

“Contractor tendering research: going beyond bid/no-bid and mark-up models”

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Abstract

Within a wider research program into the effectiveness and efficiency of the tendering procedures of construction contractors' (CCs), a content analysis of tender research published in 27 journals between 2010 and 2016 found that CC tendering procedure research remains a low-focus area. CC related tender research commonly focuses on factors influencing 'bid/no-bid' and markup decisions, often combined with developed decision modelling. Comparing the content analysis results with semi-structured interviews with 20 Australian civil engineering CCs (including some of Australia's largest contractors, and with eight involved in international operations), it was found that the industry remains largely unaware and unsupportive of such developed tender decision tools. Instead, CCs suggest tender research should focus on efficient tendering procedures, encouraging clients to use standard rather than bespoke contracts, and improved quality and risk transfer in tender documents. The combined semi-structured interview findings and content analysis results provide researchers with contemporary tender research themes that civil engineering CCs, and potentially more general contractors, are more likely to embrace, thereby advancing the efficiency of construction tendering and contractors' work procurement management.

Keywords: contracting, corporate responsibility/governance, tendering.

1. Introduction

It can be argued that research into construction tendering often overlooks construction contractor (CC) internal tendering procedures (Laryea, 2013). This is important since CCs, along with other companies and particularly publicly listed companies, are required to meet increasing levels of corporate governance requirements, such as the Australian Securities Exchange's *Corporate Governance Principles and Recommendations* (ASX, 2014). Contractors' procurement of work is one corporate activity subject to increased governance oversight (ASX, 2014; SAI, 2003). Therefore questions arise as to the nature and extent of governance control CCs apply over their tendering procedures and whether these controls lead to improved tender efficiency and effectiveness.

A wider research program is currently investigating the effectiveness and efficiency of Australian civil engineering CCs' (a AU\$20 billion (US\$15 billion) sector (ABS, 2016)) internal tendering procedures (Urquhart et al., 2017). As a precursor to that work, a content analysis was undertaken on tender research, published in 27 journals between 2010 and 2016, expanding on Laryea's (2013) earlier review. While identifying a gap in current CC internal tendering procedure research, the content analysis found nearly 43% of CC related tender research involved the well-trodden path assessing 'bid/no-bid' and/or 'markup' factors, often including development of mathematical decision models.

Awareness and adoption of such developed models was assessed here in this new work with 20 Australian civil engineering CCs during a series of semi-structured interviews investigating their internal tendering procedures and associated corporate governance. Of the 20 CCs, two are subsidiaries of international contractors and a further six operate divisions outside Australia. Based on this CC sample, which included some of Australia's largest CCs, it was found that

there was little awareness, and even less adoption, of bid/no-bid and markup models by the contracting industry. These findings suggest an apparent misalignment between researchers' tender focus and CCs' take-up of their research output. Consequently, as part of the wider study, these CCs were asked to suggest topics where tender research should occur. It is argued here that the combination of the content analysis and the CCs' tendering research suggestions facilitates researchers in identifying gaps to be explored, thus improving take-up of researchers' findings. Pursuit of these research themes should advance managing and CCs' work procurement tendering overall.

Details behind the tendering research content analysis are provided in Section 3 of this paper, while their comparison with the CC semi-structured interview findings is discussed in Section 4. Contractors' suggested topics for tendering research are discussed in Section 5.

2. Literature Review

Laryea (2013) identified a dearth of research relating to CC internal tendering procedures. Much of what exists consists of experientially based text books (eg Brook, 2011; Greenhalgh, 2013) and often details estimating processes more than tendering procedures and strategies. Laryea's (2013) review of tender (or bid) research found only 29 articles, published between 1983 and 2012, that focus on CCs' tender procedures. Of those 29, the papers based on Australian research were published before the year 2000 and focused on tendering theory (Runeson and Skitmore, 1999), ethics in tendering (Ray *et al.*, 1999), and subcontractor pre-tender and post-tender negotiations (Uher and Runeson, 1984) (all cited by Laryea, 2013). The time gap suggests an apparent lack of attention to CC-related tendering research in Australia this century.

Since 2000 the Australian market has experienced the global financial crisis and various high-profile corporate failures. These events, and subsequent legislative and regulatory changes, have led to more stringent corporate responsibility/governance obligations being placed on companies (ASX, 2014; SAI, 2003). Notwithstanding such obligations, CCs continue to be over represented in company failure statistics (Coggins *et al.*, 2016), leaving company directors potentially exposed to legal action under the Australian Corporations Act 2001 (CoA, 2001). While various client procurement and tendering guides have been developed (eg CEIIDA, 2010; DTF, 2013), a similar position does not appear to exist for CCs' internal tendering systems and procedures. Research funded by contractor industry associations, such as the Australian Contractors Association (Ashurst Australia, 2014; Blake Dawson, 2011), has more of a marketing intent, promoting industry views to clients, rather than providing CCs with guidance on effective tender procedures.

