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‘BLT’ IS NOT A SANDWICH: LEARNING & TEACHING EMERGING BUILDING PROCUREMENT METHODS; AUSTRALIAN, ASIAN AND EUROPEAN PERSPECTIVES

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Abstract

A clear understanding of procurement methods for built environment professionals is paramount. The current building process continues to evolve for both, governments and private sector clients and in cases also for combined public-private concessions. Over the last 25 years clients have become more knowledgeable on procurement, project finance and construction delivery mechanisms. Some institutional clients have evolved to become industry experts, in other cases contractors have become project investors such as in Public-Private Partnerships (PPPs) or Build-Lease-Transfer (BLT). As building and construction procurement methods continue to change it is then paramount to bring this knowledge into Master and Higher Education programs related to the built-environment. It is important to clearly understand the emerging procurement methods and mechanisms to successfully deliver and operate projects including building with quality, stakeholder engagement, risk sharing, owner life-cycle operations and project financing strategies. It is important to learn how to identify key project attributes before selecting a procurement route. This matching exercise is explained in the paper utilising six techniques. This paper then discusses on learning and teaching procurement as experienced by the authors with experiences in Australia, Asia and Europe in particular with research and teaching to Master and Honours students in architecture, engineering, building operations and construction management.

Keywords

Building Procurement, Decision-Making, Value for Money, Project Life-cycle

Introduction

Learning & Teaching building procurement methods to built environment professionals is paramount. In the last three decades considerable attention and research has been done in construction procurement methods (Naoum & Egbu, 2016). The construction industry was identified as an example of market failure, contracting arrangements generating excessive transaction costs and poor client satisfaction (Sweeny, 2009). Sweeny in his research found that the current industry model is not operating to deliver projects outcomes to achieve accurately customer needs and expectations in a consistent way. In addition, a survey prepared by the Chartered Institute of Buildings in 2010 (CIOB, 2010), revealed that for 77% of the respondents see clients as not sufficiently knowledgeable about procurement in the construction industry, which often leads to poor leadership and advice being taken from a client perspective and results in potential project short comes such as over-budget, outside of timeframes and poor construction standards with resulting building defects and quality short comes (CIOB, 2010). Much of the concern for construction quality has exacerbated in recent years, in particular with flagship projects being on the spotlight such as the disastrous fires of the Glenferrie Tower in the UK (2017) and the Lacrosse Tower, Melbourne (2014) and more recently the disputes on urgent structural rectification of the Opal (2018) and the Mascot (2019) towers in Sydney.

From an industry perspective, construction professionals view procurement as crucial to the timely delivery of project both, on budget and to high quality standards. The same survey (CIOB, 2010), revealed that for 87% of respondents believed that good procurement is synonymous of a successful project. The same survey identified that 65% of the construction short comes were due the wrong used of delivery methods (CIOB, 2010). Considering that 93% of respondents have been involved in projects that overran in terms of cost is it worth considering their views as 57% of those projects believed that the chosen procurement method directly contributed to the cost overruns. Similarly, 94% have been involved on projects that overran in terms of time. Of those, 49% believe the chosen procurement method directly led to the time overruns.

If looking at the above, the link of procurement methods and project outcome is clear. Two questions remain open: which are those procurement methods are available? and how to select the right fit? In the view of the authors those two questions in combination require further investigation and more importantly, adoption by industry and client organisations. This paper deals with the second aspect. This is to say that Learning & Teaching and learning construction procurement by various project stakeholders is paramount in the improvement of construction quality.

Some authors recognised the importance of the procurement selection criterion and identified that it often tilts towards risk aversion or preventions rather than best overall outcomes, thus identifying best value for money solution for overall project lifecycle (Edwards et. al, 2014). More often than not, the industry seems to make key decisions based on ‘gut-feeling’ rather than applying rational thinking and decision-making, Sweeny (2009) highlighted that a significant percentage of industry key decision-makers did not make appropriate criterion for selecting the best method, ie. they have stayed in a comfort-zone selecting procurement methods previously utilised. Alan Turner (1997) developed a table with four traditional methods and using nine criterion and questions that could be applied for procurement method selection resulting in an objective and rational decision.

