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International construction joint ventures as a resourcing model

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Shortages in materials, skilled labour, and equipment, are well known within construction industries, and impede performance on ongoing and pipeline projects. This study explores international construction joint ventures (ICJVs) as a resourcing model that could relieve pressures within the New Zealand (NZ) construction industry. The study goes further to identify the risks and constraints associated with ICJVs. There is a dearth of literature on the role of ICJVs and their impact on the industry within the context of resource acquisition. The data for this study were collected by way of the administration of an online questionnaire survey to a representative sample of contractors, developers, and consultants. A simple descriptive method of analysis was employed for ease of understanding. The study established that materials and labour were the most demanding resources that ICJVs could help address in NZ. Risks associated with compliance with local regulations and certification requirements and those related to lead times were the most critical constraints for international material acquisition. The study findings also indicate that language and communication barriers and differences in the practice of rules and regulations were the most significant constraints for utilising international skilled labour.

Q1 **Keywords:**

Q2 1. Introduction

It is becoming increasingly difficult to ignore issues of resource challenges in the construction industry. These challenges include access to skilled labour, building materials and funding (Vaughan, 2016). In relation to skills, the deficiency is not only in the trades but also in professional consultancy services including designers, engineers and other specialists (Steeman, 2018). Studies have identified lack of skills as one significant factor in the success of construction projects (Ayodele *et al*., 2021; BDO, 2019; Ho, 2016). Because of the vital role that the construction industry plays in any country's economy, there has to be ongoing discussions and more importantly, action plans on how to address the long-term shortage of skilled construction professionals. Despite the acknowledged significance of the construction industry, it suffers from severe shortages in terms of manpower and skills (Sherlock, 2017) for various reasons. A KPMG (2015) report indicated that 44% of global construction firms are unable to secure their required craft labour, and 45% of these organisations had a lack of qualified employees. The KPMG report also indicated that 69% of construction organisations admitted that more than 5% of their workforce were hired through external sources. In New Zealand (NZ), its construction sector has a deficit of 43 600 skilled labour required to meet expected yearly market demands (Gibson, 2018). It is reported that labour shortages are highest in the Auckland region where the most construction activity takes place in NZ (MBIE, 2018). In 2018, construction output was forecast to be sustained year-on-year until the end of the forecast period of 2023. Although Covid-19 has had a negative impact on total construction outputs, there is an anticipated recovery after 2023 (MBIE, 2020a).

This study aims to explore the significance of international construction joint ventures (ICJVs) to address resource challenges within the NZ construction industry. Three research questions were formulated to be addressed by the current study. These are the following:

What are the most demanding resources in the NZ construction environment?

What are the risks and constraints in the acquisition of externally sourced resources?

How could ICJVs assist in addressing resource challenges in NZ?

2. International construction joint ventures: motivations

The opportunity to share resources by transferring and pooling these resources has been identified in previous studies as one of the primary motivations for embarking on joint ventures in the construction sector (Razzaq *et al*., 2018). ICJVs allow partner organisations to access new resources such as funding and finance, personnel and associated supply chain and technology (Terjesen, 2014). Chao and Rotimi (2020) also suggest that ICJVs provide wider access to new markets, which a local partner may not have had access to, consequently enhancing their capacities in knowledge and expertise (Norwood and Mansfield, 1999). Furthermore, Luo *et al*. (2001) and Panibratov (2016) suggest that there may be improved project management capabilities through knowledge transfer on ICJVs.

With particular reference to capacities and capabilities, difficulties associated with finding and keeping skilled labour could be resolved through joint venture arrangements. Foreign partners are able to transfer employees from their foreign country base to the host country where there may be capacity issue (Hwang *et al*., 2017). It is equally possible to solve capability issues by importing much-needed skills using joint venture partners. Ping Ho *et al*. (2009) explain how ICJVs provide access to capable subcontractors and the possibilities of obtaining cheaper materials for projects procured using joint venture arrangements with foreign partners.

Through ICJV strategies, stakeholders are able to share technologies and managerial resources that place them in a position to break through tender thresholds (contract prequalification requirements). Resource sharing and cross-exchange of learnings from venture partners are a major source of competitive advantage (Sung-Lin and Min-Ren, 2011), especially when one considers the magnitude of global competition, knowledge becomes a crucial strategic resource and a critical asset required for competitive advantage (Kivrav *et al*., 2008; Teerajetgul and Charoenngam, 2006). Because firms have different resource levels (Khattab and Soyland, 1996), ideally, they should consider their resource advantages and strengths to prepare them in pursuing diverse business strategies (Ping-Ho *et al*., 2009). However, Khamaksorn *et al*. (2020) suggest that the transfer of knowledge, skills, and experience between foreign and local partners in ICJV projects is predicated on their understanding of knowledge transfer methods and mechanisms.

