Learnings from a collaborative academia –construction sector bespoke study programme – a reflective case study

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Abstract:
The construction industry is known as a competitive, fragmented and often adversarial work environment. Maintaining high levels of productivity and profitability within such an environment frequently requires a diverse range of skills and experience. Published research investigating the application of integration, collaboration, and organizational learning has demonstrated that leveraging these concepts can begin to address fragmentation, increase integration and encourage innovative thinking thereby providing the opportunity for productivity gains within the construction industry. Two years ago a first tier New Zealand commercial construction company approached a tertiary provider to consider tendering for its management training programme. The primary aim was to focus on introducing the principles of lean construction and integrated project delivery to over 300 middle management onsite construction staff over the next 5 years. The company wanted a delivery approach that would have the greatest possible impact on staff in terms of engagement and knowledge transfer. A bespoke training programme of study was developed and delivered collaboratively with the company, for 50 managers in 2016 and another 50 in 2017. The tertiary provider drew on the latest innovations in construction education, and combined that with the partnered company's culture vision for the wider sector potentially. Feedback has been positive and constructive from the construction company partner, the programme participants and the academic staff on the programme.

Keywords:
academia-industry, collaboration, construction sector, innovative thinking, organisational learning

1 Introduction

Maintaining high levels of productivity and profitability within the construction industry, frequently requires innovative and front-foot responses. Perhaps, as suggested in published research, leveraging the concepts of collaboration and organisational learning, fragmentation could be reduced by increasing integration of the design and construction project team participants, stakeholders and specialist trades. The aim being to enable opportunities for productivity gains within the construction industry. With this in mind the research question became, “How does the collaborative industry-academia partnership work in achieving training with high staff engagement and effective knowledge transfer?” The main focus being on how a bespoke training programme for the construction company partner was jointly developed and delivered, and the literature that informed and that process.

The New Zealand Construction industry has been experiencing a significant period of growth during the last 7 years, driven primarily by the Christchurch earthquake rebuild, the demand for housing, particularly in Auckland, and increased net gain immigration. At the same time there has been ongoing discussion between government and industry regarding how to manage the lack of skilled capacity within the construction sector, which has further constrained productive capacity (PWC, 2016). The lack of capacity has further increased the demand for skilled labour, causing resultant increased pressure on all construction activities. Whilst there are plenty of opportunities in the current market for construction companies, the way in which they operate can determine their short and long term futures in the sector. The New Zealand Government has also been considering how best to support the construction sector. Tertiary training institutions have been challenged by the government to diversify, initiate, implement and deliver responsive and innovative programmes for the construction industry sector. An industry-academia training partnership was established between a tertiary provider and a first tier New Zealand construction company in 2015 (Laing et al., 2017). The relationship was established to provide a jointly developed and delivered bespoke training programme for middle managers (senior site managers, quantity surveyors, project managers, etc.) that drew on and combined the latest innovations in construction methodology, and people management education, for example, an overarching 'lean' approach to the programme modules. The construction company was looking for a delivery approach that would have the greatest possible impact on staff in terms of engagement and knowledge transfer.

After successfully procuring the rights to deliver a bespoke training programme for the construction company, the tertiary provider and the construction company worked in partnership to develop the detailed planning of the programme and its delivery. The programme was funded by the construction company and involved significant coordination and time investment by the management /leaders/staff trainers, and the tertiary provider academic and administration staff, before it could be implemented. Speedy responses and actions were essential by both partners to ensure that the timelines set by the construction company for the programme would be met. That experience alone added real and intrinsic value to the construction company and to the tertiary provider staff involved. The resource factor in academic-industry training partnerships is referred to by Poston and Richardson (2011) as being a serious challenge particularly at the planning phase, as it involves deciding on the levels of agreed involvement, recognising potentially differing priorities of timing and schedules for the industry professionals and the academics. Flexibility is a key aspect in these partnerships. In early 2016 the non-government funded bespoke programme was delivered to the case study company's first cohort of 50 middle managers from all around New Zealand. The programme is now in a third year of delivery and is demonstrating and delivering the tangible value sought by the construction company, as evidenced in the Findings and Discussion sections herein.

2 Literature Review

The selected literature review and analysis specifically focussed on themes and keywords that informed the research topic and the research question.