However, a problem identified in the literature is the overwhelming use of jargon and terminology that also changes in relation to countries and geographic jurisdictions such as economic zones or states within countries. Klein, R. (RIBA, 2018) mentioned that in his experience, over 95% of sub-contracts and sub-sub-contracts are amended standard contracts or bespoke contracts. In 30 years of dealing with contractual and legal issues in the industry, I can only recall one example of the use of an unamended sub-contract. In other words, even if the principal contractor is set away from a cost + contract such as an alliance contract, subcontractors and the overall supply chain is still pretty much business as usual. This calls for deeper education for client and industry bodies and representatives of various suppliers of professional services.

Soup of letters: building procurement methods

The process for selecting the most suitable procurement delivered method has been studied since 1985 with the NEDO report (NEDO, 1985) and after that several methods have been used and research to adjust the methods with the specify requirements of projects and clients (Skitmore & Martin, 1988; Franks, 1990; Turner, 1990; Kumaraswamy & Dissanayaka, 1998; Alhazmi & McCaffer, 2000; Chueng et al. 2001; Morledge & Smith, 2013; Naoum & Egbu, 2016; Bugrov & Bugrova, 2018). Grimsey and Lewis further reviewed methods such as Public-Private Partnership by carefully describing what is a PPP, and what not (2014) the paper contains a raft of abbreviations and acronyms ranging from BLT (Build-Lease-Transfer) to BOO and BOOT (Build-Own-Operate and Transfer).

The authors now reflect on the lessons of teaching procurement methods in higher education with Construction Management Honours and Master programs delivered in Europe, Asia and Australia. The vision is to educate construction professionals at a deeper level on the clear understanding of how projects come about and what are the contractual relationships, which place them on a launching platform for success. Value management workshops identifying core project attributes and procurement method identification are some of the teaching techniques applied (Aranda-Mena 2016). The premise is that there is no good nor bad procurement method but the challenge is on identifying

the right fit based on project attributes. For over a decade all cases have been real construction scenarios with industry speakers brought on board (Aranda-Mena et. al. 2013).

Procedure: Teaching and learning procurement methods in a period of twelve weeks in lectures of two to three hours plus weekly tutorials. Industry guest speakers are often invited due to the pragmatic nature of the subject, students of construction management and engineering highly value direct industry insights and hands-on workshops during tutorials. The aim is to develop a clear understanding on each of the procurement methods and students are asked to set up packages for a building or infrastructure project so lessons learnt are put into place from day one. The methods presented here below encourage students not only to apply established procurement routes but also to compare with emerging ones based on best project outcomes. The three first methods on construction procurement are thought by the second co-author and the last two, on infrastructure procurement, by the lead co-author.

Selecting a procurement route: Alan Turner (1997)

Turner, A (1997) develop a methodology to help clients to select the best procurement route following the recommendation of the NEDO' report (NEDO, 1987). He started the process with the first seven steps for medium-large projects: (1) selecting an in-house project executive; (2) Appointment of a principal adviser; (3) Care in deciding the client's requirements; (4) Timing the project realistically; (5) selecting the best procurement path; (5) Choosing the organisations to work with the client (7) Designation a site or building. Based on 12 case studies he tested the application of the NEDO report "Thinking about Building" and introduced developed a table with nine criterion for four traditional methods, not including private finance: Traditional, Design and Build Management and Design and manage

His strategy was to start with the context, understand the client characteristics based on Masterman and Gameson (1994) suggestions and project, and use the NEDO table suggestions to access the Procurement Assessment Criterion (PAC) (See Table) following an analysis of the results looking at the different Procurement Arrangement Options (PAO).

