FACTORS THAT INFLUENCE THE FORMATION OF CONSTRUCTION PROJECT TEAMS FOR SUSTAINABILITY: CONSIDERATION OF SPECIFICITY

Andrew Ross*, Augustine Blay Armah and Anupa Manewa
School of the Built Environment, Liverpool John Moores University, UK

ABSTRACT

The importance of effective multi-disciplinary organisational teams has been a central aim of management research in the construction industry for over 50 years. As design and construction processes are reconsidered to include sustainability there is a need to consider procurement approaches which facilitate more effective coordination between supply chain partners. Such procurement approaches require a strong theoretical basis and also need to consider parties other than the client, design team and contractor. This paper reports on ongoing research about the factors that influence the formation of construction project teams. The focus of the study was how buying organisations' collaborative procurement strategies interact with a range of specialised trade contractors and to identify those factors which affect their selection during the project development. The theoretical basis for the study was adapted from transaction cost economics and the research strategy was mixed. This paper reports upon the quantitative second phase which used a survey of 570 professionals working for UK contracting organisations. The findings of the research suggest a future approach is required which seeks to increase the specificity of trade contractors to the developing project which will facilitate an improvement in knowledge transfer relating to alternative low carbon approaches to design and construction.

Keywords: *Knowledge Transfer; Supply Chain Integration; Sustainability.*

1. INTRODUCTION

It is widely recognised that a project is successful when is completed on time, within budget, in accordance with specification, and delivers value for money for clients and end-users (Davis and Love, 2011; Eriksson, 2010; Egemen and Mohamed, 2005). However construction clients are dissatisfied with the performance of the industry (Meng, 2010; Karim *et al*., 2006; Beach *et al*., 2005; Miller *et al*., 2002). In the United Kingdom (UK), the construction sector has been criticised for underperforming. Time and budget overruns are common and excessive resources are required to correct defects. Poor productivity, variable construction quality and client dissatisfaction are problematic areas for the sector (Kadefors, 2011; Eriksson *et al*., 2007; Egan, 1998; 2002). Some of the root causes for poor performance have been attributed to the sector's features: fragmentation, the uniqueness of construction as a product, outdated procurement methods, and little or no integration between the project actors (Eriksson *et al*., 2007).

The UK construction industry has a long-standing reputation for being adversarial, demonstrated by poor relationships between members of project team, which in turns, results in numerous problems including poor project performance and limited number of long-term relationships between project participants. Given the severity of the problems and the obvious failing of the industry's approach towards integration of key project team members and processes, it was of little or no surprise that Sir John Egan's report (1998) challenged the industry to address its under-performance. In a follow up review, the industry's 'Strategic Forum' laid down challenging targets for improving its management practices within its 'Accelerating Change' report (Strategic Forum for Construction, 2002). As Wolstenholme (2009) recently highlighted, the industry needs to maintain its focus on integrated supply chains. It has been suggested that practice from manufacturing can be transferred to the construction industry (Errasti *et al*., 2007; Akintoye *et al*., 2000) and that organisations extended their management

*Corresponding Author: E-mail - A.D.Ross@ljmu.ac.uk

approaches beyond the boundaries of organisations to include their suppliers (Christopher and Towill, 2001; Gunasekaran and Love, 1998).

Organisational collaboration includes a wide range of practices intended to facilitate greater inter-firm cooperation amongst those involved to increase the whole supply chain network performance (Goulding *et al*., 2012; Barlow *et al*., 1997). In the construction sector, it may be short-term and project-orientated or long-term and strategic in nature (Goulding, 2012; Beach *et al*., 2005; Barlow and Jashapara, 1998). In the case of the later, it is usually concerned with optimising the relationship's resources through closer collaboration to exploit long-term benefits, whereas the former focus more on agreeing project governance issues to secure immediate project benefits (Errasti *et al*., 2007; Beach *et al*., 2005). Collaborative sourcing is often perceived as the optimum approach to achieving supply chain improvement through the development of more effective customer-supplier relationship (Humphrey *et al*., 2003).

