businesses involved in the reconstruction of the Christchurch city, this study analyses the workforce resourcing strategies adopted in small and medium sized subcontracting construction businesses under an environment facing severe pressure. It addresses the following queries - (i) What are the resource shortages in the investigated subcontracting businesses; and (ii) What are the investigated subcontractors' workforce resourcing strategies?

SUBCONTRACTOR BUSINESSES AND DISASTERS

Subcontractors play an important role in construction project outcomes. Previous studies indicate that subcontractors execute 60 to 90 percent of the overall physical execution in any construction project (Kumaraswamy and Matthews, 2000; Karim *et al.*, 2006). The predominance of subcontracting businesses makes construction project success rely heavily on the subcontractors' performance and capability (Ng *et al.*, 2009; Banki *et al.*, 2009; El-Mashaleh, 2009). Alzahrani *et al.*, (2013) show that accessibility of labour resources is critical to the construction project success. Their findings revealed that labour availability acts as a strong influencer over the builders' project scheduling, budget and impact models. Similarly, the degree of labour productivity has been shown to be decisive in ensuring a positive outcome on the construction projects (Sacks and Harel, 2006). A preliminary study conducted by Harel (2005) identified (i) capacity utilisation, (ii) workflow stability, (iii) level of financial exposure and (iv) cash flow as important factors for subcontractors' business continuity.

The subcontracting businesses stand in stark contrast to the low rate in implementing formal institutional of workforce management. Informal routinisation is most likely to be legitimised in their businesses' operation as a result of resource constraints within the organisations (Dundon and Wilkinson, 2009). Additionally, the subcontracting businesses are inevitably prone to the external business interferences; particularly to the construction market fluctuation and turbulences in the economic cycle (Ng *et al.*, 2009). Arditi *et al.*, (2000) indicate that most subcontracting businesses are not well equipped with business knowledge and thus, jeopardise the permanency of their businesses. Business failures, high bankruptcy rate, poor performance and/or non-performance are therefore, synonymous with small and medium-sized construction businesses (Russell *et*

al., 1991; Shaikh, 1999; Schaufelberger, 2003). Subcontractors' business failure is associated with defective managerial skills and stunted business maturity (Abidali and Harris, 1995; Schaufelberger, 2003).

Following the Christchurch earthquakes, subcontracting businesses were at the forefront of rebuilding efforts. Chang *et al.*, (2016) found that subcontractors in Christchurch encountered fragile business stability because of the heightening unemployment growth and workload inconsistency within the sector. Investigating subcontracting businesses showed difficulties with workforce resourcing planning, susceptibility to the construction market changes and informal management approaches. When the Darfield earthquake struck Christchurch in 2010, the New Zealand construction industry was going through a period of low activity caused by the 2008 global financial crisis. Wilkinson *et al.*, (2015) reported that earthquakes provided a period of significant growth for construction contractors of all sizes. Their report showed that between 2010 and 2011, capacity building, innovation and upskilling for growing businesses become a focus for construction businesses. Most businesses went through a period of significant growth and there were new entrants to the market. For companies, this meant a period training, recruitment, resource shortages and developing ways of maintaining their staff in the face of external competition. Some businesses focused on developing better working environments, others had to develop new business systems to cope with growth.

Their report (Wilkinson *et al.*, 2015) also showed that between 2012 and 2013, with the continued demand for labour and associated cost inflation in the construction market (in the earthquake and the non-earthquake related construction markets), businesses focused on improving their efficiency, productivity and capability in undertaking earthquake-related work. Imported workers from outside Christchurch impacted businesses including businesses having to pay higher wages and facing increased pressure on housing their workforce. The 2014 and 2015 activity showed that, workload fluctuations meant contracting businesses moved to diversify into new business markets such as new subdivisions in Canterbury and housing and infrastructure markets elsewhere. There were concerns about the risks of overcapacity in Christchurch.

The surge in construction activity following the earthquakes offered the sector the chance to develop skills and capital base for improving business economic prospects. The results of the work on Christchurch subcontractors by Chang *et al.*, (2014) and Wilkinson *et al.*, (2015) showed that there was a range of initiatives that subcontractors used to develop their business. The first element was in establishing and maintaining a solid client base where future opportunities coming from the new subdivision areas in Christchurch and/or other building activities likely in Canterbury region meant a conscious decision to focus on existing clients and growing new business relationships. Diversification of business services and skillsets was also a key initiative seen in Christchurch where recruitment of skills in specialist areas combined with resource sharing through partnership, became a channel to diversity business types. Retaining flexibility in workforce composition, especially through recruiting younger workers (under 25 years old) in an attempt to ensure flexibility in the use of labour due to the lower skill sets these workers have and to enable them to respond to uncertainties in the economic environment. However, this form of flexibility increased turnover rate among younger workers and hence companies ran the risk of lower performance.