As point of departure, client and project particulars are explained and workshopped during class. Alan suggested an initial understanding of the balance of priorities between what he called Product, Price and Programme. The product is usually referred to quality, performance or complexity. The price is usually referred to costs, cost certainty, or flexibility in target. The programme is time, early start, early completion, important milestones. See in figure 2, an example of a project with a balance of priorities where the programme is more relevant for a client.



Figure 1. Example of balance between programme, product and price (based on Alan 1990)

The following Table 1 Provides an example of underlying project criteria and project attributes. The clear understanding of project nature can then be linked to a procurement method or methods such as in cases when projects are packaged under various modes looking at ‘value for money’ outcomes.

Table 1: Adapted from Alan (1990) and NEDO (1987)

Combined Procurement Assessment Criteria and Identifying Project Priorities												
Criteria	Sub-criteria		Procurement method									
			Traditional		Design and Build		Management		Design and Manage			
			Criteria (0 or 1)	Sequential	Accelerated	Direct	Competitive	Develop and Construct	Management contracting	Construction Management	Contractor PM	Consultant PM
Timing	Crucial	0			0	0			0	0	0	0
	Important	0			0	0	0	0	0	0	0	0
	Not as important as other factors	0	0									
Variations	Yes	0	0	0					0	0	0	0
	Definitively not	0			0	0	0					
Complexity	Yes	0	0	0					0	0	0	0
	Moderately so	0		0	0	0	0	0	0	0		
	No, just simple	0			0	0						
Quality level	Basic competence	0			0	0						
	Good but not special	0	0	0	0	0	0	0	0	0	0	0
	Prestige	0	0		0				0	0		
Price certainty	Yes	0	0			0	0	0	0		0	
	Target plus or minus will do	0		0						0		0
Competition	Certainly for all construction work	0	0				0	0	0	0	0	0
	Construction and Management teams	0	0					0	0			
	No, other factor are more important	0			0							
Responsibility	Can manage separate firms	0	0	0					0	0		
	Must have only one firm for everything	0			0	0	0				0	0
Risk avoidance	No, prefer to retain risk and therefore control	0								0		0
	Prepared to share agreed risks	0	0	0					0			
	Yes	0				0	0	0			0	
		Total	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ

For teaching purposes the four Procurement Methods shown in the above Table 1 are used in individual assignments. Students need to clearly understand client requirements and project characteristics (including expectations) and then to use the table to compare and run the best matching factor. The NEDO / Alan table also provides an effective way to investigate existing projects/case studies in order to evaluate other potential outcomes to the one reported by the client or project team. This method helps students to justify what and why they recommend specific procurement modes. This method combines quantitative data and qualitative assessments as well.

Selecting a procurement route: Sean Sweeney (2009)

Sweeney (2009), demonstrated the importance of using transaction cost economics (TCE) theory for project delivery approaches in large and complex projects rather than use current ‘market contracting’ perspective. Sweeney studied twelve different procurement methods: Lump-Sum; Guaranteed Maximum Price (GMP), Cost reimbursable; Measure and value/schedule of rates; Design and Construct (D&C); Construction Management, Managing Contractor; Fast track; Negotiated; Project Alliance; Public-Private Partnerships (PPP). Sweeney recommended organisations to six steps to approach his methodology: (1) Identification of project characteristic, (2) Development of a Procurement delivery project performance criterion, (3) weighting the criterion against the specific needs of the project, Client’s Criterion Preference Score (CCPScore) (see table 2), (4) Assessment and scoring of the same criterion across a wide range of PDM’s to generate ‘utility factors’ for each

criterion for each PDM (see table 3), (5) Scoring each PDM using the utility scores noted in 4 and multiply these by the weightings developed on 3, (6) ranking each PDM by the resultant score to identify the PDMs most likely to suit the needs of the project (see table 4).

Table 2 – Identify client's criterion preference score (Adapted from Sweeney 2009)

	Criterion 1	Criterion 1	Criterion 1	...
CCPSCore	A%	B%	C%	...

