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Inter-organizational interactions among a sample of plant-reliant construction sub-contractors

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Plant-reliant sub-contractors (PrSC), being those who rely heavily on mechanization to provide specialist work packages, are profuse in the construction sector. Their market is highly competitive; hence, to sustain profitable utilization of their mechanized fleets requires effective business exchanges, mutually beneficial trading relationships and inter-organizational trust—but in reality, these ideals are not always satisfied. These and other inter-organizational mechanisms are qualitatively investigated through nine case study PrSC companies. Data were accrued via unstructured interviews, coded and thematically examined using narrative analysis, to define distinct and related constructs. Findings highlight the negative impacts of recent macroeconomic downturn and austerity, cutthroat competition, 'one-sided' business dealing, loss of trust and strained business relationships. Key concerns from the analysis that relate to the engineering project community include lack of PrSC investment in mechanized assets, breakdown of mutual organizational interfaces, potential for incongruous business dealings and an air of financial instability. While conducted in a UK context, international construction market pressures mean that the findings will be of interest beyond this geographical boundary.

Keywords: Organizational interactions, business relationships, sub-contractors, perceptions.

Introduction

Significant 'evolution' of inter-organizational interfaces has occurred over the last 50 years (Esposito and Passaro, 2009, p. 304). Practical developments have borne witness to improved inter-firm relationships (Turnbull, 1989; Love *et al.*, 2002), growth of mutual business exchanges (Landeros and Monezka, 1989) and the establishment of strategic alliances (Vyas *et al.* 1995; Todeva and Knoke, 2005). From an academic standpoint, issues of particular interest have included transaction cost theory (Hobbs, 1996; Yigitbasioglu, 2010) and organizational learning (Fynes, 1998; Holt *et al.*, 2000), while more recently, globalization (Manning and Baines, 2004) and virtual enterprises (Sarkis *et al.*, 2007) have been emphasized. Much of this practical and theoretical evolution is apparent in the construction sector,[1] as evidenced in procurement practice and extant literature, respectively. Evolution has also resulted from 'introspection' of that sector, for instance by Latham (1994), Egan (1998) and The National Audit Office (2001); who between them advocated improved industry performance and better value-for-money (Egan, 2002; Atkin and Borgbrant, 2009). Notably, construction business harmonization and relationship improvement have equally been encouraged (Giannakis, 2007, p. 401; Hu, 2008, p. 58).[2]

Embedded within the UK construction engineering sector and spanning others such as manufacturing, agriculture and waste are plant-reliant sub-contractors (PrSC)—firms that rely extensively on a mechanized plant to provide sub-contract work packages. Here, 'plant' typically includes self-propelled machinery such as excavators and dump trucks, along with mechanical access equipment (e.g. mobile elevating work platforms) and logistics machinery such as conveyors. Notwithstanding the importance of PrSC within construction and that of their inter-organizational relationships, they have attracted minimal research (Holt and Edwards, 2012). This is evidenced by a dearth of

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written knowledge relating to PrSC among construction, procurement and business relationship literature.

Given this vacuum, the study's aim is to assess key perceptions regarding inter-organizational relationships among a sample of PrSC owners and managers. Objectives linked to this aim include: (i) identification of principal issues (themes) that concern said owners/managers; (ii) arranging these themes in order of importance and (iii) assessing the practical implications of findings both for the construction engineering sector generally and PrSC more specifically. In addition to helping address said void in the literature, further reasons underpinning the aim and objectives include: (i) identifying avenues for constructively taking the research theme further; and (ii) because only when problems regarding construction sector inter-organizational relationships are understood can solutions be proffered. Measuring sub-contractors' perceptions in this way is arguably the best way to deduce problems, because it is they who often get treated poorly by clients and main contractors (CMC) (see 'Literature Review' section later). Benefits stemming from greater understanding and potential to offer solutions could help mitigate the sector's adversarial environment and encourage greater financial stability, as a result of more mutually beneficial relationships.

Literature review

Sub-contractor organizations are a key feature of construction project delivery (Kerzner, 2009; Hartmann and Caerteling, 2010) and PrSC are a specific subgroup of these, who rely on productivity-enhancing mechanization[3] to perform their work. PrSC may own their plant but hire is often preferred, because unless adequately utilized, owned assets are a liability (Harris and McCaffer, 1991). PrSC engage with private sector hire/lease outlets and numerous other stakeholders as shown in Figure 1. The figure identifies how new plant supply feeds into PrSC (via NP_1) as well as the hire/lease (NP_2) and other (NP_3) sectors. These demand groups might additionally employ used plant (U_1, U_2 and U_3). PrSC sometimes use hired plant (via HL_1) to service clients as a component of specialist work packages (HL_{1a}). Contractors may also directly engage the hire and lease sector (HL_2).

Several key inter-organizational constructs are associated with PrSC. These include business-to-business exchanges, trust, 'mutually beneficial' relationships and profit-based asset investment. This is not a definitive listing and neither are these constructs mutually independent; rather, they are for the most part interrelated and in many instances rely on a reciprocal interaction in practice. PrSC business exchanges can be: (i) upstream (interface with machinery manufacturers); (ii) downstream (supplying contractors) and (iii) horizontal (with the hire and lease sector). The importance of 'collaboration' among these interactions was emphasized by Derrouiche *et al.* (2010), which harmonizes with Lysons and Farrington's (2006) claim that the main issue facing purchasing managers is development of supplier relationships. However, inter-organizational complexity exists, especially when purchasing capital assets to be operated over many years (Roehrich and Lewis, 2010).