RESEARCH METHODOLOGY

In 2016, a group of small and medium-sized subcontracting businesses in Christchurch were approached to take part in this study, with thirteen agreeing. This study adopted a

case study approach to understanding the business strategies and management of the labour markets. Interviews were conducted with the managers (e.g. operation, general, managing) of the subcontracting businesses; enabling insights into the micro-level of the subcontractors' resourcing priorities. All the interviews were verbatim transcribed and analysed using Leximancer, NVivo 10 and Vensim PLE software. Leximancer scrutinises the transcribed texts and graphically displays the extracted data into concept maps and the interrelationships between the themes (Smith and Humphreys, 2006; Sotiriadou *et al.*, 2014). In this study, transcriptions relating to resource shortages were fed into Leximancer and the results are presented in Figure 1 and Figure 2. Following this, the subcontractors' workforce resourcing strategy is thematically collated using NVivo 10. Details of the participating subcontracting businesses are provided in Table 1.

Table 1: Subcontracting Business Profiles

Subcontractors	Characteristics	Resourcing for Disaster Recovery Projects Experience (Year)
S1	Roofing specialist	4
S2	Civil construction and drainage subcontractor	4
S3	Civil construction subcontractor	4
S4	General civil subcontractor	4
S5	Building services specialist	4
S6	Civil construction subcontractor	4
S7	Steel reinforcing specialist	3.5
S8	Commercial, heritage and residential subcontractor	4
S9	Civil construction and drainage subcontractor	4
S10	Civil earthworks and civil construction subcontractor	4
S11	Building façade specialist	3.5
S12	Civil engineering earthmoving subcontractor	3.5
S13	Geotechnical and civil construction subcontractor	4

FINDINGS

The paper focuses on two main findings as follow:

1. Analysis of labour shortages and the contributing factors to labour shortages in the case study subcontracting businesses
2. Analysis of subcontractors' workforce resourcing planning strategies

Labour Shortages

Figure 1 shows the major themes relating to resource shortages based on the case study subcontracting businesses. A direct connection was evident between labour, demand, skill shortages, tradesperson, experience and local pool of talent. The subcontractors involved with the recovery projects have felt the tightening of the labour market, facing difficulties in accessing the right staff. From the interviews, a frequent referral to labour shortages was found, reflecting an exhausted talent pool in the Christchurch construction industry.

Labour is a problem with the increased workload. The workload is getting bigger even now from last year so yes, getting labour in place is a priority and it's not easy. S11

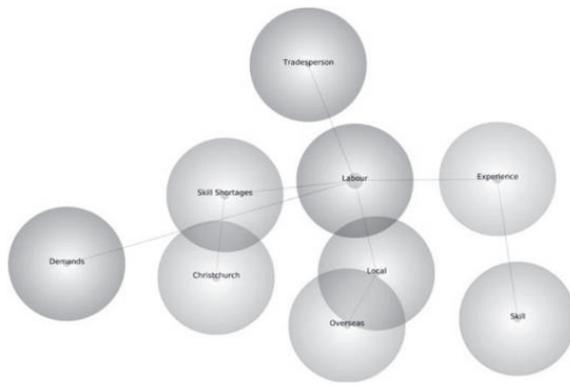


Figure 1: Leximancer Analysis on Resource Shortages in the Case Study Subcontracting Businesses

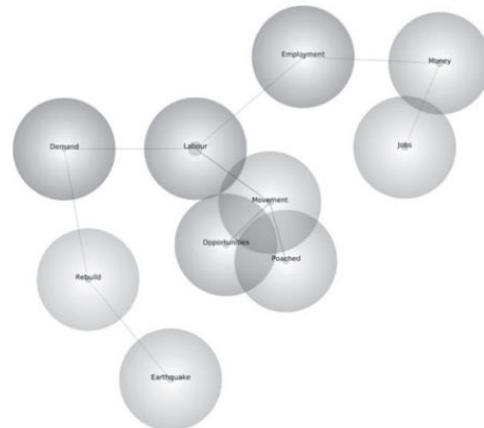


Figure 2: Leximancer Analysis on Contributing Factors to Labour Shortages in the Case Study Subcontracting Businesses

The Christchurch recovery projects demanded an escalation of workforce expectation within its construction industry. A 100 per cent upsurge of construction workforce employment has been quantified in the second quarter of 2015 as compared to the pre-quake environment. In September 2015, 31,000 construction workforce employments have been recorded with the anticipation of continuous growth until 2018 (MBIE, 2015). The derived demand for construction employment has a significant impact to the subcontracting businesses in Christchurch.