2.1 Sector Identity

The construction sector is frequently referred to as being a fragmented, sometimes confrontational and a predominantly competitive work environment (Egan, 1988; Latham, 1994). This could be said to be particularly true in the New Zealand market, which is comprised of a few large-scale construction companies, but is primarily a

plethora of small and medium enterprises, whether construction companies or related labour sources and suppliers within the construction sector supply chain. There is a noticeable lack of integration on the majority of projects currently, increasing levels of outsourcing occurring to meet deadlines, and a significant lack of skilled resources available. Risk and opportunity are going hand in hand at the moment in this sector. The fragmentation occurs horizontally and vertically in particular. This is realised for example, in the ongoing practice of single stage competitive bidding for work, though this has been mitigated to some extent on some projects with the adoption of alliancing, and other mechanisms such as integrative governance (and risk sharing), and the management of boundaries using boundary spanning for instance. As noted by Fellows and Liu (2012) boundary spanning on projects involves bridging and connecting with external organisations, forming project teams and coordinating interdependent work efforts within and across organisational boundaries. This approach is now being seen by a few of the large-scale and confident construction companies in New Zealand as a market opportunity, as a means to achieving their company vision of being a leader in the field and achieving an increased market share. This was one of the main reasons why the particular construction company approached this tertiary provider to set up a collaborative training partnership (Laing et al., 2017).

2.2 Collaboration and Organisational Learning Practices

In order to be competitive in the construction sector, companies need to adopt practices that ensure continuous development and improvement. Collaboration and organisational learning are practices that are the focus of attention for companies looking for a competitive advantage. Collaboration is based on the concept of building relationships with stakeholders (internal and external) by building trust (Cheung et al., 2015). The trust relationship is established and enhanced via an organisation's culture and how it communicates. Trust based inter-organisational relationships allow for a greater level of performance in supply chains (Delbufalo, 2011). Building trust processes contributes to higher levels of collaboration and team integration (Baiden et al., 2006). This has been shown to increase the performance of Architecture, Construction and Engineering (ACE) project delivery teams (Franz et al., 2016). Organisational learning is a process that helps expand on what a trust built collaborative relationship affords by openly sharing knowledge and understanding (Cheung et al., 2015). The combined process of collaboration and organisational learning means greater opportunities are created for innovative solutions to complex problems. The ability to solve complex problems, such as those found in the construction sector, are enhanced further via incorporating models such 'Systems Thinking', as suggested by Senge (2003) and looped learning (Wong 2015), which advocates organisations and individuals adopt learning practices. A key component of organisational learning involves the ability to express and share understanding via knowledge sharing (KS) practices. By communicating one's knowledge, an opportunity can be created for knowledge growth among participants. Knowledge sharing is shown to help organisations create a competitive advantage through increased productive practices (Abu Bakar et al., 2012; Wang and Ko, 2013). Navimipour and Charband (2016) research into the knowledge sharing literature has categorised a number of key mechanisms for supporting this process. These include, but are not limited to, having a culture that encourages KS, leadership support, project teams' recognition of the value of KS, and a willingness of participants to engage in KS. These practices are enhanced when interdisciplinary and inter-organisational engagement is supported and rewarded (Zhang et al., 2013). Organisations involved in KS practices can also benefit from understanding how knowledge is successfully transferred.

Construction projects can be seen as unique in that many of the parties involved are separated in terms of time and location during the life of a project. Understanding how to transfer knowledge in this context is key to leveraging learning. Knowledge management has two broad categories, being 'explicit' and 'tacit' knowledge. Explicit knowledge is generally easy to manage via record keeping and information systems. Whereas, tacit knowledge is more challenging to engage with, and manage, as it is held in the minds of individuals. The ability of individuals to draw on both explicit and tacit knowledge at the right time has the greatest impact on knowledge transfer success (Bagheri et al., 2016). Research has demonstrated that it is through the mechanism of integrated project teams (IPT) in construction that the opportunity for knowledge transfer is at its greatest potential (Zhang et al., 2013).

2.3 Industry-academia relationships

Key drivers that create successful industry-academia partnerships result from the time invested in establishing a construction company's actual needs and the tertiary provider's willingness and ability to form a meaningful training relationship (Schofield, 2013). Those involved in a partnership need the right mix of construction industry experience, management, research and teaching expertise, from diverse construction management backgrounds, and in addition, shared common drivers such as increasing productivity and collaboration in the construction industry (Laing et al., 2017). Patterson (2016) identified the importance of effective communications in developing trust and loyalty during the first phase of relationship building, and that collaborative relationships should be built on the principles of partnering where trust is developed through open communications. There are many barriers to academic-industry collaboration, as it requires a higher level of commitment and activity (Tumbas et al., 2016), and there are always resourcing risks and challenges (financial as well as staffing, and differing drivers/priorities). Laing et al. (2017) found that in order to achieve a collective approach, the key for the construction company and the tertiary provider was that each was actually prepared to listen, adapt and offer suggestions. As a consequence, the relationship is based on a pro-active problem solving approach by both parties.