Other challenges abound in the PrSC business environment, characterized principally by intense competition (Lowe, 2011) and low profitability (Chiang, *et al.*, 2002; London, 2008). These characteristics mirror the oft-cited adversarial practices, disjointed supply mechanisms and lack of trust inherent

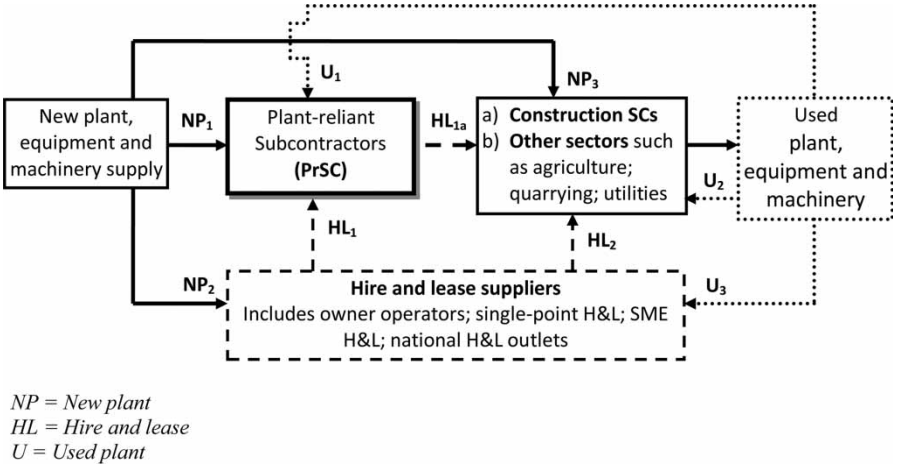

Figure 1 Interaction of PrSCs with related purchase and supply mechanisms
Source: Based on Holt and Edwards (2012).

throughout construction (Fearne and Fowler, 2006). One reason for such challenges results from contractors 'using' sub-contractors as a risk mitigation tool (Segerstedt and Olofsson, 2010). That is, because demand is uncertain (Kalchschmidt *et al.*, 2006) main contractors encourage PrSC to compete, which simultaneously holds down prices. The latter may be convenient for main contractors, but this treatment of sub-contractors can also fuel supply chain (SC) complexity (Baldwin *et al.*, 1998).

The nature of construction reported in much of the literature suggests a 'biased' organizational environment, dominated by major contractors and clients. This harmonizes with the assertion that small- and medium-sized enterprises (SMEs) are less able to harness the benefits of SC management (Vaaland and Heide, 2007). It also—paradoxically, given said pressures on pricing—may not yield optimal 'benefits' for CMC. This is because well-integrated organizational relationships improve SC performance (Lee *et al.*, 2007), which promotes forecasting, planning, logistics (Nakano, 2009) and ultimately, profitability (Tracy *et al.*, 2005). Equitable relationships are essential in achieving these benefits (Kwon and Suh, 2005), the importance of which have grown since proliferation of outsourcing (Hallikas *et al.*, 2005). Partnering, which according to Hartmann and Bresnen (2011) subsumes many *collaborative trading arrangements* (BSI, 2010), has evolved as a widely cited mechanism to promote equity (Huphreys *et al.*, 2003; Cheng *et al.*, 2004; Fortune and Setiawan, 2005; Eriksson, 2007; Xie *et al.*, 2010). Conversely, some disagree (Fernie and Thorpe, 2007) highlighting partnering's dyadic (client/contractor) focus and resultant neglect of sub-contractors (Bygballe *et al.*, 2010).

Gadde and Dubois (2010) alluded to construction's 'one-sided' relationships, suggesting that these do not always provide sub-contractors with tangible benefit. Business collaboration is a necessity not an option (Matopoulos *et al.*, 2007) and for construction stakeholders, co-ordinated, mutually beneficial relationships are essential (Akintoye *et al.*, 2000) and call for organizational integration (Singh and Power, 2009; Bankvall *et al.*, 2010; Lönngren *et al.*, 2010). Collaboration also synergizes with: (i) corporate social responsibility—as this promotes sustainable relationships that do not harm stakeholders (Foerstl *et al.*, 2010) and (ii) 'lean construction'—which embraces (*inter-alia*) customer focus, co-operative relationships and systems efficiency (Eriksson, 2010). The literature confirms that construction relationships generally and collaborative, mutual arrangements specifically can be complex constructs. Howerver, it is proposed that the latter yield business benefits and can encourage stability to PrSC[4] with commensurate benefits for CMC.

Methodology

Kaufmann and Denk's (2011) model for methodological rigor suggests the following iterations: define research questions; develop research instrument; gather data; analyse data and make theoretical implications. Research questions were identified in the 'Introduction' section as aims and objectives and theoretical implications will be expounded later in the 'Discussion' section. Therefore, the following describes research instrument development, sample design, data collection and analysis.