Unfortunately, whilst there is sufficient evidence to suggest that the collaborative relationships in construction developments have been increasing of recent years, it has been reported that not all the collaborative relationships in construction developments are successful (Ng *et al*., 2009; Miller *et al*., 2002; Dainty *et al*., 2001). Its acceptance amongst the main contractors, subcontractors and their suppliers in the UK construction industry is still not considered to be universal (Mason, 2007; Beach *et al*., 2005). This is due to the industry being affected by macro-economic, organisational and technological factors that serve to restrain change to its structure, practices and products. The external environment is a key factor in the contingent organisation of projects (Hartmann and Caerteling, 2010; Moore, 2002). Collaboration requires that firms undertake a range of transactions with other organisations that are informed by the context of their market. According to Bidgoli (2010), supply chain management should incorporate strategic differentiation in order to achieve value enhancement, operational efficiency improvement, and cost reduction. Indeed, the application of supply chain initiatives has been criticised for being generic and without due consideration for different subcontract trades (Ross and Jaggar, 2005, Ross and Goulding, 2007; Ross, 2011), and a need to change traditional thinking across the whole supply chain (Goulding *et al*., 2012). It is also acknowledged that the level of uncertainty associated with different procurement strategies varies greatly which can influence the formation of construction teams (Dow *et al*., 2009). Similarly, subcontract trades exhibit different intrinsic complexity and asset specificity (Ekstrom *et al*., 2003). Consequently, it is argued that the constructor's procurement approaches used during project development will vary significantly over a range of subcontract trades (Ross, 2011). Thus, there is a call for a better understanding on how contractors' collaborative procurement strategy interacts with different specialist trade contractors in their supply chain (Ross, 2011; Bidgoli, 2010).

Crouse (1991) offers the following as potentials of a balanced collaborative relationship: offer the ability to leverage internal investments; emphasis on core competencies; leverage core competencies of other firms; reduce capital needs and broaden products offerings; gain access or faster entry to new markets; share scarce resources; spread risk and opportunity; improve quality and productivity; having access to alternative technologies; provide competition to in-house developers; use a larger talent pool and satisfy the customer. A theoretical framework that has merit in exploring relationships between organisations is transaction cost economics. The following section of the paper considers how this may be adapted to consider its approach to construction supply chains.

2. DEVELOPING A THEORETICAL FOUNDATION

Researchers have suggested that despite many efforts to develop a better understanding of procurement systems, that they lack an economic foundation (Ross, 2011; Eriksson and Laan, 2007; Arditi and Chotibhongs, 2005; Ngowi and Pienaar, 2005; Kale and Arditi, 2001) and that a transaction economic approach may assist in the understanding of the relationships that exist between contracting parties (Chiang, 2009; Winch, 2001). Coase (1937) pioneered the theory of Transaction Cost Economics (TCE) and suggested that the allocation of resource in market economies is not only based on market prices but also through entrepreneurial decision making unrelated to prices. As suggested by Williamson (1985), the end product of efficient governance of transactions is competitive advantage, which requires tailoring procurement procedures to transaction characteristics (Eriksson, 2006). It has been observed that long term contract with agreed limits, rather than, a series of contracts could reduce the costs of

discovering the relative prices of contract agreements (Kale and Arditi, 2001).This reduction in the contract agreements costs leads to the efficiency of the firm. The term "marketing costs" (price mechanism related costs) used by Coase can be defined as the costs of discovering the relative prices of suppliers and agreeing separate contracts with each supplier. Dietrich (1994) contends that there is possibility for contracting costs reduction if a factor of production (a contractor) did not have to place a series of contracts each time with other factors of production but in fact replaced them with one long term contract with agreed limits. This reduction in the use of the spot markets results in lower cost of contracting and increased the efficiency of the firm.

The TCE approach has further been developed to explain human and environmental factor costs. These have been identified as bounded rationality (limits to the acquisition and processing of information), opportunism (self-interest seeking with guile) and asset specificity (the investment on specific assets by agents that lock them in to agreements). Williamson (1981) introduced a new term to replace marketing costs and defined it as transaction costs. According to him, the attributes of a transaction determine what constitute the efficient market, hierarchy or relationship. The key properties that affect the transaction include: bounded rationality, opportunism, small numbers bargaining, and information impactedness. Williamson (1985) argues that these are considered to be transaction difficulties and associated with cost increase when transactions are characterised by: asset specificity, uncertainty, and frequency. Moreover, Williamson (1981) affirmed that the hierarchy (firm) could reduce problems through a reduction in the number of exchanges, which increased frequency resulting in learning.

The important transactional features are asset specificity, uncertainty and frequency (Williamson, 1985). Transactions characterised by high asset specificity and high uncertainty need a more complex governance mechanism than standard transactions with low asset specificity. The significance of frequency is in relation to the costs incurred. Complex governance mechanisms may incur large costs, which must be recovered in future transactions. If transactions are infrequent, it is unlikely that the actors will invest in expensive and complex governance mechanisms.