As recent relevant CC tendering procedure literature has been identified as limited (Laryea, 2013) a content analysis of an extensive range of peer-reviewed literature was undertaken. The content analysis process and subsequent findings, described in Section 3, helped inform this ongoing wider research program into the effectiveness and efficiency of Australian civil engineering CC internal tendering procedures (Urquhart *et al.*, 2017).

3. Content analysis of contractor-focused tendering research

3.1 Method of content analysis

Content analysis is a widely accepted means of undertaking systematic and detailed inspection of previous material, such as peer-reviewed journals, to identify the presence or absence of themes and thus trace development of scholarship in particular research areas (Krippendorff, 2103; Leedy and Ormrod, 2013). Four key steps were undertaken in this content analysis.

Firstly, it was decided journal samples to be analysed would be drawn from two sources: initially the six journals adopted in Laryea's (2013) review, *Building and Environment (BE)*; *Building Research & Information (BRI)*, *Construction Management and Economics (CME)*, *Engineering, Construction and Architectural Management (ECAM)*, *International Journal of Project Management (IJPM)*, and *Journal of Construction Engineering and Management (JCEM)*, and then a further 21 influential construction management journals (Naoum and Egbu, 2015), some of which were identified through the Emerald, EBSCOHost and Scopus databases. These journals are listed in Table 1. Second, the journals were analysed for keyword combinations of

“tender* OR bid**” AND “construct* OR contractor* OR build**” in the abstracts year by year for the publishing period of January 2010 to November 2016. As the wider research project is focused on civil engineering construction tendering, during the content analysis, articles specifically related to residential building construction were excluded.

Thirdly, each article was examined and coded as having either a client-focus, a CC-focus, or both. Coding was undertaken initially on the basis of article abstract and then by reading the full article. As coding is typically accomplished with reliance on human interpretative abilities, coders should be familiar with the specific phenomena being examined (Krippendorff, 2103), in this case tendering research applicable to CCs. For consistency in approach, all coding was undertaken by the lead author, drawing on his 35 years’ experience in the Australian construction industry, including 20 years of managing tendering for four of Australia’s largest CCs. Where a potential for doubt existed, an article was coded as being both client- and CC-focused. As several articles specifically related to subcontractor tendering matters, they were coded separately. Client-only-focused articles were then excluded from further analysis. Finally, each CC-focused, client-and-CC-focused, and subcontractor-focused article was coded for country of research base, main research focus/theme, and research methodology. Content analysis results are presented in Section 3.2 below and highlight that tendering research remains largely focused around bid/no-bid and markup modelling, while CC tendering procedure research remains limited.

3.2 Results of content analysis

The content analysis initially identified 231 articles relating to tendering in the engineering construction and non-residential building sectors. Following detailed examination, 122 articles were identified as client-focused and therefore outside the remit of this study. Of the remaining articles, 71 were CC-focused, 32 were both client-and-CC-focused, and six were subcontractor-focused, totalling 109 articles (collectively ‘contractor articles’). The spread of contractor articles by journal and country research base is summarised in Table 1. No relevant contractor articles were identified in journals *BE*, *BRI*, *Facilities*, and *Proceedings of the Institution of Civil Engineers - Management Procurement and Law*. The number of country entries (125) exceeds the contractor articles as various articles compared tendering matters across several countries - for example Ke *et al.* (2013) compared project delivery processes in Australia, China, Hong Kong and Singapore.

3.2.1 Tender research themes

Each contractor article was coded into one of the 14 research themes listed in Table 2. The aggregate number (115) exceeds the contractor articles because some researchers covered several themes in the one article, such as the often-linked bid/no-bid and markup discussions. Several research subthemes applied within the broader research themes (numbers shown inside parentheses in Table 2). Australian-based research is identified and referenced separately in Table 2, in number and as a percentage of the world research in each theme.

Internationally, researchers’ most common focus themes were bid/no-bid decisions (26 articles, of which 18 occurred in the period 2014-2016) and markup decisions (21 articles), many of which included development of decision models. Examples of bid/no-bid decision models included variations of fuzzy set theory models (Tan and Shen, 2010), analytic hierarchy process (AHP) (Nandi *et al.*, 2011), and data envelopment analysis (El-Mashaleh, 2013). Markup analysis examples included graphic tools (Ballesteros-Pérez *et al.*, 2012), AHP (Polat *et al.*, 2015), linear mixed models (Oo *et al.*, 2010), and, agent based modelling (Asgari *et al.*, 2016).

Research into bid/no-bid factors is often structured to address particular industry or contractor needs, such as contractors in the Gaza Strip (Enshassi *et al.*, 2010); builders in Qatar having to select from project opportunities leading up to the Federation Internationale de Football Association 2020 World Cup (Jarkas *et al.*, 2014); organisational cultural influences in Malaysia (Low *et al.*, 2015); and, more recently, indigenous contractors in Nigeria competing against international CCs (Olatunji *et al.*, 2017). In Australia, Shokri-Ghasabeh and Chileshe’s (2016) findings into such factors were based primarily on responses from builders (90%), 85% of which had turnovers of less than AU\$100 million (US\$75 million), thus reinforcing the need for a study into larger Australian civil engineering CCs.