Qualitative vis-à-vis quantitative data (manifest in transcripts emanating from the unstructured interviews) were chosen for this study, mainly because of their 'rich' nature (Partington, 2002, p. 114). This qualitative leaning of the methodology 'observed' PrSC within their 'natural context' (cf. Hancock and Algozzine, 2006) and facilitated hermeneutic flexibility in seeking to understand the meanings of parts (data) within a (their) universe of study, to theorize and model reality (Grbich, 2009). However, notwithstanding use of numerical data in qualitative studies being somewhat controversial (Maxwell, 2010), a quantitative element was embraced through numerical analyses of some components of these qualitative data (see later). Sandelowski (2001) stated, 'numbers are integral to qualitative research as meaning depends, in part, on number'—hence, in this respect numbers complemented the qualitative leaning of the study. The inductive analysis was favoured because research data were qualitative and appropriate to interpretive methodology (Prasad, 2002, p. 13). Induction facilitates these characteristics, as evidenced by its frequent use within organizational studies (Eren-Erdogmus *et al.*, 2010; Berte *et al.*, 2010; McCabe, 2010).

Table 1 lists sample design criteria and their rationale. Criteria ensured that cases would represent the engineering sector; relied on mechanization (i.e. were PrSC); held appropriate experience (a minimum of five years of trading) and operated nationally. *The Off-highway Plant and Equipment Research Centre* (OPERC, 2011) corporate member list (the world's largest professional body of mechanical plant stakeholders: civil engineers, building, plant hire, quarrying, manufacturers and members of these SCs) was used as a population to ensure that participants satisfied these criteria and were representative of the sector. Given population homogeneity, targets were randomly invited to participate (Barrow, 2006, p. 303). For reasons of commercial sensitivity some declined the invitation, but a sample comprising nine PrSC (designated as P_A, P_B, … P_J) was selected and the principal characteristics of these are shown in Table 2. Some data are excluded from Table 2 because : (i) of said commercial reticence

Table 1 Sample design criteria

Essential criteria	Rationale (and typical characteristics of the population)
Sub-contractor organization operating within construction sector	Sub-contractor work package suppliers—embedded within the SC, with downstream suppliers and upstream clients—have broader experience of SC characteristics. Construction sector SC package suppliers rely a lot on plant and equipment
Business activities dependent on off-highway plant and machinery	A primary focus of the research was to investigate the impact of how macroeconomic pressure affects users of such plant and equipment
Established company (a minimum of five years of trading)	Will have been in business long enough to develop own disposition towards SC relationships. Will have experienced SC trading both pre- and post-2007 recession
Operated at national level (Great Britain)	Larger (national) firms will have broader experience of the SC especially with prominent players, i.e. national principal contracting organizations
Members of Off-highway Plant and Equipment Research Centre	Membership helps to demonstrate the firm's interest and/or involvement with off-highway plant

Table 2 Summary characteristics of the sample

ID	Nature of business	Turnover	Employees (No.)	Interview method	Transcript words
P_A	Civil engineering package supplier	[a]	310 (circa 2007) 160 (circa 2010)	F-T-F	5513
P_B	Civil engineering package supplier	[a]	120 (pre-2010) 60 (circa 2010)	F-T-F	5465
P_C	Civil engineering package supplier	£7M (pre-2010) £12M (circa 2010)	80 (circa 2007) 140 (circa 2010)	F-T-F	5652
P_D	Building/masonry package supplier	[a]	45 (pre-2010) 30 (circa 2010)[b]	F-T-F	3623
P_E	General construction	£22M (circa 2010)	180 (pre-2010)[c] 124 (circa 2010)	T-phone	11 801
P_F	Building/masonry package supplier	40% reduction pre-2010	28 (pre-2010) 24 (pre-2010)[b]	F-T-F	10 548
P_G	Civil engineering package supplier	£30M (circa 2008) £15M (circa 2010)	[a]	F-T-F	7148
P_H	Civil engineering package	£15M (circa 2010)	[a]	F-T-F	6266
P_J	Building/masonry package supplier	£18M (circa 2007) £11M (circa 2010)	320 (circa 2007) 170 (circa 2010)	F-T-F	11 387

[a]See 'Methodology' for explanation of missing data.
[b]Staff only (trades are sub-contracted in).
[c]Joiners and bricklayers only (does not include other trades/ machine operators).

(some did not want to quantify their downsizing) and (ii) interviews were unstructured; hence, 'standard' questions did not apply. All participants operated throughout Great Britain and SME were based on European Union definition (cf. European Commission, 2003)—though two would be classified as large companies based on their pre-2007 headcount. Six interviewees were managing directors; the remainder a project manager, contracts manager and senior estimator. The sample size was considered appropriate for an inductive research of this nature using rich, narrative data.

All but one interviews were conducted face-to-face (F-T-F, sixth column in Table 2)—the exception (P_E) performed via telephone at participant request. At the outset, it was explained to interviewees that this was academic research, events would be recorded for analysis and that personal or company identities would be

treated confidentially. The opening question was along the lines of, 'How is business since 2007, for example, regarding pricing, competition and workload?' Following this, the interview was allowed to develop based on response—thereafter focussing on key points raised by respondents as matters progressed. The rationale of this open question lead-in technique is to allow participants to describe in their own words a situation. It is designed to encourage, '… an extensive and developmental answer and may be used to reveal attributes or obtain facts' (Saunders *et al.*, 2009, p. 337). Yin (2009, p. 107) suggested that this kind of unstructured approach allows the interviewee to become an 'informant' vis-á-vis a respondent. Its characteristic of facilitating 'dramatic reconstruction' (of events) is analogous to *ethno-drama* (Ackroyd and O'Toole, 2010) insofar as interviewees (actors) have experienced the situations and emotions they portray. The unstructured approach facilitates authentic insight into experiences, from which knowledge of a social world can emanate (Silverman, 2009, pp. 126–7). Nonetheless, interpretation of experiences was undertaken carefully because as Silverman (2003, p. 343) put it, '… elevation of the experiential as the authentic … is a stubbornly persistent impulse in contemporary sociology'. All interviews were captured on voice recorder and later transcribed verbatim for analysis in N-Vivo. The depth of discussion was reflected in average interview duration of 1.25 h and average transcript of 7493 words (see sixth column in Table 2).