Table 3 – Example of raking of each criterion for each PDM (1-10) to generate CCPScores (Sc 1-Sc10) (Adapted from Sweeney 2009)

Criterion	PDM 1	PDM 2	PDM 3	PDM 4	...
Criterion 1	Sc.1	Sc.6	Sc.4	Sc.9	...
Criterion 2	Sc.5	Sc.3	Sc.5	Sc.2	...
Criterion 3	Sc.6	Sc.9	Sc.7	Sc.5	...
...	...	...	...	...	...

Table 4 – Final results combining raking of criterion of each PDM with criterion score for client (Adapted from Sweeney 2009)

Criterion	CCPSCore	PDM 1	PDM 2	PDM 3	PDM 4	...
Criterion 1	A%	A% x Sc.1	A% x Sc.6	A% x Sc.4	A% x Sc.9	...
Criterion 2	B%	B% x Sc.5	B% x Sc.3	B% x Sc.5	B% x Sc.2	...
Etc.	..	...	...	...	...	...
Total	$\Sigma 100\%$	Σ	Σ	Σ	Σ	

Sweeney (2009) identified 30 main project performance criterion consolidated in 11 generic ones. An example criterion would be: Quality, funding rigidity, program speed, scope rigidity, risk transfer, complexity in client, need for contractor involvement in design, flexibility, operational perspective to the design, innovation and value creation, transaction economy. This method is used in workshops with the students, and in groups of 4 or 5 students are requested to look at different case studies. Firstly, each group needs to identify between 5 and 7 criterions by which to select preferred PDM for their project. Each criterion should reflect their Client's preferences and be expressed as clearly as they can. e.g. Cost - their preference that the selected PDM can control cost growth risk throughout the progress of the project. Spend some time thinking and discussing what your Client's criterion may be.

Then the students are expected to produce an agreed list of Client criterion for a given project. Secondly, each group splits into two. The smaller number of the group ranks or scores each criterion in terms of relative preference over the other agreed criterion. Should end up with each criterion having a numeric score (or %) which shows it relative ranking in relation to the other criterion. Call this the Client's Criterion Preference Score (CCPSCore). The larger part of the group takes the Client criterion and assesses each of the PDMs against the list of criterions. I.e. for each PDM produce a score (say 1-10) which notes that PDM's specific ability to provide or meet the demand of each

specific client criterion. Finally, each group review scores, discuss and report recommendation to the full class.

Selecting a procurement route: Morledge & Smith (2013)

Morledge & Smith (2013) in the second edition of the book Building Procurement developed a methodology, including NEDO (1998) and Skitmore and Marsden (1988). Using the same methodology that Alan for client characteristics, Morledge & Smith introduced the component dynamic of the process and a typical balance for main types of clients. Owner-occupier clients may emphasise occupation and value certainty; developers, price and rapidity; and investor clients, design and speed.

In addition, the authors, adapted the method of scoring utility factors developed by Fellows and Langford (1980) to rank the criterion for each procurement method (See columns (a) in table 5). In other to link client and project's particular with these utility factors, the authors proposed a client's priority (P) raking between 5 to 1 (From 5 Essential to 1 Do Without). Each client's priority will be multiplied by the utility score to obtain a score, the final results will be adding all the scores by each column.

Table 5: Identifying client's priority. Adapted from Morledge & Smith (2013)