Demand for these people (skilled labour) is high and therefore they are free to come and go as they please, like within other businesses, etc. So you've got to work hard to retain them and you've got to be very flexible with how you tackle the problem. S7

The findings also revealed that the escalated demand for skilled workforce has plagued subcontractors with a significant workforce difficulties.

One of the difficulties is they're a bit transient; they don't stay. They try to move around for more money. Some of them are just here for a short time so they try to use the opportunity of getting a job and they agree on a rate for the work. Then, they immediately want more and then they go to another contractor and maybe they get more, maybe they don't, but they just move around. S13

There was general agreement on the consequences of the workforces' portability. The workforce departures restricted the businesses in taking up work. This scenario signifies the need for a smarter workforce management strategies to combat the 'early-departure workforce' trend.

The contributing factors to labour shortages within the case study subcontracting businesses are presented in Figure 2. From the analysis, labour shortages emerged in conjunction with the demand for rebuilding Christchurch, workforce fluidity across the industry and the monetary-driven employment trend in Christchurch. The scarcity of workforce was agreed by a majority of the subcontractors to affect their business performance. Essentially, the investigated subcontractors acknowledged the workforce as drivers for productivity improvement and achieving sustainable competitive advantage.

We don't want it to be a negative in our tendering processes. We still want to be able to price the jobs on the basis that we will have the people, but with the same token, we are actively looking to try and hold the people we think can fill those roles. S3

The notion indicates that organisational performance is correlated to the quality, suitability, and capability of the organisation’s workforce.

Subcontractors’ Workforce Resourcing Planning Strategies

The results featured in this study showed the subcontractors’ initiatives in ensuring sustainable success to their businesses. In particular, a prioritisation of the organisations’ market adaptability and business agility has been evident; supplemented with a ‘short to medium-focused’ business planning. Two fundamental planning elements were found from the investigation, (i) workforce skill requirements, and (ii) business strategy. Workforce skill requirements place attention on strategizing the organisational ‘workforce supply and demand’ essentials, workforce composition, staffing, retaining and capacity building of the human resources. Business strategy focuses on the creation of adaptable business operations.

We still stick to the core business, but we are just trying to get our teams a bit tighter. So, better staff. We pay some of them a little bit more, the good guys a wee bit more, but they are achieving more. S10

As such, a great deal of effort is directed to strengthening and growing business.

Diversification is a necessary part of growing a business. The first part is your core strengths - your core strengths are what you’ve got to be good at - but as you grow your business you need to be agile enough to diversify into other markets. That’s not to make those the core instrument for your revenue, but it’s to meet modern demand. S5

The ability to acclimatise promptly to the construction market fluctuations is most desirable in the dynamic business environment. Accordingly, organisational agility has been cited by one of the investigated subcontractors to be pivotal in sustaining the business success.

Resilient and agile as well. Agility is important because there are opportunities all the time. S13

In order to deliver benefits of the workforce resourcing planning initiatives, the identified workforce requirements have to be embedded into the organisations’ business decisions. Figure 3 demonstrates the integration of these two elements to form the subcontractors’ workforce resourcing planning strategy. This integration is expected to enhance businesses with the capacity to shift, flex and adjust in a highly dynamic market.



Figure 3: Subcontractor Workforce Resourcing Planning Strategies

DISCUSSIONS

Over the years of responding to earthquake rebuilding, subcontracting businesses became strategic in their business decision making and in their approach to sustaining their businesses. Findings from this study demonstrate a maturing of the studied businesses coupled with the application of multiple methods for solving workforce problems. It is clear from the results that businesses had to absorb the effects of the earthquakes, seeking to minimise any adverse impacts on their business, especially around resourcing the workforce and the changing workforce structures.

Given the susceptibility of the subcontracting businesses to the construction market fluctuations, it is, therefore, important for subcontractors to understand the interplay between the environmental scenarios and their organisation's strategic planning. Knowledge of the business environmental forces afforded the investigated subcontractors with their business environment pattern, identification of the industry's opportunities and threats and, most importantly the development of the organisations' strategic action plan in responding to the changing environment. Essentially, sensitivity to the labour market fluctuations facilitates subcontractors to establish workable measures in circumventing the impacts of skills shortages (Dainty *et al.*, 2005).