Chao and Rotimi (2020) conceptualised the motivation for developing ICJVs by establishing resources that can be met through international partners' involvement in construction projects. These are listed as follows:

- Access to international supply chain (e.g. cheaper building materials and equipment)
- Access to skilled labour and specialists (e.g. carpenters, joiners, stoppers, tilers, plumbers, and glazers)
- Access to specialised international subcontractors (e.g. design and build contractors, for example, for a façade)
- Acquiring design support services (e.g. detail design and coordination services)
- Access to technical support (e.g. material and equipment certification and testing)
- Transfer of technology (e.g. virtual design simulation and construction)
- Acquiring procurement support services (e.g. preparation of multi-trade schedule of quantities to enhance the procurement process)
- Transfer of project execution knowledge and experiences (e.g. tunneling, deep foundation, high-rise structural works, and specialist fit-outs)
- Acquiring project management resources (e.g. experienced project managers, site managers, and site engineers)
- Access to additional funding resources.

Risks and constraints associated with ICJVs were similarly identified from previous studies to assist the evaluation of the potential constraints and limitations in the acquisition of international resources. There are 25 risks in ICJVs in the East Asia region, identified by Li and Tiong (1999) and 58 ICJVs risks investigated by Shen *et al*. (2001) in mainland China, while Ozorhon *et al*. (2008) suggested it was difficult to manage ICJVs due to the different cultural backgrounds between partners. Zhang and Zou (2007) investigated 17 risks in a Sino-foreign construction joint venture project by way of a fuzzy analytical hierarchy process approach. However, McIntosh and McCabe (2003) identified 64 risk factors, probably the highest number of recent studies. In this current study, the risks and constraints associated with international resource acquisition through ICJV strategy have been rationalised into 21 items. ~~These are categorised in Table 1 as resource acquisition risks and constraints, with the exclusion of non-resource related risks clearer understanding.~~ Q3

3. The NZ context

Resource challenges are prevalent in the NZ construction industry, so much so that construction skills fall within the frequently listed skills in short supply by its immigrations department. Furthermore, two survey reports, one produced by BDO, an independent consultancy that regularly surveys the performance of the NZ construction industry (BDO, 2019), and the other by the Ministry of Business, Innovation and Employment (MBIE, 2019), provide evidence of the capacity and capability challenges of the NZ construction sector. Resource issues have exacerbated construction business performance issues manifesting in business failures (Forbes, 2019) and the inability to deliver at the scale required for intensive housing (NZCIC, 2017).

The boom-and-bust cycle within the construction sector has had great impact on the provision of construction labour, consequently on employment and the national economy. Post Covid-19, there is likely to be widespread uncertainty on labour demand and supply within the NZ building and construction industry. It has been suggested that the impact of skills shortages on business performance will be either significant (25%) or minor (57%) Q4 according to NZIOB and Hays Construction (2020). Although about 59% of businesses are confident in their abilities to cope with change and overcome challenges (CCNZ and Teletrac, 2020), there is still comparatively lower overall confidence because of uncertainties around industry outlook and the general economy.

The report by BDO in 2019 also acknowledged that many challenges are constraining the sustainable growth of the NZ economy and placing construction industry participants at great risk of non-achievement (BDO, 2019). For example, there is concern that the fragmented nature of the NZ construction industry (Vaughan, 2016) reduces its ability to train the required skills needed to cater to the volume of ongoing and future construction activities. Steeman (2018) suggested that resources

Table 1. Risks and constraints with resource acquisition

Risks and constraints	Shen *et al*. (2001)	McIntosh and McCabe (2003)	Li and Tiong (1999)	Zhang and Zuo (2007)	Chao and Rotimi (2020)
1 Quality control	√	√			
2 Warranty					√
3 Import restrictions			√	√	
4 Lead time		√			
5 Delivery		√			
6 Compliance (building code)		√			
7 Currency fluctuation	√		√		
8 Language barrier			√	√	
9 Culture barrier	√		√		
10 Differences in rules and regulations	√				
11 Differences in construction methodology		√			
12 Comply with local laws and regulations			√		
13 Availability of labour	√	√			
14 Differences in design practices		√			
15 Time differences					√
16 Buildability issues				√	
17 Non-compliance with local practice		√			
18 Restrictions from building authorities					√
19 Non-compliance with building code					√
20 Restrictions of money transfer policy			√		
21 Intellectual property rights		√			

are generally stretched, and contractors only have time to deliver projects rather than invest in training programmes. Considering that the industry is made up of small and medium size players, it has been challenging to get training done, and difficult for small contractors or subcontractors to employ a large number of staff, because their workloads are unpredictable (Steeman, 2018).