Each transcript was thematically analysed and open coded (Strauss and Corbin, 1990) using the N-Vivo code-based theory builder (Weitzman, 2003, p. 320), tree nodes coding method (QSR, 2011, p. 29). Thematic nodes suggested what was happening in the data and what they meant (Charmaz, 2009, p. 46). Bazeley's (2007, p. 105) 'rules of thumb' were applied: organizing trees (themes) based on conceptual relationships; using separate nodes for each theme and keeping the system 'light and flexible'. Ten theme (parent) nodes were developed, from which four subthemes (child nodes) evolved. Coding can 'fragment' data; to mitigate this, subsequent theme development, interpretation and relationship examination applied

Table 3 Parent and child thematic nodes derived from the analysis

Parent and (→)child nodes	Description (thematic content)	Sources (A)[a]	Refs (B)[b]	(A)*(B) (SR)	Rank [c] from SR
Clients	Clients, their roles, actions, attitudes etc. past and present	5	24	120	**8.5**
Education / competence	Education and/or competence of any player including workers or managers	8	48	384	**4**
Employment ramifications	Anything regarding employment	7	25	175	**7**
H&S ramifications	Anything regarding H&S	9	61	549	**2**
→ **Specific incidents**	Reference to specific adverse H&S incidents	6	13	78	**10**
Other financial aspects	Anything financial but not directly related to pricing	7	27	189	**6**
Positives	Anything positive regarding for example, changes taking place	2	3	6	**14**
Pricing ramifications	Anything to do with pricing (e.g. impacts)	9	100	900	**1**
Programme ramifications	Anything to do with project programmes	4	13	52	**11**
→ **Crashing**	Problems from crashing programmes	3	5	15	**12.5**
Quality	Anything to constructed product quality	3	5	15	**12.5**
SCs (now)	Anything that characterizes SCs at the present time (present tense)	8	35	280	**5**
→ **Former SC characteristics**	Anything that characterizes SCs prior to time of interviews (past tense)	8	15	120	**8.5**
→ **SC changes taking place**	Any reference to SC transitional changes at time of interviews	9	50	450	**3**

[a]Number of sources (interviewees $n = 9$) making explicit reference to these themes.

[b]Number of references (interviewee quotes) within each theme.

[c]Where rankings are similar, fractional ranks (e.g. [{12 + 13}/2] = 12.5) are used to facilitate Rank Spearman test later (cf. Meddis, 1984).

narrative analysis; which is less prone to do so (Bryman, 2004, p. 398).

Data analysis

Before commencing analysis, a reminder of the study's aim and objectives, which are as follows: to assess key perceptions regarding inter-organizational relationships among a sample of PrSC owners/managers; to identify principal issues (themes) that concern them; arrange themes in order of importance and to assess the practical implications of findings both on construction generally and PrSC specifically.

The 'importance' of identified themes

Table 3 lists themes along with their definitions. Column three shows the number of narratives attributed to each theme during coding, while column four lists the number of transcript excerpts used from among them. For instance, five transcripts were attributed to 'Clients' (Table 3, column three) from which 24 specific references were made (column four). Based on the premise that—given that the interviews were unstructured—participants talked most about themes important to them, column five indicates theme importance using the product of these metrics (i.e. sources × references = SR). Column six ranks themes, with the largest SR afforded the highest rank. The most important theme was 'Pricing issues' (SR = 900, rank 1) followed by health and safety (H&S) '… ramifications' (SR = 549, rank 2) and 'SC changes taking place' (SR = 450, rank 3). 'Crashing' and 'Quality' were considered the least important issues.

Preceding superscript numbers (1, 2 and 3) and bold text in relevant cells of Table 4 show the three themes achieving greatest transcript coverage during coding in respect of each interviewee, thus offering an alternative analysis of theme importance levels and *relative* importance perceptions. For example, column two shows that 12.4% (^{1}**12.4**) of P_A's transcript was coded against 'Pricing ramifications' while in second place, 3.4% (^{2}**3.4**) was coded against 'SCs (now)'. 'H&S ramifications' and 'Programme ramifications' jointly ranked third with 3% coding (^{3}**3.0**) for this participant.