Table 1 – Contractor articles by journal source and country base (2010–2016)

Journal	Country												Total
	Aus	Chi	HK	Pol	Sin	Spa	Tai	Tur	USA	UK	Other	ND	
JCEM	1	2	3	0	1	1	1	0	8	3	4	2	26
CME	3	0	3	0	1	1	1	0	4	4	2	3	22
IJPM	2	3	2	0	0	3	0	0	1	1	3	1	16
JME	0	1	1	1	0	0	1	1	1	0	4	2	12
ECAM	5	1	1	0	1	0	0	0	0	0	0	2	10
PRO	0	0	0	3	0	0	0	1	0	1	2	0	7
CI	2	0	2	0	0	0	0	2	0	0	0	0	6
JFMPC	1	1	1	0	1	0	0	0	0	0	0	0	4
IJCPM	0	0	0	0	0	0	0	1	0	0	2	0	3
AIC	0	0	0	0	0	1	1	0	0	0	0	1	3
CEB	1	0	0	0	0	0	0	0	0	0	2	0	3
PMJ	0	0	0	0	0	0	1	0	0	1	0	0	2
JPIEEP	0	0	0	0	0	0	0	0	1	0	0	0	1
JMM	0	0	0	0	0	0	0	0	0	0	0	1	1
MD	0	0	0	0	0	0	0	0	1	0	0	0	1
Decision	0	0	0	0	0	0	0	0	0	0	1	0	1
RIO	0	0	0	0	0	0	0	1	0	0	0	0	1
JBIM	0	0	0	0	0	0	0	0	0	0	1	0	1
TEDE	0	0	0	0	0	0	0	1	0	0	0	0	1
IJSPM	0	0	0	1	0	0	0	0	0	0	0	0	1
EPOJ	0	0	0	0	0	0	0	0	0	0	1	0	1
SG	0	0	0	0	0	0	0	0	0	0	1	0	1
JMPM	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	16	8	13	5	4	6	5	7	16	10	23	12	125

Journal Source Legend (in addition to those listed in section 3.1):

JCEM - Journal of Construction Engineering and Management; **CME** - Construction Management and Economics; **IJPM** - International Journal of Project Management; **JME** - Journal of Management in Engineering; **ECAM** - Engineering, Construction and Architectural Management; **PRO** – combined result Procedia Engineering, and Procedia Economics and Finance; **CI** - Construction Innovation; **JFMPC** - Journal of Financial Management of Property and Construction; **IJCPM** - International Journal of Construction Project Management; **AIC** - Automation in Construction; **CEB** - combined result Australasian Journal of Construction Economics and Building, and Construction Economics and Building; **PMJ** – Project Management Journal; **JPIEEP** - Journal of Professional Issues in Engineering Education and Practice; **JMM** – Journal of Modelling in Management; **MD** – Management Decision; **Decision**; **RIO** – Review of Industrial Organisation; **JBIM** - Journal of Business & Industrial Marketing; **TEDE** - Technological & Economic Development of Economy; **IJSPM** - International Journal of Strategic Property Management; **EPOJ** - Engineering Project Organization Journal; **SG** - Simulation & Gaming; **JMPM** - Journal of Modern Project Management.

No relevant contractor articles were identified in the following journals that were also reviewed: Building and Environment; Building Research and Information; Facilities; and, Proceedings of the Institution of Civil Engineers - Management, Procurement and Law.

In the country entries listing:

Aus – Australia, **Chi** – China, **HK** - Hong Kong, **Pol** – Poland, **Sin** Singapore, **Spa** – Spain, **Tai** – Taiwan, **Tur** – Turkey, **USA** – USA, **UK** – United Kingdom; **Other** involves Belgium (1), Canada (2), Ecuador (1), Egypt (1), Finland (2), Germany (1), India (2), Indonesia (1), Israel (1), Jordan (1), Kuwait (1), Malaysia (1), Netherlands (2), Norway (1), Palestine (3), Qatar (2); and **ND** denotes - Not defined/specified.

Analysis of the published articles shows empirical research into tendering procedures is limited to tender review processes in the UK (Laryea, 2013); design decision systems during tender in the Netherlands (Van Der Meer et al., 2015); tender reviews and the *PMBOK® Guide* (PMI, 2008) in Taiwan (Chou and Yang, 2012); and Australia's 'lessons learned capture' of past project knowledge for future tenders (Shokri-Ghasabeh and Chileshe, 2014). Presumably such limitations remain due to tendering's commercially sensitive nature (Laryea, 2013).