Client's Priority		Procurement Method															
		Traditional				Design and Build				Management				Design and Manage			
P=	5	Sequential	Accelerated	Direct	Competitive	Develop and	Management	Construction	Contractor	Management	Contracting	Management	PM	PM	PM	PM	PM
to	1																
1		(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Timing	P1	10	(a)xP1	50	(a)xP1	100	(a)xP1	90	(a)xP1	60	(a)xP1	100	(a)xP1	100	(a)xP1	90	(a)xP1
Cost	P2	90	(a)xP2	40	(a)xP2	100	(a)xP2	100	(a)xP2	90	(a)xP2	20	(a)xP2	20	(a)xP2	30	(a)xP2
Flexibility	P3	100	(a)xP3	90	(a)xP3	30	(a)xP3	30	(a)xP3	40	(a)xP3	80	(a)xP3	90	(a)xP3	60	(a)xP3
Complexity	P4	40	(a)xP4	20	(a)xP4	20	(a)xP4	10	(a)xP4	40	(a)xP4	100	(a)xP4	100	(a)xP4	70	(a)xP4
Quality	P5	100	(a)xP5	60	(a)xP5	40	(a)xP5	40	(a)xP5	70	(a)xP5	90	(a)xP5	100	(a)xP5	50	(a)xP5
Price Certaint	P6	40	(a)xP6	50	(a)xP6	100	(a)xP6	90	(a)xP6	90	(a)xP6	40	(a)xP6	30	(a)xP6	100	(a)xP6
Responsibilit	P7	30	(a)xP7	30	(a)xP7	100	(a)xP7	100	(a)xP7	70	(a)xP7	60	(a)xP7	90	(a)xP7	100	(a)xP7
Risk	P8	30	(a)xP8	30	(a)xP8	80	(a)xP8	100	(a)xP8	70	(a)xP8	30	(a)xP8	10	(a)xP8	100	(a)xP8
Results			Σ		Σ		Σ		Σ		Σ		Σ		Σ		Σ

(a) Utility, (b) Score

Selecting a procurement route: Grimsey and Lewis (2004 and 2014)

The Grimsey triangle is a method currently public infrastructure procurement. The use of the tool is set in a workshop environment where students need to assess and think on a particular project attributes from various stakeholders and professional disciplines thus bringing best Value for Money outcomes. Overall, it is important to understand where a particular project sits in relation to five axes including: time to market, value for money, risk transfer, innovation and flexibility for change (See Fig. 2).

A workshop discussion takes place where participants rank the project according to the above 5 dimensions and then drawn on a two-dimensional plot. Then, a second layer where various procurement methods are objectively located in relation to the 5 dimensions is shown. The findings are discussed across main stakeholders and a decision is made. Full explanation of the method is beyond the scope of this paper however, figure 3 illustrates the relationship of the 5 dimensions of project expectations and the qualities of various procurement methods.