Five interviewees (P_A, P_E, P_C, P_G and P_H) talked about 'Pricing ramifications' most or, in the present context, perceived them as most important. 'SC changes taking place' were most important for two interviewees (P_D and P_J) while 'H&S ramifications' and 'Clients' were talked about most by P_B and P_F,

Table 4 Coding coverage by interviewees

	Percentage transcript coverage via coding											
Parent and (→)child nodes	P_a	P_b	P_c	P_d	P_e	P_f	P_g	P_h	P_j	Total[a]	Rank[b]	Rank[c]
Clients	0.0	0.0	^{2}**6.5**	0.0	0.0	^{1}**5.9**	2.2	^{2}**5.7**	^{3}**6.2**	24.3	**4**	8.5
Education/competence	0.0	^{2}**11.3**	3.3	6.6	^{3}**1.5**	2.9	3.3	^{3}**4.7**	4.9	17.5	**5**	4
Employment ramifications	2.3	0.2	1.9	0.5	1.0	^{2}**5.2**	0.0	0.0	1.1	5.2	**8**	7
H&S ramifications	^{3}**3.0**	^{1}**13.7**	4.9	^{2}**9.0**	^{2}**2.2**	^{3}**3.3**	^{2}**10.9**	0.6	^{2}**6.8**	48.9	**2**	2
→ Specific incidents	1.7	0.0	2.5	0.6	0.7	1.9	2.8	0.0	0.0	–	–	10
Other financial aspects	0.0	^{3}**6.4**	^{3}**5.7**	0.0	1.2	1.6	3.3	3.1	0.9	12.1	**6**	6
Positives	0.0	0.0	0.0	^{3}**8.2**	0.4	0.0	0.0	0.0	0.0	8.2	**7**	14
Pricing ramifications	^{1}**12.4**	3.2	^{1}**6.8**	2.4	^{1}**4.6**	2.9	^{1}**23.4**	^{1}**21.5**	5.7	68.7	**1**	1
Programme ramifications	^{3}**3.0**	0.0	2.3	0.0	0.0	0.8	0.0	0.0	4.1	–	–	11
→ Crashing	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.9	2.0	–	–	12.5
Quality	0.0	0.0	1.7	1.2	0.0	0.0	0.0	0.0	1.2	–	–	12.5
SCs (now)	^{2}**3.4**	3.8	1.4	7.1	0.9	0.2	5.4	1.5	0.0	3.4	**9**	5
→ Former SC characteristics	1.4	0.9	0.8	0.0	0.3	0.3	1.1	1.3	3.6	–	–	8.5
→ SC changes taking place	0.3	2.4	5.5	^{1}**12.5**	1.1	0.7	^{3}**5.6**	3.2	^{1}**12.1**	30.2	**3**	3
Totals[d]	28.8	41.9	43.3	48.1	13.9	25.7	58	42.5	48.6			

$R_s(9) = 0.70$, $p < 0.05$

[a]Total of highlighted cells.

[b]Based on total of highlighted cells.

[c]Brought forward from Table 3 for comparison.

[d]Percentages of interviewee's transcripts coded against themes.

respectively. Emphasis on pricing agrees with SR analysis from Table 3 suggesting that present bidding pressures are of most concern to the sample—a situation also highlighted in the literature (Building, 2011). Four interviewees (P_D, P_E, P_G and P_J) identified 'H&S ramifications' as second-most important; two (P_C and P_H) identified 'Clients' and the remaining two (P_B and P_A) placed 'Education/competence' and 'SCs (now)', respectively, in second place.

The totals of interviewees' 'top three' subjects expressed in percentages of transcripts coded among all themes are presented in column 11 of Table 4; upon which ranks are assigned (column 12). The association between these ranks and those derived from SR (Table 3) is confirmed by a strong (Salkind, 2010) positive Rank Spearman correlation coefficient (cf. Howitt and Cramer, 2011, p. 68) ($R_{s(9)} = 0.70$, $p < 0.05$). The bottom row of Table 4 shows total percentages of each interviewee's transcript coded against all themes: the most coded was P_G with 58% of its content relevant to themes, followed by P_D and P_J at 48%. Mean percentage of transcript coded among the sample was 38.9% (SD = 13.6%) and the least amount coded was 14% (P_E).

Analysis of themes

The following themes are analysed in order of 'importance' as determined by the results of the SR analysis (that were presented in Table 3 earlier). Some linkages are given by the authors in square brackets —these are provided purely to aid readability/explanation of the respondents' quotations where it was felt necessary. Finally, the sources of quotes are identified as per the interviewee IDs given in Table 2—hence '(P_C)' identifies that a quote is attributed to civil engineering package supplier P_C. The 10 highest ranking themes are discussed in most detail; the remaining four themes, a little less so.

Pricing ramifications (rank 1)

The overarching perception was that work is presently being 'bought' below cost, in order for companies to try and maintain cashflow. Typical comments in this regard included:

> "They are actually buying the work … to keep businesses ticking over … they are struggling to get the turnover … they are doing stupid things with tenders … to try and get the workload in" (P_A). "… it's about just winning the job no matter what" (P_C).

Given this, resulting downward pricing pressure on tender sums was frequently mentioned:

> "… we went in with profit and overhead on a £6.5M package and they [the winning bid] were £1M cheaper … other guys will tell you how they are putting prices in at below cost and they are getting the floor wiped from underneath them" (P_A). "… [we are] getting beaten by 30%" (P_B). "… even after taking 200 thousand off we were told unless you can take another 350 thousand off you're not doing it [getting the work]." (P_E). "… prices are getting slashed way below what I would consider sustainable" (P_H).

'Underbidding' has been referred to as 'suicidal tendering' (Merna and Smith, 1990) and is attracting further, more recent debate (Building, 2011). Some interviewees confirmed that to 'compete' in this environment, they were excluding plant costs from their tenders. This is harmful for profitable operation and bodes poorly for future capital investment in the new plant. It was confirmed:

> "[work is being won] without allowance for labour or plant or fuel, which is quite alarming" (P_A). "[to keep the tender low] … we put the plant in there for the first 40 weeks [without charging it]" (P_E). "… we've thrown in one item of plant to get the job … it would be sat in our yard anyway" (P_F). "… when I do my pricing I'll work out the plant … and we'll say we can absorb that … we can take that out" (P_H).