Table 2 – Aggregated contractor article tender research themes and subthemes (2010–2016)

Research theme/sub-theme	Total	Australia
"Bid/no bid" decision: factors and/or modelling (Ballesteros-Pérez 2016; Ballesteros-Pérez, et al. 2015; Liu, et al. 2016b; Shokri-Ghasabeh and Chileshe 2016)	26	4 (15%)
"Mark-up" Decision: factors and/or modelling (Oo, et al. 2014; Soo and Oo 2014)	21	2 (10%)
Costing or pricing, including escalation measures/indices, schedule of rates	12	0 (0%)
Business, business development and bid strategies/processes: includes business development and bid strategies (6); behavioural economics (1); business strategy (1); profit and business structure (1); project governance (1); effect of bidding success (1) (Ke, et al. 2013)	11	1 (9%)
Factors influencing costs: includes debt and equity (1); development method (1); overhead costs (2); project delivery methods (2); resources to be allocated to projects (plant and personnel) (2)	8	0 (0%)
Subcontractors including subcontractor selection (Chalker and Loosemore 2016; Loosemore 2014)	6	2 (33%)
Risk, including risk attitude	5	0 (0%)
Unbalanced Bidding (Cattell, et al. 2011)	5	1 (20%)
Business failure risks: includes business survival and insolvency (2); cashflow issues (1); client payments (1); underpricing (1) (Coggins, et al. 2016, Liu, et al. 2016a; Tran and Carmichael 2013)	5	3 (60%)
Delay costs and issues	5	0 (0%)
Tendering procedures: includes design systems (1); knowledge management (1); tender review processes (2) (Shokri-Ghasabeh and Chileshe 2014)	4	1 (25%)
Tender documentation: includes contract terms/negotiation (2); quality of tender documents (1)	3	0 (0%)
Innovation (Rose and Manley 2014)	3	1 (33.3%)
Game learning (Oo and Lim 2016)	1	1 (100%)
Total	115	16 (14%)

Number inside parentheses denotes the number of subtheme contractor articles.

3.2.2 Preferred methodologies

The most common research methodologies (43 of the contractor articles, as shown in Table 3), involved analysis of available tender data sets for bid/no-bid and/or markup decisions and commonly included development of mathematical models based around such information. Such approaches occurred despite researchers recognising that CCs do not use, or have minimal take-up of, such models (Asgari et al., 2016; Nandi *et al.*, 2011; Tan and Shen, 2010;). Various researchers identified industry practitioner take-up of such models was limited because of CCs' difficulties in generating sufficient meaningful data (Ballesteros-Pérez *et al.*, 2016; Oo et al., 2010), or models were too difficult or complex to apply while conversely being too simplified to be a useful tool (Ballesteros-Pérez *et al.*, 2012). Egemen and Mohamed (2007: p. 1379)

found “92.5% of respondents had never used any statistical and mathematical model for bid mark-ups”.

Table 3 – Main research methodologies (2010–2016)

Main research methodology	Number
Data set modelling and/or mathematical modelling	43
Questionnaire and/or survey	30
Case study	14
Interviews	9
Bid (simulated) experiment	5
Embedded observation	3
Literature review	2
Delphi technique	1
Focus groups	1
Grounded theory	1
Total	109

Although content analysis is limited to articles published in the selected journals (Hu *et al.*, 2016), this current study serves to highlight that research into CC tendering procedures, and associated governance controls, remains a low focus for researchers. While the content analysis shows an ongoing high focus on bid/no-bid and markup factor investigation, and associated decision modelling, the question arises as to whether such research is being followed and even adopted by CC practitioners. This work’s semi-structured interviews undertaken with Australian CCs, described in Section 4, indicate that there is a very low awareness of, and effectively no adoption of, such models.

4. Comparison of content analysis results with construction contractor interviews

As alluded to, findings from the preceding content analysis were compared with primary research results obtained during semi-structured interviews with 20 Australian civil engineering CCs, undertaken as part of the wider research project into the effectiveness and efficiency of CCs’ internal tender procedures (Urquhart *et al.*, 2017). The CCs were convenience sampled from Austroads’ National Prequalification System (NPS), a road/bridge construction accreditation body, (Austroads, 2017).

Semi-structured interviews provided opportunities to probe for clarifications or extra information (Zuo, et al. 2015) on CCs’ internal tendering procedures and consisted of three parts: part 1 involved company and individual demographics. Part 2 consisted of various ‘check list’ and ‘rating scale’ questions (Leedy and Ormrod, 2013) around tender prospect selection, risk assessments, tender review structures and CC’s knowledge, and/or use, of bid/no-bid and markup determination models. Part 3 involved an open discussion about the CC’s tender procedures, their effectiveness and efficiency, tender review processes and competitor assessment. Interviews were held, in accordance with the host institution’s human ethics requirements, from November 2016 to July 2017. Transcripts of the 1.5-2 hour long interviews were provided to the interviewees to review and adjust if necessary. CC responses were compared with the content analysis results (see Section 4.2).

During discussions CCs were asked “If you were given access to a researcher to do tender research, what would want them to research?” CC responses are reviewed in Section 5 of this paper and provide researchers with an insight into CCs’ tender research requirements.

4.1 Construction contractor demographics

Selected CC companies were invited to nominate a company representative to attend the semi-structure interviews. Eight of the CCs offered an interviewee other than the initial contact person and four CCs required two representatives to attend the interview. The demographic breakdown of the 20 CCs and respective interviewees is provided in Table 4. Six CCs secured 60-80% of their turnover by competitive tender while the remainder secured 80-100%. All

interviewed CC were assigned a randomly selected three letter acronym, rather than an interview order number, for identification purposes.