As a consequence, the industry is now struggling to execute complex and large-scale construction works, coupled with lack of innovation. Government and local authorities have intervened in the market through new and updated policy initiatives, including new regulations. For example, there is a concerted effort to reform the resource management system to support the building and construction sector to lift its performance (MBIE, 2020b).

Hartley (2018) had concluded that it was significant that 'external' resources be allowed into the construction market to ease capacity and capability challenges experienced by the industry. Very few NZ construction industry studies have addressed resource acquisition using ICJVs. In this study, it is contended that the use of ICJV can be strategic to addressing NZ's construction resource challenges. Knowledge of the status, challenges and opportunities of ICJVs in NZ is scarce. Therefore, towards contributing to the discourse on ICJVs, this study addresses the following objectives: determine the resources in demand that could be addressed through ICJVs in NZ and establish the constraints/limitations in acquiring some of the identified resources through ICJVs?

4. Research method

This study aims to explore the significance of ICJVs to address resource challenges within the NZ construction industry. To achieve this study purpose, some questions were formulated. The first seeks to understand the current state of resources within the NZ construction industry, which was addressed through the literature review. The review focused on resource sharing, transferring, and pooling in ICJV from previous studies outside of NZ, as there is a shortage of literature on ICJVs in NZ. Ten types of potentially demanding resources were identified through literature review. Also, potential risks and constraints of resources acquisition through ICJVs were listed. In order to answer the second research question, a questionnaire survey was conducted. The data were collected from local NZ construction practitioners through an online questionnaire survey. This was undertaken to identify the most demanding resources and potential risks and constraints in relation to resources acquisition through ICJV strategy. An online survey seems to be an efficient way of gathering a considerable amount of data, with minimum human efforts and mistakes (Regmi *et al*., 2016). According to Regmi *et al*., (2016), the online survey approach is helpful when collecting data from people with special circumstances or gathering information from busy individuals, as they can respond at their convenience and take longer time to answer the questions.

This strategy of data collecting can produce meaningful results only if the survey questions are clear and specific. The following section details the step-by-step process of the online questionnaire survey adopted for this research.

4.1 Questionnaire survey

The survey focused on a representative sample of contractors, developers and consultants, as these groups are deemed to be the key stakeholders of any type of project delivery. A respondent-driven sampling method, so-called the snowball method, was used to ensure adequate responses can be collected. Just few industry professionals were contacted directly and asked to help recruit other participants through calls and emails. This method is commonly used to locate rare populations or target participants that are anticipated to be very hard to reach (Cui *et al*., 2019). Also, a non-profit professional organisation, the New Zealand Chinese Building Industry Association (NZCBIA), was approached to get additional support. The NZCBIA represents a wide range of businesses and professionals in the building industry in NZ and the Kiwi business and professionals that have close working relationship with the Chinese building industry and the local NZ industry.

The online survey questionnaire was developed by using 'Google Form' which is free and easily accessible. The online survey was posted by way of social media 'LinkedIn', and 'WeChat'. Email invitations attached with questionnaire links were sent to the identified construction professionals to get more survey responses. A total of 38 responses were obtained for this study. ~~The response rate is statistically significant.~~ The target participants were NZ-based contractors, developers, and consultants as these groups are considered key stakeholders of any type of project delivery. These are directly involved in ICJV types of projects as well. Also, these target groups are assumed to be most appropriate to participate in the survey with less potential biases. For instance, local suppliers are likely to respond against sourcing cheaper international materials through ICJV, and local subcontractors would be reluctant to partner with international subcontractors. Undoubtedly, international resources would bring potential competition to the local market, which local subcontractors and suppliers would potentially act against to protect their own interests. Hence, this research study considered contractors, developers, and consultants the most appropriate target participants.

5. Presentations and analysis of results

5.1 Online questionnaire response

The purpose of the survey was to identify the most demanding resources and potential risks and constraints concerning resources acquisition through ICJV strategy. The questionnaire consists of three major sections with 30 questions in total. The first part (Section 1) is the general information section that collected information about respondent's profiles, including the discipline or field of work, years of local working experience, any involvement in ICJV project/s, and finally, the respondent's job title. Feedback collected in this section allowed the researcher to filter data and enabled a more accurate survey result.

The second part (Section 2) of the survey covered specific survey questions regarding the demanding level of each identified potential resource that could be acquired from foreign joint venture partner/s by using a 5-point Likert scale and followed by a 'checkbox' of associated risks and constraints. There is an option to select 'others' for each question, designed to collect additional views on the risks and constraints from the participants that may add to the listed options.