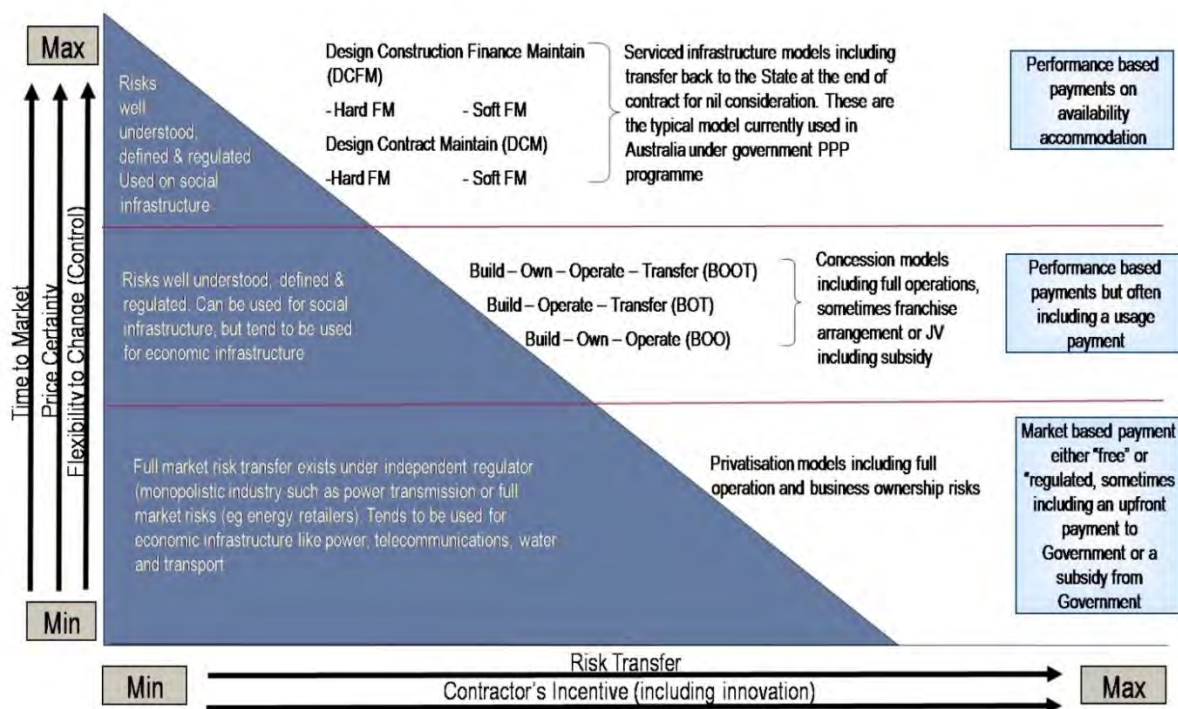


Figure 2: Triangle with five dimensions on project attributes (Grimsey and Lewis 2004)

Selecting a procurement route: Richard Foster

The Foster approach closely aligns to the one set by Partnerships Victoria, Australia for infrastructure procurement, the method looks to further investing the business case if a project is being proposed as a Public-Private Partnership. This is important to further investigate as the PPP route creating a business plan and market appetite if private sector project financing is a viable route. The full procedure aims to identify value for money and a clear business case for the client (not for the contractor but for the client which in the PPP model is a public organisation or entity such as hospital for instance).

Learning & Teaching procurement: reflections

The process of teaching procurement methods should always start by a thorough understanding of project attributes which could escalate into high risk such as price, design/construction quality, time, resources (material, labour and equipment), coordinating subcontractors (or trade contractors) amongst other. This first approach of basic methods leads towards more modern methods, using collaborative methods of sharing risks for construction (alliancing), and using external partners to finance the project (BOT) and to finance and operate (BOOT, PPP, PFI) which usually include the traditional methods as sub-procurement. In addition, looking at procurement methods internationally, language and cultural issues need to be better understood.

If reflecting on regional and national differences, this paper discusses on the need for procurement courses to cater for such contextual differences. Harmonisation on standards across European member states helps and comparison with Australia is important when teaching international students. In the case of Asia ISO standards apply. Procurement methods or process to deliver projects have different names in different countries. As an example, in Portugal the term Procurement does not have a direct translation, the different methods of contracting are identified by “code of contracts” or “work contracts” used in Portuguese legislation and standards forms of contracts. An example is a typical

construction management system that in Europe is the designation for the management method where the client takes on the contractual role and construction or project manager provides the active role of managing the separate trade contractors. In comparison the UK and Australia, the label (name) of some procurement methods differ however the methods remains the same for example Private Finance Initiative versus Public-Private Partnership. Other examples on label changes across jurisdictions are two management methods: Construction Management and Management contracting in Europe (UE) and UK Construction Management methods means that the client contract the trades (thus liable). In Australia the same name alludes to the main contractor subcontracting all trades (see table 6). Also, in Australia is common to use the terminology such as design and construct or design and build, with or without novation of the design consultant, which is not the case in other jurisdictions.

Table 6: Comparative table on construction management roles and methods from client perspective.