2.4 Collaborative Learning and the Living Curriculum approach

Tertiary providers have an ongoing desire and need to find, create and implement new and innovative ways of facilitating real-world learning for programme enrollees (Guerrero et al., 2016) whether at trade, middle management or senior management levels. The construction sector is ever-changing in the demands and expectations from stakeholders and clients in particular. Construction sector companies whether individually or collectively engaging architectural, engineering or construction staff have to ensure that they are trained in-house as well as further developed into an innovative, front-footed, effective, and forward looking team. There are currently several learning methods employed by tertiary providers. Collaborative learning is the predominant method. This involves a workshop approach in high tech computer-rich, integrated group-friendly teaching spaces, and online resources. Participants work as interactive groups /teams in a problem-solving mode with the facilitator as a constant mentor, critic and guide (Davidson and Major, 2014). The term Living Curriculum is not unique to tertiary providers as it is used widely by many educationalists where learning is reframed as a complex social conversation (Keesing-Styles et al., 2014). The thinking is formed from a belief that people learn best by constructing their own understanding and solutions to problems through discourse with peers and the broader community. The 'Living' aspect emphasises the dynamic nature of the approach that grows and changes by responding to the needs of the students, (Birchmore and Kestle, 2011), and in this particular research work that community was the construction company, and their selected participants on

the bespoke programme. This collaborative, and flexible approach to the bespoke programme had 'Lean' as an overarching theme to all of the 6 modules and this fitted well with the outcomes sought by the construction company for their interdisciplinary middle management staff.

3 Research Methodology

An interpretive case study research approach was conducted from the perspective of the main contributors to the industry-academia relationship as it provides a broad opportunity to develop a comprehensive view of the elements involved from the perspective of those involved, according to Liu and Fellows (2015). This stage of the industry-academic partnership process was essentially concerned with building on the work already published by Laing et al. (2017) which focussed on the procurement process of setting up the industry construction partnership with the tertiary provider in 2015/16. The principles of a bespoke programme of study were designed and developed collaboratively with the construction company and the modules were jointly delivered. Each of the four company cohorts of 25 participants have been middle managers from across New Zealand, and were selected by the company's senior management in 2016 and 2017 (and now in 2018). Each module has had a lead academic deliverer/facilitator running two all-day real-world problem-based workshop sessions. One of the company's senior (on-site or specialised) staff were provided to facilitate a section of each of the modules to work alongside, and collaborate with the academic(s). This approach provided the company's perspective and relevant live project examples to support and underpin each module's focused theme. Participant evaluations, using anonymous evaluation forms, were then conducted by the tertiary provider and the construction company, at the end of each of the 6 modules on the bespoke programme, and for the overall programme.. Using qualitative data coding techniques (Fellows and Liu, 2009) the evaluation responses were coded against the literature themed sub-headings. The collected data was reviewed and reflected on by the tertiary provider academics and the construction company management.

4 Findings and Discussion

Evaluative feedback received from the programme participants in 2016 and 2017 are the main findings of this case study research. In addition, a quote from the construction company partner after four cohorts have been through the bespoke programme in 2016/17 is included here, together with the reflective evaluations on the participants' feedback and the learnings from the academic staff:

4.1 Construction company partner feedback

"We chose to partner with the tertiary provider to deliver our programmes as we believe they are an institution that provides a practical and collaborative approach to learning in the construction space. The facilitators at the tertiary provider have done a great job at developing and delivering relevant content to our employees, whilst ensuring they have an engaging learning experience. We particularly liked the delivery staff’s ability to be ‘pracademic’." (quote from the construction company partner's leadership personnel March 2018).

4.2 Participants' feedback

The overall programme of 6 modules was evaluated by the participants using anonymous course evaluation forms that asked questions such as:

What aspects of the programme have been most valuable to you in your work? Do you have any comments on the programme content? How has the programme impacted your job / role? Which, if any, modules or learning do you think would be beneficial to a much greater range of participants?

The data was codified from the participant feedback and then presented under the following sub-headings to compare the findings, and establish the overall level of support for the collaborative bespoke programme's aims.