5.2 Demographic information

A total of 38 questionnaires were received through the snowball sampling method adopted for this survey. Table 2 shows a breakdown of the demographic information of the respondents. Majority of the respondents (55%) have quantity surveying backgrounds compared to other professions. The high per cent age of professionals with quantity surveying backgrounds prompted further scrutiny of the responses, to determine their knowledge and involvement in ICJVs. Of the 63% of respondents with local construction experience, 14 (58%) are quantity surveyors. Further scrutiny found that 57% had less than 5 years of local experience. However, 67% of these respondents were at middle and senior management cadre, suggesting that they had prior international construction work experiences before NZ. Generally, the respondents work with contracting organisations (55%). In terms of job cadre, 26% of the respondents are at senior management level, and 46% at middle management and operation level. Respondents were required to indicate how long they have been involved in any ICJV projects. The response shows that 63% have been involved in projects of this nature. From the demographic information obtained from the respondents, it is inferred that the dataset emanates from reliable sources and speaks to the NZ context.

5.3 Resources in demand in NZ

Respondents were asked to indicate their level of interest in accessing a list of ten international resources on a scale of 1 to 5, with 1 being 'not interested' and 5 being 'very interested'. The scores of the ranking assigned by the respondents are added up and divided by the total number of respondents to give a mean score (MS) for each resource. From the MS, a rank order of interests for the resources was established and presented in Table 3. The Cronbach's alpha value calculated from the dataset is 0.876, which indicates an acceptable internal reliability of the survey as it is greater than 0.700 (Hair *et al*., 2014).

The result shows a relatively high level of interest in accessing international building materials at an average of 4.42 out of 5 with a median number of 5. By implication, the result means that there is potential building material resource shortage in the local market or that the local building material product/market is less attractive. Of note, is that the survey respondents held that the ICJV strategy was

Table 2. Respondents' demographic information

		Frequency	Percentage
Organisation	Contractor	21	55
	Developer	11	29
	Consultant	6	16
		38	100
Qualification	Civil engineering	7	18
	Architecture	3	8
	Quantity surveying	21	55
	Information technology	1	3
	Construction management	5	13
	Mining engineering	1	3
		38	100
Local work Experience	Less than 5 years	22	58
	5 to 10 years	8	21
	10 to 20 years	6	16
	Over 20 years	2	5
		38	100
Experience with ICJV	Yes	24	63
	No	14	37
		38	100
Cadre	Junior	1	3
	Operations	10	26
	Middle management	17	45
	Senior management	10	26
		38	100

Table 3. MS and ranking of the level of interest for accessing international resources through ICJV

Types of resources	MS	Median	Ranking
Building materials and equipment	4.42	5	1
Skilled labour	4.05	4.5	2
Specialised subcontractors	3.79	4	8
Design support services	3.47	4	10
Technical training support	3.68	4	9
Technology transfer	4.05	4	2
Procurement support	3.95	4	5
Project execution knowledge and experiences	4.00	4	4
Project management resources	3.84	4	6
Funding support and resources	3.84	4	6

useful in the acquisition of much needed international building materials for NZ.

On a similar note, the level of interest for acquiring international skilled labour and technology transfer were found to be considerably high, rated second over seven other types of international resources. The average interest level was 4.05 out of 5 with a median number of 4, showing a considerably high level of interest. With the advent of new information management systems and technologies, such as planning software, BIM, Blockchain, the demand for technological skills have increased. The survey results align with the various industry reports reviewed in the Introduction, which found manpower and skill shortages within the NZ construction industry.

The survey shows that other highly ranked interests (see 4 to 6 on Table 2) also relate to the acquisition of skills and manpower through ICJVs. These were more specifically referring to project execution knowledge, procurement, and funding. The respondents to the survey have indicated that skilled labour can be acquired through ICJVs.

Checking through the table, it is observed that the least MS was 3.47 (design support services). This infers that regardless of the ranks, all the resources were of interest to the respondents and could be acquired through ICJVs. This confirms the importance of ICJVs as a viable procurement strategy within the NZ context. Similarly, the results further confirm the resource shortages within the local construction market, especially in the greater Auckland region in NZ.

5.3.1 Constraints to international resource acquisition

In this section of the questionnaire survey, respondents were required to identify risks and constraints associated with acquiring resources under ICJVs. Table 4 provides a breakdown of the respondents' views about the risks and constraints corresponding to ten types of resources that can be met through international partners' involvement on construction projects. The ten resource

Table 4 Ranking of risks and constraints to acquiring international resources through ICJV