In order to build a resilient business performance, it is critical to establish organisational performance in accordance with the organisations' vision, goal and growth plans. Figure 4 shows a conceptual model of the interdependency of the subcontractors' business environment, workforce planning strategies, project resourcing and organisational outcomes applied in rationalising the basis of the workforce planning imperatives.

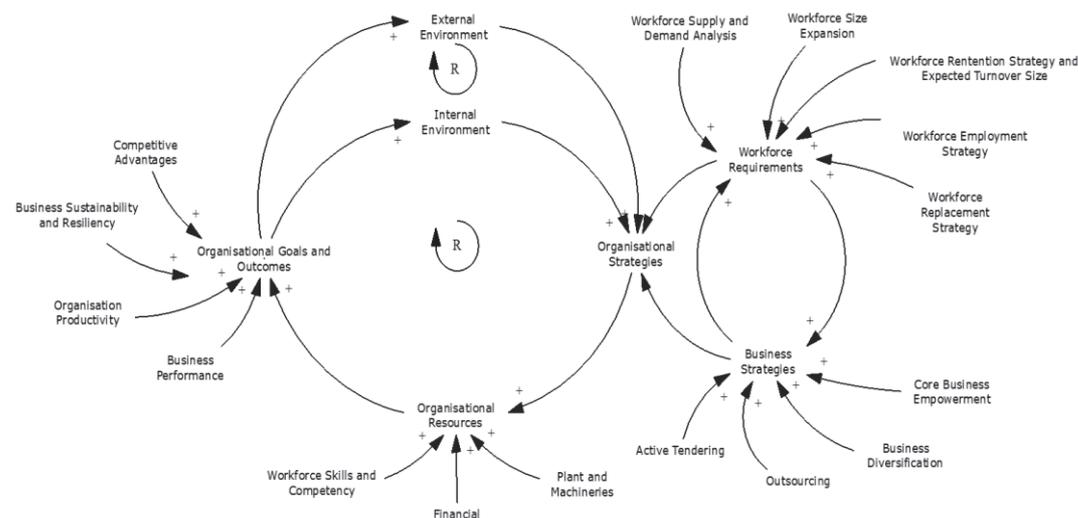


Figure 4: The Interdependency of Business Environment, Workforce Planning Strategies, Project Resourcing and Organisational Outcomes in the Subcontracting Businesses

The need to sustain competitive advantage makes it germane to embrace adaptive capacity to cope with the external turbulences. For this reason, the subcontracting businesses have to demonstrate business agility in seizing strategic opportunities. The sustenance of an organisation competitive advantage often gravitated around the ability of the organisation in sustaining its people and the execution of people processes (Brandenburg *et al.*, 2006).

Maintaining workforce flexibility results in improving the internal organisational strength to capitalise on business opportunities. The external environmental dynamics are readily recognised to interfere with the subcontracting businesses' internal attributes. Therefore, a diagnosis of the organisations' internal environment is important in averting the external

threats and overcoming the internal weaknesses. The internal capacity of the subcontracting businesses (e.g. workforce skills and competency, financial, plant and machinery) determines the execution of the subcontractors' competitive strategy.

Workforce utilisation has been actively practised and agreed by a majority of the investigated subcontractors as an ad-hoc solution to meet the organisations' staffing requirements. Although workforce utilisation is capable of ameliorating the adverse effects of the organisations' skill issues, its long-term focus could strain the organisations' ability in coping with business expansion (Loan-Clarke *et al.*, 1999). An integrated system of workforce resourcing programming and the organisations' strategic business planning with the ability to manage future events' consequences can strengthen business performance.

CONCLUSIONS

The changing built environment in Christchurch, coupled with intensified competition in acquiring qualified skills meant that subcontracting businesses were forced to adapt their businesses and focus on business demands of lack of resources and workload fluctuations. Post-earthquake challenges demanded an organisational ability to respond and successfully change. Workforce planning initiatives were developed to ensure the organisations' skills base could be maintained. A planned approach to long-term workforce resource planning is needed in for greater predictability to the organisations' employment outlook and equipping subcontracting businesses with a specific functional procedure on workforce resourcing planning. The research also suggests that a focus on adaptability, internal skills and workforce capacity building are critical to resilience building in subcontracting businesses. Through the crisis, subcontractors have emerged with the ability to create sufficient workforce resourcing for projects, strategic utilisation of workforce, better workforce cost control and higher overall organisational efficiency. As the earthquake rebuild continues further analysis will provide an examination of how maturing subcontracting businesses face the market slowdown.

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