Asset specificity has been defined as the ''degree to which the assets used to conduct an activity can be redeployed to alternative uses and by alternative users without sacrifice of productive value'' (Williamson, 1996, p. 105). According to Williamson (1985, p. 95), four different types of transaction specific asset investments can be identified: site specificity, which is related to the geographical location of an investment; physical asset specificity, which is related to specialised equipment and tools; human asset specificity, which is associated with employees' knowledge, expertise and learning by doing; and dedicated asset, which represent a discrete investment in generalised production capacity that would not be made but for the prospect of selling a significant of product to a specific customer.

Governance such as markets, firms and hybrids have unique characteristics. Furthermore, it has been observed that more integrated governance structures are associated with a higher degree of asset specificity, more complex transactions or more frequent exchange (Ross, 2005; Liu *et al*., 2009). To economise transaction costs, transactions with different properties are matched with governance modes. These different properties were to be investigated by this research and an approach to data collection was required to investigate the approaches taken by different organisations.

3. RESEARCH APPROACH: DATA COLLECTION

The population chosen for the survey was main contracting organisations in the United Kingdom. The aim was to explore trends, attitudes, or opinions of participants as well as key factors influencing supply chain collaborative strategies of contracting organisations involving different specialist trade contractors and the Chartered Institute of Building (CIOB) and Kompass UK were seen as the professional bodies that companies with worldwide construction and professional expertise and experience would be members. As a result, they could be considered as a population that would represent good practice on collaborative working exchange within their various supply chain networks. After piloting, the main survey was sent by mail on 15 February 2013 with a return date of 01 March 2013. The cover letter emphasised the support of the participants as well as highlighting the importance of the research to the industry in general, and the value of the participants' response in particular. The variables and their measures were drawn from a detailed analysis of the literature which cannot be reported here due to

space limitations. Table 1 summarised the variables that were defined and measured within the questionnaire.

Table 1: Research Variables

Areas Measured in the Questionnaire	Items Used for Analysis	Description of Scales and How Factors Were Obtained
Demographics variables	Title	Eight groups
	Employer size	Four groups
	Decision making role	Four groups
	Experience	Five groups
Organisational variables	Subcontract strategy	Dichotomous
	Organisation size : Turnover	Five groups
	Number of employees	Five groups
Collaborative supply chain	Benefit	Total score of the 8 item factor
	Collaborative technique	Total score of the 7 item factor
	Performance	Total score of the 9 item factor
Subcontract trades interactions	Procurement approach	Mean score of the 2 item scale
	Strategy assessment	Total score of the 14 item factor
	Strategy differentiation	Total score of the 14 item factor for each trade

4. DATA RETURNS

A total of 65 questionnaires were returned from the initial mailing representing 11.4%. The initial response rate was considered as low. Since any analysis based on this return would lead to bias in the results and may be considered as unreliable (O'Leary, 2010; Newman, 2007). Consequently, follow up procedures were implemented. The participants who had not responded to the initial survey were identified and in the week commencing 11 March 2013, a follow up letter was sent to them. The follow up letter included an additional copy of the questionnaire and reminder. A final total of 107 questionnaires were returned representing a response rate of 19%. This was considered to still be low response rate; however, in construction it is not unusual to report survey response of such rate.

5. RESULTS

The data was coded and entered into SPSS, respondents were asked to provide information relating to their current role and position, how long they had held this position for in their current organisations as well as their experience in dealing with subcontractors' procurement. A summary of the respondents' characteristics are displayed in Table 2.

Table 2 shows that construction managers constituted the largest group (25%), followed by others, (17%), then project managers (15%), quantity surveyors (11%), procurement managers (10%), managing directors (10%), supply chain managers (8%), site managers (5%) respectively. The largest group of field of operation was contractor in civil engineering, 32 (31%), followed by contractors who carried out both building and civil engineering projects 30 (29%), building contractors 29 (28%)and other 13 (13%) of the respondents.