Another pricing theme concerned the role of banks and on-going survival of 'troubled' firms. P_A felt that banks are allowing 'struggling' companies to continue trading, where previously they may not have done so, being reluctant to foreclose and emphasizing 'turnover is turnover' regardless of margin:

> … banks are baying for turnover … [clients say to the bank] … look we've got an order for £2 million, but the bank hasn't got a clue if the price should be £2.5 or £2.6 [million] they just give them time and hope that somewhere along the line … they pick up another job where they can make some money. I am amazed that more companies have not gone bust [than have done so to date] (P_A).

It was argued that 'buying work' suppresses the market and sustains artificially high levels of supply (than previously witnessed in recession), thereby adding pressure on prices:

> "… it isn't a case of 'can we work for these rates' because we can't … it's a case of can we minimize our losses" (P_B). "… 12 of us on the tender list, and I was thinking God knows what cross section of

prices we are going to see here … "… we have gone beyond value-for-money and are … compromising what we are trying to achieve".(P_C). "[one client said] … we don't care if you've got bells on your hats, unless you can come to this price you're not playing the game [getting the work]" (P_E).

Health and safety (H&S) ramifications (rank 2)

Many suggested that pricing pressures meant that H&S funding was being affected:

"… some bids are so cheap that safety is compromised … safety doesn't exist because it's just cheapest is best and [clients] turn a blind eye to it" (P_A). "… prices are falling, but what's getting compromised? I do think it is having an impact on safety standards" (P_C). "… where the price is driven down and margin disappears … one of the first things that seems to disappear is safety" (P_D). "… you cut costs as a main contractor … that increases the risk on the health and safety side of things" (P_E).

This was further explained by some, as resulting from shorter project programmes which also had a negative effect on quality. Some suggested that the two are related:

"The only way we can make it financially stack up is by knocking a week off programme … [which means] … concentration goes on the completion date, not safety (P_A). "[cost reduction] means condensing a programme … if you work under stressful conditions standards drop … resulting in a higher risk workplace" (P_C). "… in terms of quality, you get an issue with safety … the delivery of quality and the delivery of safety is actually the same thing, if you lower your quality threshold, you lower your safety threshold (P_D).

H&S management was discussed, especially the present emphasis on H&S qualification using card schemes (CPCS, 2011) and much less importance attached to workers' experience:

"… if someone has a briefcase full of certificates [from] going on this, that and the other course, [it is accepted] they are better than someone who has only the minimum of certificates, but who has experience and is aware of dangers (P_B). "… it's dangerous how [importance of experience] has been replaced, people are not seeing the real [H&S] risks … people managing health and safety can recognise whether [workers] have got a [competence] card or not, but they can't recognise whether they are an absolute danger on site" (P_C).

Notwithstanding, there was positive discourse. P_D confirmed that for them safety was important because a serious accident or fatality 'is as good as the end' for a sub-contractor. P_E stated that they were particularly committed to H&S training, but the most encouraging statement emanated from P_J:

I think safety's moved on enormously over the last 10 years … it's improved year on year for the better … I think there's a genuine intent now within [larger companies] to operate safe sites (P_J).

SC changes taking place (rank 3)

An overarching feeling among interviewees was that former SCs, especially those encouraging mutual benefit, have generally been replaced by more adversarial, client-driven arrangements that emphasize competition and lowest cost:

"… [we had] a partnering arrangement … [but] the minute the recession hit [clients] tore the rule book up and said 'right we will go on best price, forget all this'… [clients] have scrapped relationships … the partnerships … we had in place (P_B). "… [clients] have had to withdraw back into competitive tendering … from the frameworks and partnerships that they were undertaking" (P_C). "… now supply chains are relatively abandoned" (P_G).

Despite its documented failings, participants highlighted resurgence of open, competitive tendering. Further, that tender selection was now almost solely price driven with little evaluation of other criteria such as sub-contractor ability to undertake the work. P_D stated they were often on tender lists in excess of ten and that cheapest bid usually wins, regardless of other factors:

We welcome competition but sometimes you wouldn't believe who is qualified to do what nowadays, you know, all of a sudden, when the numbers [i.e. the tender sums] fit (P_D).

P_G confirmed emphasis on 'price selection' and that no longer does quality (even of tender submission) seem to matter. Some optimism remained, however, especially regarding the need for innovation as a mechanism to compete with this changing environment and, that this was making firms aware:

"… in a recession a lot of innovations and a lot of people come in [to the industry] who are slicker,

> and they are not bogged down with procedure … we need to welcome new ideas … (P_D). "We will have to get better and leaner we'll have to be more innovative … some of the guys that are up-and-coming will be good and if we rest on our laurels … they're going to further erode the work that we've got" (P_J).

Education/competence (rank 4)

Two participants emphasized the predominance of 'tick-box regimes' to placate competency requirements from an administrative (rather than practical) point of view, along with much less value attached to experience:

> "… we have site managers, project managers and above, as long as they have got all their boxes ticked … believe that they are acting properly, but it frightens me what I see on sites because they are not capable of seeing real danger (P_A). "… we have got to have a card for this … a card for that', so [workers] have been sent on courses … there's a sort of assumption that if somebody has got a certificate for something then they can do it and that is where the whole system falls down … much more emphasis should be put on experience" (P_B).