		Building materials and equipment	Skilled labour	Specialised subcontractors	Design support services	Technical training support	Technology transfer	Procurement support	Project execution knowledge and experiences	Project management resources	Funding support and resources	Frequency count	Ranking
1	Quality control risk	21		3								24	16
2	Warranty risk	24		4								28	14
3	Import restrictions	18										18	19
4	Lead-time risk	22		18				1				41	9
5	Delivery risk	19										19	18
6	Compliance risk (building code)	29		27		26	28					110	3
7	Currency fluctuation risk	15									20	35	10
8	Language and communication barriers		35	25	24	30	21	25	26	30	12	228	1
9	Culture barriers (national and organisational)		25	15	13	15				25		93	5
10	Differences in rules and regulations		28	29								57	6
11	Differences in construction methodology		22									22	17
12	Compliance with local laws and regulations							34	31		29	94	4
13	Availability of manpower			1								1	21
14	Differences in design practices				30							30	13
15	Time differences				14							14	20
16	Buildability issues			21	21							42	8
17	Incompatibility with local practice						30	26	29	31		116	2
18	Restrictions from building authorities											0	22
19	Non-compliance with building codes								26			26	15
20	Restrictions of money transfer policy										33	33	11
21	Intellectual property rights				14	12	13		11			50	7

Table 4. Continued

	Building materials and equipment	Skilled labour	Specialised subcontractors	Design support services	Technical training support	Technology transfer	Procurement support	Project execution knowledge and experiences	Project management resources	Funding support and resources	Frequency count	Ranking
22	Unfamiliar with local rules and regulations								31		31	12

types were collated from NZ literature, while the 22 risks and constraints items were obtained globally. Respondents were to indicate the probable risk(s) associated with those resources for each of the resource types. A simple tally count of the risks and constraints was undertaken, which was used to establish a ranking of the risk items in Table 4.

The results show that the highest ranked risk and constraint (ranking = 1) to the use of international resources is 'language and communication barriers'. This risk item was indicated to affect nine out of ten international resources, with the highest being 'skilled labour' and the lowest being 'funding support and resources'. This would seem logical, as language barriers could impact on the quality of communication and interrelationship between project parties, and consequently, the achievement of project objectives. Ranked second is 'incompatibility with local practice' that impacts project management resources (31), technology transfer (30), project execution knowledge and experiences (29), and procurement support (26), respectively.

The next risks and constraints are related to 'compliances with building codes', ranked third, and relates more to technical and technological issues associated with building projects. The respondents considered the ability (or otherwise) of ICJVs to comply with local building regulations and could constrain the opportunities for ICJVs to address resource challenges.

Ranked fourth and fifth are compliances with local laws and regulations and cultural barriers, respectively. Aspects that these risks and constraints may impact relate to the management of projects and people as can be observed from Table 4. The least item that constituted risk to the use of ICJVs to address resource needs is 'restrictions from building authorities'. This means that building authorities in NZ are generally open to any means by which resource challenges can be tackled, even if it was through ICJVs.

Looking across columns in Table 4, the magnitude of risks and constraints varies depending on the resources under consideration. For example, certain risks and constraints are associated with acquiring international building materials and equipment through ICJV strategy. The most frequently identified risk is the 'compliance with local building code', the total number of respondents that selected this item was 29. This is followed by 'warranty risk', 'lead-time issue' and 'quality control' with response numbers of 24, 22, and 21, respectively.

In column two on skilled labour, the risk items are 'language and communication barriers', followed by 'differences in rules and regulations', then 'cultural barriers', and lastly, 'differences in construction methodology', respectively.

6. Discussion

Through literature review, this paper established the challenging resources within the NZ construction industry and how ICJVs

could become strategic in addressing those challenges. It also established ten types of resources that can be met through international partners' involvement on local construction projects. The study went further to confirm these resources through interviews, and the results are subsequently ranked. Finally, the risks and constraints associated with each resource are identified, evaluated, and ranked according to their impact on ICJVs. These findings are insightful and provide basis for the improvement of wider construction industry constraints. The next paragraphs provide detailed discussion of the study findings.

It is evident from the analysis that there are preferences for ICJVs to meet the resource challenges that currently affect the performance of the NZ construction industry. ICJVs could address the heightened demand brought about by housing shortages, population growth, and reconstruction at the lower South Island of NZ. Mitigating those challenges could address workforce and contractors' requirements in support of the suggestions of Al Alosi (2017). It is important to note that international resource acquisition would need to be planned at the early pre-construction stages of projects. With international skills acquisition, the lack of specialisation that has impacted the capability and productivity of the NZ construction industry could be tackled. Although acquiring an external workforce has its own complications, these will need to be justified through immigration application formalities. Ghose *et al*. (2017) had also identified that regulatory policies significantly constrain the NZ construction supply. For materials and equipment inputs, an appropriate lead time for their acquisition will be required through the use of ICJVs. Concerning the identified risks and constraints, an independent project management team with the ICJV project execution experiences could help deliver and address those risks when they occur. The benefits offered by ICJVs of leveraging partner resources, know-how, reputation, and the ability to spread risks give feasibility to the study findings. Furthermore, the inherent resource, market, and capital-seeking strategies of international joint ventures (Parameswar and Dhir, 2018) consequently give access to resources, new markets and funds, which are often unavailable in the local construction market.