4.2.1 Sector Identity

“I think the course content as a whole reflects the overall company philosophy of collaboration”; “Made me feel that I was on the company’s long term plans”. “I feel like I am on a path that is structured to help my development”; “I've understood for a very long time that business is about good relationships, and now I've made the connection that people make good relationships happen.; “I am more aligned with colleagues, which being relatively new to NZ has helped me understand further how the cogs turn within the company culture”.

4.2.2 Collaboration

“It has given me confidence when approaching tasks like planning, communication with subcontractors, risk management and Lean Construction”; “I'm getting better engagement with my project team and subcontractors through properly listening and understanding their point of view”;“ I also conduct myself differently when talking to subcontractors and when trying to resolve an issue or a conflict”; “Collaborative working ideas have helped improve working relationships with other staff and subcontractors”; “I personally learnt a lot about myself and how I can improve with the first module on effective communication and conflict management. It has definitely influenced my behaviour and the way I go about daily duties”.

4.2.3 Organisational Learning

“It was clear that the tools which are already provided are not being utilised to their full potential, so it was a good experience to learn more about some of the systems tools we already have access to”; “Especially the technology focus areas.”; “Have put a lot into practice already, and am aware of other aspects that need to be put into practice. The programme has also opened up my eyes to many new ways of doing things - e.g. last planner”; “Have been given exposure to alternate ways of thinking and incorporate that into my work. Have made contacts and correspond with others outside my region. Surprised that the issues I face are very similar across the company”; “It was good because it taught you things e.g. risk management from the site managers point of view. There were also things I haven’t been exposed to in my job. We learnt about them and the right way to do it.”.

4.2.4 Knowledge Sharing

“Sharing knowledge and experiences with peers, and senior colleagues in the business, as well as learning about leading techniques was great”; “Meeting other members of the company and discussing the way they do things in other regions compared with what we do"; “Meeting new staff has enabled me to increase my network base so I have others to discuss similar issues/projects with”; “Really good to hear from other staff and projects and discuss issues, and solutions.”.

4.4.5 Collaborative Learning

“The effective communication module - I took a lot away from this, and have put many aspects learned into every day practice - have definitely seen positive results from this, especially in my own team members and subbies”; “Meeting peers within the company who share broad experience and knowledge, sharing our work stories and scenarios”; “Meeting company staff, was the most beneficial, but the communication/collaboration and risk management were the items studied that I will use on a daily basis. Other topics, whist useful to increase my knowledge, will not be used as much”; “Talking/sharing experiences with other teams, and the presentation from other industry experts. Each subject has provided me with new skills and a better level of understanding which can be used when communicating with my team, subcontractors, and consultants”.

4.3 Reflections on the bespoke training programme

Schofield (2013) reviewed a wide range of potential barriers that face those entering an industry-academic collaboration. On reflection, a credible point of contact for both organisations proved to be a key success factor and was a key stipulation by the construction company. This worked well and became a cornerstone of the programme. The Programme Curriculum Advisor (PCA) specifically appointed by the construction company for this partnership with the tertiary provider, was an experienced academic and highly experienced Construction Manager. This offered an opportunity to tailor a bespoke programme that fitted the construction company's commercial needs, and the tertiary provider's academic drivers. Feedback on the programme and the collaborative relationship has been positive for the construction company partner, and academic staff.

4.4 Reflections on the participants' feedback

When reviewing the evaluation results from participants there was a general consensus that the programme is adding value individually and collectively, and has a strong level of support. Engagement in learning is positive and the majority of participants are applying their learnings back on site, by working and thinking differently. Generally, the feedback connects with literature discussed. Comments regarding sector identity, collaboration, learning and teaching pedagogy support the findings from recent and earlier research. In line with Fellows and Liu's (2012) research on boundary spanning, there is commentary from participants that relationship building and connecting with the construction company's strategy on collaborative practices is being adopted and is being given a higher level of priority. Remarks like “I'm getting better engagement with my project team and subcontractors through properly listening and understanding their point of view” connects the learning to literature by Baiden et al. (2006) on increased collaboration and team integration and that of Delbufolo's (2011) findings on how collaborative behaviour can create better performance. Organisational learning and knowledge sharing practices are clearly occurring with the participants. Cheung et al. (2015) noted the value of collaborative approaches and the opportunity for increasing productive practices, commentary such as "The programme has also opened up my eyes to many new ways of doing things - e.g. last planner"- an example of the construction company in combination with the tertiary provider connecting organisational learning. The value of knowledge sharing as discussed by Abu Bakar et al. (2012); Wang and Ko (2013) was a significant and positive outcome for the construction company with significant commentary evidence such as “Really good to hear from other staff and projects and discuss issues, and solutions” coming from participants.