Names of procurement delivery methods in UE versus Australian for Management Methods:		
Management Methods	UE (EC-LLC, 2012)	Australia (Australian Standards)*
Client liable for		AS 4915-2002
Design consultants and	Construction Management	Project Management
Trades packages	(Consultant)	(General conditions)
hiring a consultant to act as PCM to help on the performance		<i>[This contract is between the client and the consultant]</i>
Client liable for		
Design consultants and	Construction Management	Could amend a variety of AS contracts depending on whether the individual contractor is doing design work
Trades packages	(Contractors)	<i>[These contracts are between the client and the contractors]</i>
hiring a contractor to act as PCM to help on the performance		
Client liable for		AS 4916-2002
Design consultants and		Construction Management
hire a contractor to act as a PCM and to be liable for	Management contracting	(General conditions)
Trades packages		<i>[This contract is between the client and the consultant]</i>
Client hires a consultant to act as PCM to be liable for		AS 4904-2009
Design consultant and	Design and Manage	Consultants agreement
Subcontractors' work	(Consultant)	(Design and Construct)
		<i>[This contract is between the client and the consultant]</i>
Client hires a contractor to act as PCM to be liable for	Design and Manage	Could amend a variety of AS contracts depending on whether the individual contractor is doing design work
- Design consultant and	(Contractors)	
- Subcontractors' work		

* Note: The Australian Standard contracts do not necessarily correspond perfectly to the UE delivery methodology; they will typically require scrutiny and amendment.

Reflections on learning and teaching: Southeast Asia and Australia. All course offerings are part of the same Honours Bachelor of Science in Construction Management under the following course subjects: Advanced Construction Management, Construction Planning and Design 3 and Construction Specialisation. The approach is by preparing an Expression of Interest (EOI) report for an infrastructure project often on the area of health such as a hospital or transportation such as a train or metro line including stations. At the early project stages students need to develop a procurement plan in which they look at an overall value for money (VfM) proposition such as sub-packaging projects. For example, when taking a project such as the North-West Rail Link in Sydney, they had to identify aspects of the project, which could be delivered under Traditional, Alliancing, Design, and Build or Public-Private Partnership (PPP) contract types, then they had to develop a full EOI for the project proposal including all procurement project packages. Client organisations (or industry presenters) representing the Government provide the project brief. The difference between Australian and Asian offerings is the contextual and cultural difference. All case projects tend to be located in Australia however Asian teams often creating more diverse and interesting international industry consortium as they set up their Joint Venture (JVs) or Special Purpose Vehicles (SPVs), also the outlook for schematic/conceptual designs tends to be more creative and well represented by the Asian students (in particular Singaporean students who often develop sophisticated 3D visualisations in BIM platforms).

Student feedback and experience over the years indicates that the value on delivering a class in this mode relies on industry engagement and proximity with real (professional) life scenarios including call for expressions of interest (EOIs) made for real by Government departments of health or transport. Also, attendance by key industry players as guest speakers and tutorials delivered in workshop style with activities like those from practice (often attended by industry as well). A final aspect of real-life experience includes end of semester presentations to an industry panel (which sets questions, examines and provides feedback at the end of semester). In this way, industry engagement works both ways.

Applying lessons and future directions

Both co-authors are looking to further engage on the delivery of their courses, not only engaging with industry but collaborating across universities and disciplines. As next step, the authors are looking to work across countries and institutions offering thus shared experiences and lessons from various contextual and cultural background across European, Asian and Australian experiences. This somehow is seen as a virtual study tour in which, for instance, Singaporean students are briefed by Melbourne students acting as client organisation for a project development in Australia and vis-a-versa, Melbourne students briefed by Singaporean students acting as client organisation for a project development in South-east Asia. Technical and strategic thinking develops as students are immersed in different cultural, economic and legal context, not just across countries and programs but also disciplines forcing them to collaborate and ultimately learn. This Learning & Teaching mode and model has also attracted industry interest to be applied/delivered inside client and construction organisations as part of their Continued Professional Development (CPD). Finally, both co-authors are in the process of preparing research grant applications to further academic and industry domain knowledge on procurement.

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**PROCEEDINGS OF THE 43RD AUSTRALASIAN
UNIVERSITIES BUILDING EDUCATION
ASSOCIATION (AUBEA) CONFERENCE**

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Editors

Xianbo Zhao, Pushpitha Kalutara, Ronald Webber

Central Queensland University, Australia

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