Table 2: Demographic Responses

Demographic	Categories	N=107	Valid %
Job Title	Managing Director	10	9.9
	Supply Chain Manager	8	7.9
	Construction Manager	25	24.8
	Project Manager	15	14.9
	Quantity Surveyor	11	10.9
	Site Manager	5	5.0
	Procurement Manager	10	9.9
	Others	17	16.8
	Missing	6	
Current Position	<5	4	3.8
	5-9	17	16.3
	10-14	25	24.0
	15-20	26	25.0
	>20	32	30.8
	Missing	3	
Experience	<5	6	5.7
	5-9	7	6.7
	10-14	21	20.0
	15-20	18	17.1
	>20	53	50.5
	Missing	2	

6. SUBCONTRACTING AND SUPPLY CHAIN RELATIONS

Respondents were asked to indicate the average number of subcontractors used in each trade during the last financial year and the average length of relationships they have had with their subcontractors. Table 3 summarises the data captured for of each category. The survey shows an average value of 7 subcontractors were included within the selected list at project tender stage. This is almost the same in all the categories, with the exception of mechanical and electrical of 4.36 being the least and a highest of 7.76 for finishes subcontractors.

Table 3: Number of Subcontractors Used in each Trade and Length of Relationship

	Average Number of Subcontractors	Average Length of Relationship in Years
Brickwork	6.98	6.80
Groundwork	7.54	7.54
Steelwork	6.57	10.95
Mechanical and Electrical	4.36	13.70
Roofing	6.62	6.69
Finishes	7.61	5.77
Average	6.61	8.58

Table 4 below shows the primary reasons for subcontracting work packages among the respondents. Respondents were asked to indicate their agreement or disagreement on a five-point scale to a number of statements about subcontracting. These statements had been drawn from an analysis of previous research considering subcontract relationships (Lavelle *et al*, 2007, Hartmann and Caerteling, 2010). The question also encouraged respondents to give their own reasons if there were no reasons that were applicable to their answers. The responses to this question would provide an indication of some the motives for employing different groups for subcontractors and could give a deeper insight into procurement approaches more commonly used by main contracting organisations.

Table 4: The Primary Reasons for Subcontracting

Reasons for Subcontracting	Strongly Agree % (N)	Agree % (N)	Slightly Agree % (N)	Slightly Disagree % (N)	Strongly Disagree % (N)	Mean
Reduce liability exposure	63.6 (68)	36.4 (39)	0 (0)	0 (0)	0 (0)	4.64
Reduce overhead cost	14.0 (15)	69.2 (74)	16.8 (18)	0 (0)	0 (0)	3.97
Reduce construction cost	12.2 (12)	57.9 (62)	30.8 (33)	0 (0)	0 (0)	3.80
Market volatility	5.6 (6)	56.1 (60)	38.3 (41)	0 (0)	0 (0)	3.67
Reduce maintenance cost	8.4 (9)	41.1 (44)	44.9 (48)	5.6 (6)	0 (0)	3.52
Reduce construction time	9.3 (10)	25.2 (27)	45.8 (49)	19.6 (21)	0 (0)	3.24
Value to the client	10.3 (11)	19.6 (21)	47.7 (51)	22.4 (24)	0 (0)	3.18
Better workmanship	2.8 (3)	25.2 (27)	46.7 (50)	25.2 (27)	0 (0)	3.06

Overall, eight different reasons were presented to respondents. The strongest agreement was found in the need for reducing liability exposure with 63.6% of the respondents and a mean of 4.64. This was followed by reducing overhead cost with a mean of 3.97, reducing construction cost (3.80), market volatility (3.67), reducing maintenance cost (3.52), reducing construction time (3.24), value to the client (3.18) and better workmanship (3.06). The high ranking given to liability exposure gives an indication of prevalence of disputes and legal claims in the construction industry (Costantino *et al*., 2001). One reason for the high agreement for reducing liability exposure might be that contractors have been employing the system of subcontracting to shift risks. It could also mean that contractors use more market relationships in subcontracting than collaborative relations. However, emphasis given to construction cost signalled that where collaborative relationships may develop due technological interdependency, contractors may take advantage to reduce transaction cost.

This was further explored when considering the data analysis which focused upon the contractor subcontractor collaborative working relationship. The summary of this analysis is shown in Table 5.