The issue of experience was related by some to the broader problems of the industry and how, because of those problems, people are continually leaving it, in effect: a self-fulfilling problem. P_C highlighted how the sector has been harmed by leavers and the danger of a future dearth of qualified and experienced workers. This, it was asserted, applies equally to plant managers:

> **Q:** "Do management understand plant and machinery?" **A:** "Generally no" (P_B). "Definitely not, knowledge ranges from none to poor" (P_C). "… we have a declining picture" (P_E). "… they don't know a great deal" (P_H).

Some interviewees suggested that in order to cut costs, newer companies competing for work do not place training and education high on their agenda. P_F said that training funding has now dried up so although their company has training needs, they had to look more cautiously at what they spend. In contrast, P_H invested heavily in training:

> [our workers are] going on courses and meeting industry standards but [in our view smaller companies don't] … know what method statements are, COSHH assessments, various certification, they don't know.

SCs (now) (rank 5)

Generally, views were negative here and some even described SCs as 'extinct':

> "… in the last two years since the workload's cut back, the supply chain no longer exists" (P_A). "… you would have thought it was a time for relationships to come to the fore, [but clients] have actually scrapped the relationships" (P_B). Q: "Do you think the supply chain is still healthy?" A: "It's under pressure"(P_D).

Additional negative comments were furnished regarding organizational relationships and the business environment generally. P_A said CMC do not realize the desperate stages some companies are in and that there is inadequate work available to accommodate those companies still in existence. P_B reiterated this, going on to confirm that the situation was not getting any better. P_C confirmed that relationships had become stretched, while P_G stated, '… there is no supply chain, no pre-qualification or anything else … it's a very unregulated industry'. Opinion suggested the 'problem' stemmed from clients having opened up their tender invitations to other (as one described them 'previously unheard of') companies and that because of this, too much competition prevails:

> … three or four years ago you would be one of two or three who were tendering … now you can be one of nine or ten … it's the rule of the spreadsheet … cheapest price at the bottom of it is going to get the work (P_G).

Other financial aspects (rank 6)

In addition to *Pricing Ramifications* earlier, a prevalence of comments relating to 'other' financial aspects meant that such evolved a theme (node) of its own. Cost-cutting—as a means of reducing tender sums and/or as a survival mechanism—was regularly mentioned:

> We've gone back to our suppliers … we've got our costs down by paying them on 60 days instead of 90 days … Some guys have cut wages by 10% (P_E).

P_H identified that management of the works formed a significant component of any tender sum and suggested, along with others, that this (preliminary item) was being trimmed too. Similarly, it was

suggested that some were winning work because they had not included for all necessary plant and, paradoxically, that CMC were incurring extra cost in having to make up for these 'supervisory' and 'plant' shortfalls. Neither, it was asserted, are clients necessarily aware of this:

> [the client is] *supplying* [the subcontractor with] *boxes* [trenchboxes—a form of earthwork support] *to keep them* [on the job] *because they perceive them to be cheap* … [ironically, we didn't win the contact as we're more expensive but] … *with us it's a one stop shop we have all our own boxes all our own machines, own engineers own project managers* [so in the end we're as cheap as them] (P_G).

P_B mentioned 'tax holidays' being granted some competitors who, due to trading difficulties were paying tax in installments through arrangement with *The Inland Revenue* and reiterated (a situation highlighted in 'pricing ramifications' earlier) that some banks are refusing to close financially unstable companies. They asserted that these kind of arrangements are keeping companies 'afloat' who cannot work 'viably' due to financial constraint and that this is placing additional pressure on companies who do things 'properly'. P_B described this as 'being clobbered into the ground' by firms that should not be in business and maybe, also explains why many views in this area related to business survival:

> … at this moment I don't feel it is about profit, I think it is about trading through it … we're not interested in making money for the next couple of years … if it keeps the business intact (P_C). The thing that concerns me is companies going bankrupt on us … that will push us close to the wall (P_F).

Employment ramifications (rank 7)

Given the trading difficulties alluded to throughout, almost all confirmed need to reduce employee levels:

> "We had 310 in 2007 … [but now have] … 160" (P_A). "… dropped at least half of our workforce" (P_B). "… gone from140 to 80 …" (P_C). "[We have lost] … about a third of staff" (P_D). "… had to lose about 18 out of about 60 staff" (P_E). "… we've dropped the office staff … the muck shift operations they've been scaled down as well" (P_F).

Results of this included costs to the sub-contractor from redundancy payments, lower pay levels and wage cuts, fear of unemployment, reduced output from stopping overtime and ultimately a potential skills shortage. The 'human side' of this situation caused anguish for some:

> "… blokes my age with a mortgage and wife and kids …" (P_A); "I personally didn't have the strength to deal with redundancies, lay-offs or what have you … [so they had to be implemented by others]; "… they've got mortgages, they've got bills to pay they've got families … it's heart-breaking" (P_E).