In addition, the study found some significant constraints to the use of ICJVs in NZ. For example, risks associated with compliance with local regulations and certification requirements and lead times are the most critical constraints for international material acquisition. The study findings also indicate that language and communication barriers, and differences in practice rules and regulations are the most significant constraints for utilising international skilled labour. These findings support extant literature on the risks and barriers to strategic alliances on construction projects between domestic and international businesses (Bodunde *et al*., 2020; Hwang *et al*., 2017; Ozorhon *et al*., 2008; Shen *et al*., 2001; Yu *et al*., 2017). 'Language and communication barriers' is actually ranked the highest of the risks and constraints to the use of ICJVs. This is probably true when one considers the catchment of migrant construction workers in NZ. These mainly originate from the Philippines, China, and other Asian countries. Therefore, the assertion of Ozorhon *et al*. (2008) that cultural distances between joint venture partners could significantly influence performance closely aligns with this study findings. The significant risks and constraints identified in this study also align with the conceptualisations of Hastak and Shaked (2000). These are country-specific risks such as compliance and regulatory policies; market risks such as currency fluctuations and restrictions to money transfer; and project level risks such as buildability and compatibility issues. Project risks are associated with project characteristics that could affect the performance of ICJVs (Hwang *et al*., 2017).

The main findings of this study confirm the primacy of ICJVs as a resourcing model for the NZ construction industry. A well-considered approach to forming ICJVs is necessary to exploit and enjoy the benefits inherent in ICJVs. Very few studies have investigated ICJVs regarding their benefits, implications, and constraints in the NZ context. This study has provided insights into the nature of the risks and constraints of ICJVs as a resourcing model. Therefore, if ICJVs were to successfully address the resource needs of the NZ construction industry, the risks and constraints identified in the current study would need to be mitigated.

7. Conclusion

This study focused on addressing the resources shortage in the local NZ construction industry by considering ICJVs as a strategic alternative. In the context of the potentials for resource acquisition, the study found ICJVs as an ideal model for solving the widespread resource shortfalls. The findings show a relatively high level of interest of all ten resources identified in this study. However, material and skilled labour were the two most demanding resources in the local NZ market. The acquisition of international resources through ICJVs is very likely to relieve project execution pressures.

Furthermore, the study provides an analysis of risks and constraints associated with ICJVs. The study found that these risks were related to country, market, and project level risks that could negatively impact the achievement of ICJVs as a viable resource model. Although there are many risks and constraints associated with ICJVs, the survey confirms an overall high level of interest from the local practitioners' point of view. These risks are not unfounded and would seem natural in any collaborative arrangement, more so with international partners. It is suggested that the identified risks and constraints could be mitigated effectively with proper forward planning, risk management, and continuous monitoring. The study believes that a project management team with ICJV project execution experiences could help deliver and address risks when they occur. Periodic evaluation of ICJVs is recommended at all levels of implementation: country, market, and project levels, to elicit optimum benefits from ICJVs as a resourcing model.

From a practice perspective, the current study highlights the need for forward-thinking and collaboration of project programming and design management if ICJVs are to be strategic. The benefits

and risks associated with the ICJV have already been discussed in this study. The most critical elements to deliver international resources acquisition are detailed planning and accurate end-user management. Once the materials and equipment acquisition requirements are established and a decision is made, these should not be reversed unless necessary. International procurement involves risks of long lead times, and materials and products are often custom-made to suit local compliance requirements. It would be very costly and time-consuming to change and perhaps even more expensive than sourcing locally.

The study provides insight into ICJVs and the nature of the risks and constraints associated with ICJVs as a resourcing model. It contributes to the minimal literature that exists about this strategic model in NZ. The study findings are incremental; therefore, further wider-scaled studies are recommended to enhance the current investigation results. Case studies of ICJVs in NZ, past and present, could provide complementary findings that could validate the notion of ICJVs as a resourcing model for the NZ construction industry.

REFERENCES

Al Alosi O (2017) *Sufficiency of Human Resources and Construction Contractors for Post-disaster Reconstruction Projects in New Zealand*. Master's thesis, University of Auckland, New Zealand.

Ayodele OA, Chang-Richards Y and González VA (2021) A framework for addressing construction labour turnover in New Zealand. *Engineering, Construction and Architectural Management*, https://doi.org/10.1108/ECAM-05-2020-0358.

BDO (2019) The BDO 2019 Construction Survey Report. See https://www.bdo.nz/en-nz/industries/construction-and-real-estate/2019-construction-survey-results.

Bodunde FI, Akinrata E, Oke AE and Babalola A (2020) Strategic alliance in the construction industry: barriers facing its implementation in an emerging market. *Journal of Construction Project Management and Innovation* **10(2)**: 65–78, https://doi.org/10.36615/jcpmi.v10i2.391.