4.5 Reflection on the construction company partner's feedback

The company was looking for a delivery approach and team that would have the greatest possible impact on staff in terms of engagement and knowledge transfer, and to work collaboratively together in developing the programme and the delivery. It would appear in the quote received from the company leadership that their expectations have been met, and even exceeded both from the point of view of the collaborative relationship that is ongoing into a third year, but also the added-value for their staff and the company projects currently underway.

4.6 Academics' reflections on the programme and collaboration with the construction company partner

The academics delivering on the bespoke programme have been engaged on successful government funded programmes and delivery models, but this collaborative partnered model needed out-of-the-box thinking. This was the first significant step toward a different delivery model in conjunction with a construction partner who had strong foresight and vision for their company's future and the sector. It offered the opportunity to engage with applied research and influenced the way company staff introduced new ways of working and thinking on their current projects. Engaging with the construction company has been a great experience in terms of seeing the challenges the industry currently faces, and how they were generally receptive and enthusiastic about the learning opportunities being presented to them through the programme. It created the opportunity to combine overseas experience and theoretical knowledge with the local industry context. This collaborative industry-academia relationship has also assisted in understanding why certain new technologies and processes, common overseas, have not yet been adopted or implemented that widely in New Zealand. ‘Complex conversations’ being one of the main pillars of the ‘Living Curriculum’ pedagogy adopted by the tertiary provider (Keesing-Styles et al., 2014), was a natural process with these industry professionals, and the company’s co-facilitators with the cohort participants, where local examples were shared, creating rich and analytical conversations. noted The participants acknowledged how to make a shift in what is often an adversarial environment to create a collaborative and more open sector, that benefits all the players. In the last module of the programme the participants present team proposals and strategies for improving company and individual outcomes to the construction company’s senior leadership personnel. This is often the most rewarding time - seeing how their thinking has changed and how they are engaging with the construction company’s challenges.

5 Conclusion and Further Research

The research question: “How does the collaborative industry-academia partnership work in achieving training with high staff engagement and effective knowledge transfer?” focused on how the bespoke training programme for the case study construction company was jointly developed and delivered with the tertiary provider by drawing on the latest innovations in construction education, and combining that with the partnered company's culture vision for the wider sector. The discoveries of the research and its impact are that, academia and the construction industry can work collaboratively despite all the challenges suggested in the literature, if you have two parties willing to commit to common goals, listen to each other's needs, be flexible and recognise the differing ways of working. This included acknowledging and taking the risk on new technologies and new delivery models. In addition, collaboration was a strongly shared vision by the tertiary provider and the construction company partner for the sector going forward, so as to be more productive and provide enhanced value to the construction company, the

staff, clients and stakeholders. The next stage of this research is to conduct an action research study regarding whether any significant changes have occurred in the industry partner's staff and management practices and what they are, following the delivery of 3 years of participants on the bespoke training programme.

6 References

Abu Bakar, A H., Virgiyanti, W. and Tufail, M A. (2012), 'Knowledge Management Processes and Competitive Advantage in Construction Industry'. *Emerging issues in the Natural Applied Sciences*, **2**(1), pp 81-102.

Ankrah, S N. (2013), 'University-Industry Interorganisational Relationships for Technology/Knowledge Transfer: A Systematic Literature Review', *Leeds University Business School Working Paper Series*, **1**, No4.

Bagheri, S., Kusters, R J., Trienekens, J J M. and van der Zandt, H V N. (2016), 'Classification framework of knowledge transfer issues across value networks'. *Procedia CIRP*, **47**(2016), pp 382-387.

Baiden, B K., Price, A D F. and Dainty, A R J. (2006), 'The extent of team integration within construction projects'. *International Journal of Project Management*, **24**(1), pp 13-23.

Birchmore, R. and Kestle, L. (2011), 'XYZ of the Living Curriculum'. In R. Best & C. Langston (Eds.). *Proceedings of the 36th Conference for Australasian Building Educators Association*, 27-29 April. Bond University.

Cheung, S O., Chan, K Y. and Chow, P T. (2015), 'Soft power in construction contracting'. In S. O. Cheung, P. S. P. Wong and T. W. Yiu (Eds.) *The Soft Power of Construction Contracting Organisations*. New York: Routledge.