Table 4 – Interviewed construction contractor demographics

	Public	Private
Company size based on annual turnover:		
Tier 1 - (AU\$1-10 billion (US\$0.75-7.5 billion))	4	1
Tier 2 - (AU\$100 million–1 billion (US\$75-750 million))	3	4
Tier 3 – (<AU\$100 million (US\$75 million))	3	5
Interviewee's position held in company:		
Chief Executive Officer/Managing Director/National Manager	1	2
General/Regional/Operations Manager	6	4
Pre-Contracts/ Business Development/Estimating Manager	3	4
Interviewee's years' in construction:		
30-40	2	2
20-30	7	6
10-20	1	2

Note "Public" includes subsidiaries of publicly owned companies.

4.2 Contractors' use of bid/no-bid and markup decision models

Of the 20 interviewed CCs, five used a mathematical model to facilitate their bid/no-bid decision (contractors "AGJ", "CGF", "EGJ", "EHA" and "EJD"), albeit typically basic parametric-style models without statistical basis. Their respective tender procedures permitted management to override the scoring should there still be a desire to pursue a specific project opportunity regardless of the decision-model score. Low use of numerical models may occur because most CCs' bid/no-bid decisions were reassessed several times throughout a project tender process and often involved several levels of management decision, depending on delegated authorities (Urquhart *et al*, 2017).

Nineteen of the 20 CCs were unaware of the published research into markup decision-modelling techniques. One CC (contractor "HFA", a Tier 3 public CC) who was aware of such research did not use or believe in such models. One Tier 3 private CC (contractor "JFJ") said it used a mathematical model to determine its margin additions, however could not describe the model, saying the margin amount was provided by the company accountant (Urquhart *et al*, 2017). Hence, 95% of the interviewed CCs did not use markup decision-modelling techniques. This lack of modelling technique use is consistent with Egemen and Mohamed's (2007) findings of 92.5% non-use. Consistent responses suggest a level of saturation.

CCs reasons for not using such developed models were further discussed in the interviews. Despite the most common research methodology involving development of bid/no-bid and/or markup decision models from available tender data sets (see Table 3), it was found that such approaches pose several challenges for Australian CCs. Firstly, most of their clients do not disclose tendered prices, particularly in the private sector. Government road authorities remain one of the few clients likely to disclose civil construction tendered prices, albeit only on 'construct only' tenders. Such prices are usually displayed 'as opened' and may not reflect like-for-like conforming tenders. Building Cost Information Service database equivalencies (RICS, 2016) are not relevant in this situation. Some CCs admitted they occasionally priced road authority construct only projects as one of the few ways to benchmark pricing against their competitors.

Secondly, resource sector clients rarely release any winning tender results, perhaps because they can more easily award projects to other than the lowest tenderer. Thirdly, most civil engineering CCs do not specialise in narrow fields, as continuity of work is a challenge in any one sector. Hence, the chances of possessing a relevant detailed tender history of competitors by sector are unlikely and any data analysis would be of questionable value. Fourthly, the concept of predicting 'mark-ups' based on competitors' past performance was seen by many interviewed CCs as counterintuitive. The finance investment industry covers itself with the

standard disclaimer “past performance is not an indication of future performance” (Vanguard, 2016). Finally, management’s trust of ‘black box’ prediction models is an issue. The few CCs who occasionally used Monte Carlo risk modelling said results were treated with a degree of scepticism and often adjusted by management “to get the right outcome” from a commercial market perspective (Urquhart *et al.*, 2017).

Given the sample size included major Australian CCs, it is argued here that research into such predictive models is of limited interest to Australian contractors. As Chapman *et al.* (2000, p338) states, “This in turn suggests either a failure on the part of authors to convince managers that such efforts are worthwhile, or a failure on the part of theorists to convince practitioners that theoretically sound approaches are a practical proposition”. Contractors from other countries may well experience similar challenges and approaches in regards the applicability of decision models in their businesses.

In view of their apparent lack of interest in such decision-model research, the CCs were asked, “If you were given access to a researcher to do tender research, what would want them to research?” to determine where research into contractor tendering should be focused. The results are presented in Section 5.

5 Contractors’ suggestions of areas for tendering research

While not all CCs provided responses, suggestions obtained during the interviews are consolidated under five broad themes and by company size classification in Table 5. Comparing these responses with the content analysis findings suggests that there is, at least in Australia, a lack of alignment between academic research focus and CC industry interests.

Table 5 - Suggested tender research topics by contractor size and number

Suggested area of research	Tier 1	Tier 2	Tier 3
<u>Efficiency in contractors’ approaches to tendering (8):</u>			
• What is the right balance between tender process/costs and tender/project results?	1	1	1
• Where is the best place to spend tender time/cost, especially in relation to tender reviews?	1	1	1
• What is the optimum tender period/cost for best efficiency (when is a tender period too long for material gain)?		1	1
<u>Risk transfers proposed within tender document contract terms (6):</u>			
• Convincing clients adopting standard contracts, like Standards Australia forms, is more cost-efficient than bespoke contracts.	1	1	3
• Review the risks clients are passing onto contractors and whether both parties understand the implications			1
<u>Clients’ tender processes (5):</u>			
• Why are clients demanding more information be submitted with tenders, for no apparent value?	1	1	1
• Impact of increasingly poor tender document quality on decision to tender.	1		1
<u>Best practice in tender selection (3):</u>			
• High-tender-win-rate companies - what do they do others do not?	1		
• What is ‘best practice’ for deciding whether or not to bid?			1
• Contractor hubris associated with assessing ‘bid/no-bid’ factors.		1	
<u>Tender pricing decisions (3):</u>			
• Better assessments of escalation allowances and buying gain opportunities.			1
• Better practical risk and opportunity assessment methodologies other than statistical models.		1	
• More effective ways of securing past project data and productivity rates for input into tenders.		1	