Table 5: Factors Influencing Contractor-Subcontractor Collaborative Working Relations

Factor	Total	SME	Large	F Stat	P-Value
Technology performance of subcontractor	4.34	4.26	4.47	3.687	0.058
Client procurement route	4.21	4.11	4.26	0.088	0.240
Market intensity	4.12	4.08	4.11	0.453	0.426
Bilateral dependence	4.10	4.03	4.25	0.374	0.542
Project complexity	4.09	3.89	4.20	0.538	0.465
Subcontractor organisational capability	4.03	3.97	4.06	1.988	0.162
Reputation of subcontractor	3.93	3.83	3.98	0.144	0.705
Limited numbers	3.83	3.77	3.94	0.349	0.550
Subcontractor - main contractor interdependency	3.79	3.58	3.91	5.544	0.061
Location of project	3.77	3.44	3.97	0.085	0.771
Subcontractor specialisation	3.48	3.42	3.51	0.091	0.763
Subcontractor specificity	3.47	3.22	3.60	8.247	0.075
Workload of subcontractor	3.34	3.26	3.47	0.662	0.430
Price specificity	2.78	2.53	2.97	0.050	0.864

This analysis may suggest that large firms enter into more collaborative procurement arrangements than SMEs. Akintoye and Main (2007) acknowledge that more collaborative types of procurement arrangement tend to be undertaken by large construction companies due not only to complexity and size of the contract, but also the opportunity to provide continuity of work. In spite of large organisations rating the factors for collaboration in construction generally higher than the SMEs, the two groups did not differ on each of the factors for collaborative working in construction development at the 0.05 significance level.

The most important factor identified by both set of respondents was "technological performance" of the subcontractor. The results support a study by Ng *et al*. (2009) that found technological capability very vital in keeping subcontracting firm in business and thus making a collaborative approach both credible and reasonable. It may also suggest that collaborative relationship in construction development between the main contractor and subcontractor is in response to taking advantage of technical skills of subcontractors or timely use of expertise by the main contracting organisation to respond to the opportunity created. This was followed by the procurement strategy of main contracting organisation.

7. DISCUSSION

The aim of this study was to explore whether construction buying organisations employ different collaborative working relationship strategies when interacting with different specialist trade contractors within their supply chain networks during project development.

Langford and Male (2001) have argued that construction is a highly interconnected industry involving material components suppliers, the use of subcontractors within a geographic market and the extensive social connections that are in place between individuals who work for the various organisations in construction. It has been claimed that low entry and exit barriers exist within construction that are different to other forms of industry (Ross, 2011), these relate to a low capital requirement, and that the organisational capability that exists within organisations is difficult to protect and can be poached easily whilst the products produced are unspecific. According to Ng *et al*. (2009), the product in construction could be considered as a service or an end product. A differentiation in competition for a service includes reputation and product differentiation occurs through pre-qualification mechanisms. As clients adopt pre-qualification processes that require an organisation to have a reputation and good track record, this can be considered as an entry barrier to other organisations and as such organisations seek to ensure that their reputation is protected. This view is however countered by others, who suggest that the price is the final arbiter when selecting a contractor (Lavelle *et al*., 2007).

The results of the survey would suggest that the market is extensively used to select subcontractors. Price was not found to be the only determinant. Contractors require offsetting risk to their subcontractors and the approach they take varies with the specialism of the subcontractor. The activities of the construction industry and the parties within it can be considered as a network of transactions or contracts. The nature of these transactions poses a challenge in the choice of the correct governance structure for the implementation. The framework of transaction costs has been developed to include searching and gathering information about the buyers and sellers, writing and negotiating contractual agreements, as well as administering the agreement (Williamson, 1981, Lorange and Roos, 1993).

The results from the survey pointed to the direction that buying organisations had strategy for developing closer economic bonds with selected specialist trade contractors and suppliers. The survey suggested that contractors still use competition to select their specialist suppliers and that the number of competitors varies with given trades. This is more a feature of a market response than the development of strategic differentiated approaches to the management of the supply chain.

8. CONCLUSIONS

The framework adopted for this research has suggested that several factors influence the adoption of form of governance and that these can relate to the subcontracting organisations, organisational factors, the procurement approach taken by buying firms and the market determinants which were found to influence a subcontractor's specificity.

One of the key future challenges to the construction industry is to develop designs and construction techniques which result in lower embodied carbon and lower carbon in use. This will require specialist knowledge exchange between designers and constructors, which is often "locked up" in supply change organisations who consider it to be a transactional asset. Further work is required in order to identify the value placed on this transactional asset and the barriers to its exchange. It would appear that procurement approaches which increase the specifity of the subcontractor reduce the number of prospective partners and also increase the opportunity to exchange knowledge. This appears to be occurring with the more specialised subcontractors however has not extended to the less specialised contractors.