CCNZ and Teletrac (Civil Contractors New Zealand and Teletrac Navman) (2020) *Construction Industry Survey 2020*. See file:///C:/Users/jrotimi/AppData/Local/Temp/TN1671_TELETRAC_NAVMAN___NZ_REPORT_lowres.pdf.

Chang-Richards Y, Wilkinson S, Seville E and Brunsdon D (2017) Effects of a major disaster on skills shortages in the construction industry. *Engineering, Construction and Architectural Management* **24(1)**: 2–20.

Chao Q and Rotimi JOB (2020) Addressing resource shortages using international joint ventures in New Zealand: a case study. In *Proceedings the 6th New Zealand Built Environment Research Symposium* (Shahzad WM, Rasheed EO and Rotimi JOB (eds)). Massey University, Auckland, New Zealand, pp. 61–70.

Cui Z, Liu J, Xia B and Cheng Y (2019) Beyond national culture difference: the role of cultural intelligence in cooperation within international construction joint ventures and insights from Chinese companies. *Engineering, Construction and Architectural Management* **26(7)**: 1476–1497, https://doi.org/10.1108/ECAM-04-2018-0182.

Forbes S (2019) *Local government grappling with construction sector challenges. Interest.co.nz,* 08 March. See https://www.interest.co.nz/property/98520/auckland-council-recognises-construction-sector-turmoil (accessed 09/10/2021).

Ghose A, Pizzol M and McLaren SJ (2017) Consequential LCA modelling of building refurbishment in New Zealand—an evaluation of resource and waste management scenarios. *Journal of Cleaner Production* **165**: 119–133, https://doi.org/10.1016/j.jclepro.2017.07.099.

Gibson A (2018) Ebert Construction's 95 staff face uncertain future as $40m debts revealed. *NZ Herald,* 01 August. See https://www.nzherald.co.nz/business/ebert-constructions-95-staff-face-uncertain-future-as-40m-debts-revealed/2OWOBL2YKWK4H3TF5LFZGIZGUE/ (accessed 09/10/2021).

Hair JF Jr, Sarstedt M, Hopkin L and Kuppelwieser VG (2014) Partial least squares structural equation modeling (PLS-SEM): an emerging tool in business research. *European Business Review* **6(2)**: 106–121, https://doi.org/10.1108/EBR-10-2013-0128.

Hartley S (2018) NZ contractors not able to lead hospital build. *Otago Daily Times,* 03 August. See https://www.odt.co.nz/news/dunedin/nz-contractors-not-able-lead-hospital-build (accessed 09/10/2021).

Hastak M and Shaked A (2000) ICRAM-1: model for international construction risk assessment. *Journal of Management in Engineering* **16(1)**: 59–69, https://doi.org/10.1061/(ASCE)0742-597X(2000)16:1(59).

Ho and PHK (2016) Labour and skill shortages in Hong Kong's construction industry. *Engineering, Construction and Architectural Management* **23(4)**: 533–550, https://doi.org/10.1108/ECAM-12-2014-0165.

Hwang B-G, Zhao X and Chin EWY (2017) International construction joint ventures between Singapore and developing countries: risk assessment and allocation preferences. *Engineering, Construction and Architectural Management* **24(2)**: 209–228, https://doi.org/10.1108/ECAM-03-2015-0035.

Khamaksorn A, Tah JH and Kurul E (2020) Knowledge creation: a case study of international construction joint venture projects in Thailand. *International Journal of Innovation, Management and Technology* **11(1)**: 10–17, https://doi.org/10.18178/ijimt.2020.11.1.869.

Khattab MM and Soyland K (1996) Limited-resource allocation in construction projects. *Computers and Industrial Engineering* **31(1–2)**: 229–232, https://doi.org/10.1016/0360-8352(96)00118-0.

Kivrav S, Arslan G, Dikmen I and Birgonul MT (2008) Capturing knowledge in construction projects: knowledge platform for contractors. *Journal of Management in Engineering* **24(2)**: 87–95.

KPMG (2015) Global construction survey 2015: climbing the curve. 2015 Global Construction Project Owner's Survey.. KPMG International.

Li B and Tiong RLK (1999) Risk management in international construction joint ventures. *Journal of Construction Engineering and Management* **125(4)**: 277, https://doi.org/10.1061/(ASCE)0733-9364(1999)125:4(277).

Luo J, Gale A and He X (2001) Investing in the Chinese industry via joint ventures construction. *Building Research & Information* **29(4)**: 277–285, https://doi.org/10.1080/09613210122346.

MBIE (Ministry of Business, Innovation and Employment) (2018) *National Construction Pipeline Report 2018*. Wellington, New Zealand.

MBIE (2019) *National Construction Pipeline Report 2019*. Wellington, New Zealand.