The most commonly suggested research theme related to the efficiency (or otherwise) in contractors' approaches to tendering and included several subthemes. This theme is likely to appeal to contractors in other parts of the world, while the subtheme of research to convince clients of the merits of using standard contracts may be a peculiarly Australian market issue. Within the Australian market, and particularly in the resource sector, use of bespoke contracts is common, notwithstanding that a suite of Australian Standard contracts is widely available (Whyte and Macpherson, 2011). While risk transfers and contract terms featured in the research themes in Table 2, they have not been a recent Australian research focus. In regard to clients' procurement and tender procedures, there is growing CC concern about the amount of supporting documentation that clients require CCs to include with their tender submissions, especially when prequalification of CCs was a pre-tender requirement and most tenders are awarded to the lowest tender (Loosemore and Richard, 2015). One CC (contractor "JFJ") suggested these increased documentation requirements appeared to be driven by no practical reason other than clients' procurement systems now required such information. Another CC (contractor "HEF") advised that, on a shortlisted tender for a circa AU\$200 million (US\$150 million) project, they were required to submit over 20 management plans as part of their tender submission.

These findings provide researchers with an insight into CCs' tender research interests and therefore offer suggested themes for future contractor specific tendering research.

6. Conclusions and research recommendations

A content analysis of CC focused tender research, published between 2010 and 2016 in 27 journals, was undertaken. This work showed little recent empirical research into CC tendering procedures with the few relevant articles covering tender reviews, design management during the bid stage and knowledge management of 'lessons learned capture' for use in tenders. A gap identified here is how CCs manage their tendering processes while accommodating increasing corporate governance obligations in Australia.

This secondary research identified that the most common research themes (47 of the 109 articles, or 43%) involved bid/no-bid and/or markup decisions. Many of those articles included development of a mathematical decision model based around tender data sets. While such research produces good information about factors that influence such decisions, unfortunately it tends to result in models that CCs do not know about or use; this was subsequently validated by a series of semi-structured interviews with 20 Australian civil engineering CCs being undertaken for empirical research into CC tendering procedures. Findings highlighted that there is a low awareness of decision-model research (5% of interviewees) and effectively no adoption of such models by industry.

Given that these CCs did not see value in the decision-modelling research, they were asked to suggest tendering research topics which *were* of interest. In addition to wanting research into methods to improve the efficiency of their tendering procedures, two key themes sought were research to convince clients in the merits of standard contracts instead of the increasing use of bespoke contracts and concerns around the growing quantity of supporting documentation clients required CCs to include in their tender submissions for limited, if any, apparent benefit. As such, this work finds that research topics wanted by CCs do not align with the tender research themes typically researched. It is suggested the combination of the content analysis and interview responses here provides future researchers with the opportunity to re-evaluate tendering research focus.

While each market is different both in terms of clients' preferred project delivery methods and economic cycles, the issues identified in discussions with Australian contractors are likely to resonate with CCs around the world. The identified differences, between CCs' views and the tender research commonly undertaken, suggests there is a need to encourage CCs and researchers to engage more closely towards more targeted tender research.

7. Acknowledgements

The authors would like to acknowledge the contribution of an Australian Government Research Training Program Scholarship in supporting this research. The willingness of the various construction contractors to be interviewed as part of this research is greatly appreciated.