Davidson, N. and Major, C. H. (2014), 'Boundary crossings: Cooperative learning, collaborative learning, and problem-based learning'. *Journal on Excellence in College Teaching*, **25**, pp 7-55.

Delbufalo, E. (2011), 'Outcomes of inter-organizational trust in supply chain relationships: a systematic literature review and a meta-analysis of the empirical evidence'. *Supply Chain Management*, **17**(4), pp 377-402.

Egan, J. (1988), *Rethinking Construction*. HMSO, London UK

Fellows, R. and Liu, A. M. M. (2009), *Research Methods in Construction*, Oxford Blackwell Publishing Ltd.

Fellows, R. and Liu, A M M. (2012), 'Managing organizational interfaces in engineering construction projects: addressing fragmentation and boundary issues across multiple interfaces'. *Construction Management and Economics*, **30**(8), pp 653-671.

Fellows, R. and Liu, A M M. (2016), 'Sensemaking in the cross-cultural contexts of projects'. *International Journal of Project Management*, **34**(2), pp 246-257.

Franz, B., Leicht, R., Molenaar, K and Messner, J (2016), 'Impact of Team Integration and Group Cohesion on Project Delivery Performance'. *Journal of Construction Engineering and Management*, **143**(1).

Guerrero, M., Urbano, D., Fayolle, A., Klifsten, M. and Mian, S. (2016), 'Entrepreneurial universities: emerging models in the new social and economic landscape'. *Small Business Economics*, 2016, 551–563.

Keesing-Styles, L., Nash, S. and Aryes, R. (2014), 'Managing curriculum change and 'ontological uncertainty' in tertiary education'. *Higher Education Research & Development*, **33**(3), pp 496-509.

Laing, N., Roberts, P., Kestle, L., Puolitaival, T., Brenton-Rule, T. and Bryan, A. (2017), 'Development of a collaborative training partnership in the NZ construction industry'. In: Marsha Lamb (Ed.), "AUBEA 2017: *Australasian Universities Building Education Association Conference* 3-5 July 2017, RMIT Melbourne. Vol. 1, pp 156-164.

Latham, M. (1994), *Constructing the team*. HMSO, London UK.

Liu, A M M. and Fellows, R F. (2015), *Research Methods for Construction* (Fourth ed.): John Wiley and Sons, Incorporated.

Navimipour, N J. and Charband, Y. (2016), 'Knowledge sharing mechanisms and techniques in project teams: Literature review, classification and current trends'. *Computers in Human Behaviour*, **62**(September 2016), pp 730-742.

Patterson, P. (2016), 'Retrospective: tracking the impact of communication effectiveness on client satisfaction, trust and loyalty in professional services'. Journal of Services Marketing, **30**(5), pp 485-489.

Poston, R S. and Richardson, S M. (2001), 'Designing an Academic Project Management Program: A Collaboration between a University and a PMI Chapter'. *Journal of Information Systems Education*, **22**(1), pp 55-72.

PricewaterhouseCoopers. (2016), Valuing the role of construction in the New Zealand Economy. Auckland, New Zealand.

Schofield, T. (2013), 'Critical success factors for knowledge transfer collaborations between university and industry'. *Journal of Research Administration*, 44, 38-56.

Senge, P M. (2003), *The Fifth Discipline: The Art and Practice of the Learning Organisation*. Random House Australia.

Tumbas, P., Matkovic, P., Maric, M. and Veselin, P. (2016), 'Organisational aspects of university-industry collaboration'. *8th Annual International Conference on Education and New Learning Technologies EDULEARN16*, 4-6 July 2016, Barcelona, Spain.

Wang, W-T. and Ko, N-Y. (2013), 'Knowledge sharing practices of project teams when encountering changes in project scope: A contingency approach'. *Journal of Information Science*, **38**(5), pp 423-441.

Wong, P S P. (2015), 'Exploring the traction between intra-organisational and inter-organisational learning'. In: S. O. Cheung, P. S. P. Wong and T. W. Yiu (Eds.), *The soft power of construction contracting organisations*. New York: Routledge.

Zhang, L., He, J. and Zhou, S. (2013), 'Sharing Tacit Knowledge for Integrated Project Team Flexibility: Case Study of Integrated Project Delivery'. *Journal of Construction Engineering and Management*, **139**(7), pp 795-804.

Zhang, X., De Pablos, P O. and Zhou, Z. (2013), 'Effect of knowledge sharing visibility on incentive-based relationship in Electronic Knowledge Management Systems: An empirical investigation'. *Computers in Human Behaviour*, **29**(3), pp 307-313.