In order to facilitate better knowledge exchange about low carbon construction techniques, organisations should seek to reduce the number of supply chain competitors and move towards a serial approach to placement of contracts. This will allow for an accretion of knowledge over time between buying organisation and specialist contractors, this will ultimately improve the low carbon attributes of the construction product and contribute to the industry meeting the challenge of sustainability.

9. REFERENCES

Akintoye, A. and Main, J., 2007. Collaborative relationships in construction: the UK contractors' perception. Engineering, *Construction and Architectural Management*, 14(6), 597-617.

Akintoye, A., McIntosh, G. and Fitzgerald, E., 2000. A survey of supply chain collaboration and management in UK construction industry, *European Journal of Purchasing and Supply Management*, 6(3/4), 159-168.

Arditi, D. and Chotibhongs, R., 2005. Issues in subcontracting practice. *Journal of Construction Engineering and Management*, 131(8), 866-876.

Barlow, J. and Jashapara A., 1998. Organisational learning and inter firm partnering in the UK construction industry, *Learning Organisation Journal*, 5(2), 86–98.

Barlow, J., Cohen, M., Jashaparar, A. and Simpson, Y., 1997. *Towards positive partnering: Revealing the realities in the construction industry*. Bristol: Policy Press.

Beach, R., Webster, M. and Campbell, K.M., 2005. An evaluation of partnership development in the construction industry. *International Journal of Project*

Bidgoli, H., 2010. *The handbook of technology management: Supply chain management, marketing and advertising, and global management* (Volume 2). United States of America, New Jersey: John Wiley and Sons.

Chiang, Y., 2009. Subcontracting and its ramifications: A survey of the building industry in Hong Kong. *International Journal of Project Management*, 27, 80–88.

Christopher M, Towill, D.R., 2001. An integrated model for the design of agile supply chains, *International Journal of Physical Distribution Logistics Management*, 31(4), 235–246.

Coase, R.H., 1937. The nature of the firm. *Economica*, 4(16), 386–405.

Costantino, N., Pietroforte, R. and Hamill, P., 2001. Subcontracting in commercial and residential construction: an empirical investigation. *Construction Management and Economics*, 19(4), 439-447.

Crouse, H.J., 1991. The power of partnerships, *The Journal of Business Strategy*, 12(6), 4-8.

Dainty, A.R.J., Brisoce, G.H. and Millett, S.J., 2001. Subcontractor perspective on supply chain alliances, *Construction Management and Economics*, 19(8), 841-848.

Davis, P. and Love, P., 2011. Alliance contracting: Adding value through relationship development, *Engineering, Construction and Architectural Management*, 18(5), 444-461.

Dietrich, M., 1994. *Transaction cost economics and beyond: towards a new economics of the firm*. Routledge, London.

Dow, I., Sertyesilisik, B. and Ross, A.D., 2009. An investigation on the cost implications of methodology of sub-contract work pricing. *Journal of Financial Management of Property and Construction*, 14(2), 98 – 125.

Egan, J., 1998. *Rethinking construction*, HMSO, London.

Egemen, M. and Mohamed, A.N., 2005. Different approaches of clients and consultants to constructors' qualification and selection, *Journal of Civil Engineering and Management*, 11(4), 267-276.

Ekström, M.A, Björnsson, H.C, Kunz, J.C., Levitt, R.E. and Nass, C.I., 2003. *The impact of rating systems on subcontracting decisions: a transaction cost analysis.* CIFE, Stanford University, Stanford.

Eriksson, P.E., 2006. Procurement and governance management – Development of a conceptual procurement model based on different types of control, *Management Review*, 17(1), 30-49.

Eriksson, P.E. and Laan, A., 2007. Procurement effects on trust and control in client-contractor relationships, *Engineering, Construction and Architectural Management*, 14(4), 387-399

Eriksson, P.E., Dickinson, M. and Khalfan, M.M.A., 2007. The influence of partnering and procurement on subcontractor involvement and innovation, *Facilities*, 25(5/6), 203-214.

Eriksson, P.E., 2010. Improving construction supply chain collaboration and performance: A lean construction pilot project, *Supply Chain Management: An International Journal*, 15(5), 394– 403.

Errasti, A., Beach, R., Oyarbide, A. and Santos, J., 2007. A process for developing partnerships with subcontractors in the construction industry: An empirical study, *International Journal of Project Management*, 25(3), 250–256.