8. References

- ABS (Australian Bureau of Statistics) (2016) *8755.0 - Construction Work Done, Australia, Preliminary, Sep 2016*. See <http://www.abs.gov.au/ausstats/abs@.nsf/mf/8755.0> (Accessed: 04/01/2017).
- Asgari S, Awwad R, Kandi, A and Odeh, I (2016) Impact of considering need for work and risk on performance of construction contractors: An agent-based approach. *Automation in Construction* **65**: 9-20.
- Ashurst Australia (2014) *Scope for Improvement 2014, Project pressure points – where industry stands*. Ashurst Australia, Sydney, Australia. See <http://www.constructors.com.au/wp-content/uploads/2015/09/Scope-for-Improvement-2014.pdf> (Accessed: 12/01/2017).
- ASX (Australian Securities Exchange Corporate Governance Council) (2014) *Corporate Governance Principles and Recommendations* (3rd Edition). ASX, Sydney, Australia. See <http://www.asx.com.au/documents/asx-compliance/cgc-principles-and-recommendations-3rd-edn.pdf> (Accessed: 24/10/2015).
- Austrroads (2017) *National Prequalification System – Prequalified Contractors List*. See http://www.austrroads.com.au/images/Prequalification/NPS_Prequalified_Contractors_20170407.pdf (Accessed 14/06/2017).
- Ballesteros-Pérez P, González-Cruz, MC, Pastor-Ferrando, JP and Fernández-Diego, M (2012) The iso-Score Curve Graph. A new tool for competitive bidding. *Automation in Construction* **22**: 481-490.
- Ballesteros-Pérez P, González-Cruz CM, Fuentes-Bargues JL and Skitmore M (2015) Analysis of the distribution of the number of bidders in construction contract auctions. *Construction Management and Economics* **33(9)**: 752-770.
- Ballesteros-Pérez P, Skitmore M, Pellicer E and Gutiérrez-Bahamondes JH (2016) Improving the estimation of probability of bidder participation in procurement auctions. *International Journal of Project Management* **34(2)**: 158-172.
- Blake Dawson (2011) *Scope for Improvement 2011 - Project risk - Getting the right balance and outcomes*. Blake Dawson, Sydney, Australia. Available at www.blakedawson.com/publications/scopeforimprovement
- Brook, M (2011) *Estimating and Tendering for Construction Work* (4th edition). Spon Press, London, UK.
- Cattell DW, Bowen PA and Kaka AP (2011) Proposed Framework for Applying Cumulative Prospect Theory to an Unbalanced Bidding Model. *Journal of Construction Engineering and Management* **137(12)**: 1052-1059.
- CEIIDA (Centre for Excellence and Innovation in Infrastructure Delivery) (2010) *Infrastructure Procurement Options Guide*. Centre for Excellence and Innovation in Infrastructure Delivery, Government of Western Australia. Available at <http://www.ceiid.wa.gov.au/publications.html>
- Chalker M and Loosemore M (2016) Trust and productivity in Australian construction projects: a subcontractor perspective. *Engineering, Construction and Architectural Management* **23(2)**: 92-210.
- Chapman CB, Ward SC, and Bennell JA (2000) Incorporating uncertainty in competitive bidding. *International Journal of Project Management* **18(5)**: 337–347.
- Chou JS and Yang JG (2012) Project Management Knowledge and Effects on Construction Project Outcomes: An Empirical Study. *Project Management Journal* **43(5)**: 47-67.
- CoA (Australian Commonwealth) (2001) *Corporations Act 2001*, Australian Government, Canberra Available at <https://www.legislation.gov.au/Search/Corporations%20Act%202001> (accessed 05/01/2018).
- Coggins J, Teng B and Rameezdeen R (2016) Construction insolvency in Australia: reining in the beast. *Construction Economics and Building* **16(3)**: 38-56.
- DTF (Department of Treasury and Finance, Victoria) (2013) *Model Tender and Contract Documentation: Implementation Guidelines to the Victorian Code of Practice for the Building and Construction Industry*, Department of Treasury and Finance, Melbourne.

- Egemen M and Mohamed AN (2007) A framework for contractors to reach strategically correct bid/no bid and mark-up size decisions. *Building and Environment* **42(3)**: 1373–1385.
- El-Mashaleh MS (2013) Empirical Framework for Making the Bid / No-Bid Decision. *Journal of Management in Engineering* **29(3)**: 200-205.
- Enshassi A, Mohamed S and Karriri AE (2010) Factors affecting the bid/no bid decision in the Palestinian construction industry. *Journal of Financial Management of Property and Construction* **15(2)**: 118-142.
- Greenhalgh B (2013) *Introduction to Estimating for Construction*. Routledge, London, UK.
- Hu X, Xia B, Skitmore M and Chen Q (2016) The application of case-based reasoning in construction management research: An overview. *Automation in Construction*
- Jarkas AM, Mubarak SA, and Kadri CY (2014) Critical Factors Determining Bid/No Bid Decisions of Contractors in Qatar. *Journal Management in Engineering* **30(4)**,05014007.
- Ke Y, Ling FYY and Ning Y (2013) Public construction project delivery process in Singapore, Beijing, Hong Kong and Sydney. *Journal of Financial Management of Property and Construction* **18(1)**: 6-25.
- Krippendorff, K (2013) *Content Analysis: An Introduction to Its Methodology* (3rd edition). Sage, Thousand Oaks, CA, USA.
- Laryea S (2013) Nature of Tender Review Meetings. *Journal of Construction Engineering and Management* **139(8)**: 927-940.
- Leedy PD and Ormrod JE (2013) *Practical Research Planning and Design* (10th ed). Pearson Education, Upper Saddle River, NJ, USA.
- Liu L, Bannerman PL, Ding X, Elliott EJ, Ewart G and Kong X (2016a) The motives for and consequences of underpricing for construction contractors - evidence from Australia. *Journal of Modern Project Management* **3(3)**: 36-45.
- Liu T, Wang Y and Wilkinson S (2016b) Identifying critical factors affecting the effectiveness and efficiency of tendering processes in Public–Private Partnerships (PPPs): A comparative analysis of Australia and China. *International Journal of Project Management* **34(4)**: 701-716.
- Loosemore M (2014) Improving construction productivity: a subcontractor's perspective. *Engineering, Construction and Architectural Management* **21(3)**, 245-260.
- Loosemore M and Richard J (2015) Valuing innovation in construction and infrastructure, Getting clients past a lowest price mentality. *Engineering, Construction and Architectural Management* **22(1)**: 38-53.
- Low WW, Abdul-Rahman H and Zakaria N (2015) The impact of organizational culture on international bidding decisions: Malaysia context. *International Journal of Project Management* **33(4)**: 917-931.
- Nandi S, Paul S, and Phadtare M (2011) An AHP-based construction project selection method. *Decision* **38(1)**: 91-118.
- Naouma S and Egbua C (2015) Critical review of procurement method research in construction journals. *Procedia Economics and Finance* **21**: 6-13.
- Olatunji O, Aje OI and Makanjuola S (2017) Bid or no-bid decision factors of indigenous contractors in Nigeria. *Engineering, Construction and Architectural Management* **24(3)**: 378-392.
- Oo BL and Lim BTH (2016) Game-based learning in construction management courses: a case of bidding game. *Engineering, Construction and Architectural Management* **23(1)**: 4-9.
- Oo BL, Drew DS and Lo HP (2010) Modeling the Heterogeneity in Contractors' Mark-Up Behavior. *Journal of Construction Engineering and Management* **136(7)**: 720-729.
- Oo BL, Ling FYY and Soo A (2014) Information feedback and bidders' competitiveness in construction bidding. *Engineering, Construction and Architectural Management* **21(5)**: 571-585.
- PMI (Project Management Institute) (2008) *A guide to the project management body of knowledge* (PMBOK® Guide) 4th edn.. PMI, Newtown Square, PA: USA.
- Polat G, Baytekin S and Eray E (2015) Mark-up Size Estimation in Railway Projects using the Integration of AHP and Regression Analysis Techniques. *Procedia Engineering* **123**: 423-431
- Ray RS, Hornibrook J, Skitmore M, and Zakarda-Fraser A (1999) Ethics in tendering: A survey of Australian opinion and practice. *Construction Management and Economics* **17(2)**: 139–153.