MBIE (2020a) *National Construction Pipeline Report 2020*. Wellington, New Zealand.

MBIE (2020b) Reforming the building regulatory systems and building and construction sector. See https://www.mbie.govt.nz/building-and-energy/building/reforming-the-building-regulatory-system-and-building-and-construction-sector/ (accessed 09/10/2021).

McIntosh K and McCabe B (2003) Risk and benefits associated with international construction-consulting joint ventures in the English-speaking Caribbean. *Canadian Journal of Civil Engineering* **30(6)**: 1143–1152, https://doi.org/10.1139/l03-063.

Norwood SR and Mansfield NR (1999) Joint venture issues concerning European and Asian construction markets of the 1990's. *International Journal of Project Management* **17(2)**: 89–93.

NZCIC (New Zealand Construction Industry Council) (2017) *The NZ Construction Industry – Briefing to Incoming Government*. Report produced by the Construction Strategy Group, Auckland, New Zealand.

NZIOB (New Zealand Institute of Building) and Hays Construction (2020) *The 2020 Hays Construction and NZIOB Salary Guide: Sharing our Expertise*. Wellington, New Zealand.

Ozorhon B, Arditi D, Dikmen I and Birgonul MT (2008) Implications of culture in the performance of international construction joint ventures. *Journal of Construction Engineering and Management* **134(5)**: 361–370.

Panibratov A (2016) Unraveling the IJV rationale in emerging markets: the case of multinational enterprises in the Russian construction industry. *Journal of East-West Business* **22(2)**: 97–117.

Parameswar N and Dhir S (2018) Technology transfer and innovation in global international joint ventures—emerging markets' perspective. In *Global Value Chains. Flexibility and Sustainability. Flexible Systems Management* (Connell J, Agarwal R and Sushil DS (eds)). Springer, Singapore, pp. 77–87.

Ping Ho S, Lin YH, Wu HL and Chu W (2009) Empirical test of a model for organizational governance structure choices in construction joint ventures. *Construction Management and Economics* **27(3)**: 315–324, https://doi.org/10.1080/01446190902725588.

Razzaq A, Thaheem MJ, Maqsoom A and Gabriel HF (2018) Critical external risks in international joint ventures for construction industry in Pakistan. *International Journal of Civil Engineering* **16(2)**: 189–205, https://doi.org/10.1007/s40999-016-0117-Z.

Regmi PR, Waithaka E, Paudyal A, Simkhada P and Van Teijlingen E (2016) Guide to the design and application of online questionnaire surveys. *Nepal Journal of Epidemiology* **6(4)**: 640.

Shen LY, Wu GWC and Ng CSK (2001) Risk assessment for construction joint ventures in China. *Journal of Construction Engineering and Management* **127(1)**: 76–81.

Q12 Sherlock A (2017) Addressing the New Zealand's construction industry's short-term skills shortages. *Roblawmax Recruitment,* 18 August. See https://www.roblawmax.co.nz/blog/addressing-the-new-zealands-construction-industrys-short-term-skills-shortages/ (accessed 09/10/2021).

Steeman M (2018) The construction industry faces big hurdles to lift its game. *Stuff,* 26 October. See https://www.stuff.co.nz/business/108095793/the-construction-industry-faces-big-hurdles-to-lift-its-game (accessed 09/10/2021).

Sung-Lin H and Min-Ren Y (2011) Contribution-based profit-sharing scheme for joint ventures. *Technological and Economic Development of Economy* **17(3)**: 445–458, https://doi.org/10.3846/20294913.2011.580578.

Teerajetgul W and Charoenngam C (2006) Factors inducing knowledge creation: empirical evidence from Thai construction projects. *Engineering, Construction and Architectural Management* **13(6)**: 584–599.

Terjesen S (2014) Joint ventures: synergies and benefits. In *The Mand A Collection: Themes in Best Practice* (Moeller S (ed.)). Bloomsbury Academic, London, UK, pp. 121–126, https://doi.org/10.5040/9781472920355.0019.

Vaughan G (2016) RBNZ concerned range of challenges facing the construction industry will limit high density building and intensification in Auckland. *Interest.co.nz,* 12 November. See https://www.interest.co.nz/property/84532/rbnz-concerned-range-challenges-facing-construction-industry-will-limit-high-density (accessed 09/10/2021).

Yu Z, Lu C and Chan DWM (2017) Review of joint venture studies in construction. In *Proceedings International Conference on Construction and Real Estate Management ICCREM 2017, Guangzhou, China.*

Zhang G and Zou PXW (2007) Fuzzy analytical hierarchy process risk assessment approach for joint venture construction projects in China. *Journal of Construction Engineering and Management* **133(10)**: 771–779, https://doi.org/10.1061/(ASCE)0733-9364(2007)133:10(771).

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