Goulding, J. S., 2012. Strategic Management in Construction. *In: Construction Innovation and Process Improvement*. London: Wiley-Blackwell.

Gunasekaran, A. and Love, P.E.D., 1998. Concurrent engineering a multi-disciplinary approach for construction, *Logistics Information Management*, 11(5), 295–300.

Hartmann, A. and Caerteling, J., 2010. Subcontractor procurement in construction: the interplay of price and trust, Supply Chain Management: *An International Journal*, 15(5), 354-362.

Kadefors, A., 2011. Organising collaboration in construction projects: formal models meeting practitioner perspectives, *Management and Innovation for a Sustainable Built Environment proceeding*, 20 – 23 June, Amsterdam, The Netherlands.

Kale, S. and Arditi, D., 2001. General contractors relationships with subcontractors: a strategic asset. *Construction Management and Economics*, 19(5), 541-549.

Karim, K., Marossezky, M. and Davis, S., 2006. Managing subcontractor supply chain for quality in construction, *Engineering, Construction and Architectural Management*, 13(1), 27-42.

Langford, D. and Male, S., 2001. *Strategic management in construction*. Blackwell Science, Oxford.

Lavelle, D., Hendry, J. and Steel, G., 2007. The selection of subcontractors: is price the major factor? *In*: Boyd, D (Ed.), *23rd Annual Conference,* 3-5 September 2007, Belfast, UK. Association of Researchers in Construction Management, 1: 65-73.

Liu, Y. Luo, Y. and Liu, T., 2009. Governing buyer–supplier relationships through transactional and relational mechanisms: Evidence from China. *Journal of Operations Management*, 27:294-309.

Lorange, P. and Roos, J., 1993. *Strategic alliance*. NewJersey: Balckwell

Mason, J.R., 2007. The views and experiences of specialist contractors on partnering in the UK, *Construction Management and Economics*, 25(5), 519–527.

Meng, X., 2010. Assessment framework for construction supply chain relationships: Development and evaluation, *International Journal of Project Management*, 28(7), 695–707.

Miller, C.J.M., Packham, G.A. and Thomas, B.C., 2002. Harmonisation between main contractors and subcontractors: a prerequisite for lean construction? *Journal of Construction Research*, 3 (1), 67-82.

Moore, D., 2002. *Project management: Designing effective organisational structures in construction*. Blackwell Publishing, Oxford.

Newman, W. L., 2007. *Basics of Social Research: Qualitative and Quantitative Approaches*, Boston, Pearson International Edition.

Ng, S.T., Ziwei Tang, Z. and Palaneeswaran, E., 2009. Factors contributing to the success of equipment-intensive subcontractors in construction, *International Journal of Project Management*, 27(7), 736–744.

Ngowi, A.B. and Pienaar, E., 2005. Trust factor in construction alliances, *Building Research and Information*, 33(3), 267-278.

O'Leary, Z., 2010. *The essential guide to doing your research project*. 3rd ed. London: SAGE

Ross, A., 2011. Supply chain management in an uncertain economic climate: A UK perspective, *Construction Innovation*, 11(1), 5-13.

Ross, A. D. and Jaggar, D. M., 2005. Supply chain communication of cost information, CIB W92/T23IW107 *International Symposium on Procurement Systems. The Impact of Cultural Differences and Systems on Construction Performance*, Las Vegas, NV USA, Arizona State University.

Ross, A., 2005. *A model of contingency factors affecting the contractors' economic organisation of projects*, Unpublished PhD Thesis.

Ross, A.D. and Goulding, J.S., 2007. Transactional barriers to design cost management, *Construction Innovation*, 7(3), 274-287.

Strategic Forum for Construction, 2002. *Accelerating change* (Chairman: Sir John Egan), London: Rethinking Construction c/o the Construction Industry Council.

Williamson, O.E., 1985. *Markets and hierarchies, analysis and antitrust implications: a study in the economics of internal organisation*. New York: Free Press.

Williamson, O.E., 1981. The economics of organisation: The transaction cost approach, *American Journal of Sociology*, 87(3), 48-77.

Williamson, Oliver E., 1996. *The mechanisms of governance*. Oxford: Oxford University Press.

Winch, G. M., 2001. Governing the project process: A conceptual framework. *Construction Management and Economics*, 19: 799-808.

Wolstenholme, A., 2009. *Never waste a good crisis: A review of progress since rethinking construction and thoughts for our future*. Constructing Excellence, London.