- RICS (Royal Institute of Chartered Surveyors) (2016) Building Cost Information Service (BCIS). See <http://www.rics.org/au/knowledge/bcis-oceania/about-bcis/data-collection/> (Accessed 29/07/2017).
- Rose TM and Manley K (2014) Revisiting the adoption of innovative products on Australian road infrastructure projects. *Construction Management and Economics* **32(9)**: 904-917.
- Runeson G and Skitmore M (1999) Tendering theory revisited. *Construction Management and Economics* **17(3)**: 285-296.
- SAI (Standards Australia International) (2003) *AS8000-2003 Good Governance Principles*, incorporating Amendment No 1, October 2000. SAI, Australia.
- Shokri-Ghasabeh M and Chileshe N (2014) Knowledge Management Barriers to Capturing Lessons Learned from Australian Construction Contractors Perspective. *Construction Innovation* **14(1)**: 108-134.
- Shokri-Ghasabeh M and Chileshe N (2016) Critical factors influencing the bid/no bid decision in the Australian construction industry. *Construction Innovation* **16(2)**: 127-157.
- Soo A and Oo BL (2014) The effect of construction demand on contract auctions: an experiment. *Engineering, Construction and Architectural Management* **21(3)**: 276-290.
- Tan Y and Shen L (2010) A fuzzy competence requirement (FCR) model for competitive bidding strategy. *Construction Innovation* **10(1)**: 75-88.
- Tran H and Carmichael DG (2013) A contractor's classification of owner payment practices. *Engineering, Construction and Architectural Management* **20(1)**: 29-45.
- Uher TE, and Runeson G (1984) Pre-tender and post-tender negotiations in Australia. *Construction Management and Economics* **2(3)**: 185-192.
- Urquhart S, Whyte A and Lloyd N (2017) The development of a more efficient internal tender procedure framework for Australian construction contractors In: Chan P W and Neilson C J (Eds) Proceeding of the 33rd Annual ARCOM Conference, 4-6 September 2017, Cambridge, UK, Association of Researchers in Construction Management, 693-702.
- Van Der Meer J, Hartmann A, Van Der Horst A and Dewulf G (2015) Challenges of using systems engineering for design decisions in large infrastructure tenders. *Engineering Project Organization Journal* **5(4)**: 133 – 145.
- Vanguard (2016) General Advice Warning. See <https://www.vanguardinvestments.com.au/au/portal/homepage.jsp> (Accessed 12/12/2016).
- Whyte A and Macpherson E (2011) Standard Forms of Contract Selection Criteria: A Qualitative Analysis of the Western Australian Construction Industry In: *COBRA 2011: Proceedings of RICS Construction and Property Conference, Salford* (Ruddock L and Chynoweth P (eds)): The Royal Institution of Chartered Surveyors, UK, pp 651-661.
- Zuo J, Zillante G, Xia B, Chan A and Zhao Z (2015) How Australian Construction Contractors Responded to the Economic Downturn. *International Journal of Strategic Property Management*, **19(3)**: 245-259.