Clients (rank = 8.5)

Recurrent discourse focussed on clients' changing roles and their newly found 'dominant' attitude combined with lack of empathy for contractors, especially, relating to financial pressures. Examples of earlier client relationships were given to highlight how things have changed:

> "Ten years ago the clients I worked for were supportive, you worked together" (P_H). "They were very good to us, gave us an awful lot of work …" (P_F). "Go back 20 years clients knew how to build things I don't think they do now … it's just procurement [that is, a case of] oh we'll buy in [the subcontractor] … that's it, job done" (P_H).

Hence, those inter-organizational relationships (observed in this study) have deteriorated—interview dialogue particularly highlighted clients' autocratic disposition. One interviewee had 'fallen out' with a client after being treated with a 'bullish attitude' by a client that operated 'with a rod of iron', while another discussed a client who circumvented communication routes to completely control the project in terms of getting what they wanted. Two extreme examples included the client who had said, '… that is what we will pay, if you don't like it **** off' and another, who mentioned that after signing contracts sub-contractors often 'think they have made it in life' but instead, need to realize that the client now 'owns' them and that if they will not subsequently '… do what we want then we'll bust em'. Despite these examples, there was some optimism for the future. A need for improved communication and return to mutual understanding was emphasized, as one respondent said:

> "… we are all in this together … we've not got to be so short-sighted and single minded, in our objectives (P_C)"…. we've put workshops on for our main clients … we bring them in … talk through the technicalities

of [the project and our] … approach to the workface, safety issues and such like …"(P_J).

Former SC characteristics (rank = 8.5)

When alluding to former (i.e. pre-2007) SCs some indignity was apparent. Many mentioned the resources they had invested to build former relationships and 'comply' with client-driven demands. P_B referred to this as 'having jumped through hoops for ten years' to enter partnering arrangements, highlighting the significant financial investment that had gone with it. Other former characteristics in the dialogue reinforced many themes emerging earlier in the study: being able to work with (rather than against) clients (P_A), the mutual benefits of partnerships (P_B), less emphasis on cost (P_F), fewer tender competitors, higher margins, increased probability of winning work (P_H) and greater use of non-cost-related pre-qualification criteria (P_J).

Specific incidents (rank 10)

This sub-theme collated actual H&S occurrences cited by respondents in discussions elsewhere. While the detail is of lesser relevance to the present analysis, these incidents did confirm the extent of H&S risks on site by graphic description of three deaths, several major accidents and numerous examples of (increasing) risk-taking. (cf. 'H&S Ramifications' and 'Education/ Competence' above.)

Remaining themes

Here, the four lowest ranking themes are briefly discussed. 'Programme Ramifications' (rank 11) related mainly to accelerated work patterns dictated by stricter deadlines, usually imposed as a result of trimmed programmes to yield lower tender sums. As P_C put it, '… timescales are kind of being dismissed at the expense of commercial savings'. From this, the sub-theme 'Crashing' (rank 12.5) represented practical examples of the effects of this, conveniently summarized by P_A as '… trying to fill a football ground with supporters in ten minutes'. It seems logical that these themes were followed in rank by 'Quality' (rank 12.5), because repeatedly the adverse effects of shorter programmes were subjectively associated by participants with declining standards of work. Some identified that decline in quality is related to decline in safety too. Perhaps ironic that it ranked last, the theme 'Positives' (rank 14) included comments almost exclusively related to advances in e-procurement and e-purchasing.

Discussion

Figure 2 shows sub-themes attributed to main themes and primary/secondary relationships between them. For instance, *Pricing ramifications* (theme 1) shows a primary relationship with *Role of the banks* (sub-theme 1d). That is, banks have been said to emphasize turnover before profitability when dealing with 'struggling' companies—and the chase for turnover affects pricing strategies. The *Pricing* main theme has a secondary relationship with *H&S Ramifications* (theme 2), in that pricing pressures are having a negative 'knock-on' effect on health and safety matters (direction of influence shown by arrow). The following discussion looks at the 10 main themes in Figure 2, although some aspects explored earlier are discussed less. Within the discussion main themes are referenced in parentheses thus (1) and sub-themes are referenced like this (1a); hence, they may be cross referenced with Figure 2.

Pricing ramifications (1) was introduced in the above example. To continue that theme, the banks' present role (1d) appears to be upholding some unstable firms (1e) which in turn artificially props-up supply (1f). The latter links back to pricing (1) because ironically, based on economic doctrine (Sloman, 2002, Chap. 2), more competition forces tender sums down. Unstable firms with their concomitant poor cashflow are underbidding (1a) so reduced margins are common (1b). This issue of PrSCs 'buying' work means financial instability reigns (1c) and profitability [a subcontractor's *raison-d'être* according to Sacks (2004)] is poor. The resulting pressures on inter-organizational relationships and use of 'lowest bid selection' are non-conducive to achieving value-for-money (Fenn, 2001).

H&S ramifications (2) confirm reduced H&S investment (2d) and increased risk-taking (2e)—arguably explained to a major extent on cost-cutting combined with shorter project programmes (2f)—that in turn, evolve from price pressure (1). The latter can cripple smaller firms (Harvey, 2000, p. 197). These problems appear to manifest themselves in reduced workforce (H&S) risk recognition (2c) and may explain the *Specific H&S incidents* (10) recorded during the study that, unfortunately, continue to plague the sector at large (Stranks, 2008, p. 15).

SC changes taking place (3) identified predominance of partnership breakdowns (3a), leading to more adversarial relationships (3b) and a resurgence of open bidding methods (3c). The resultant seems a client/sub-contractor 'power struggle' that has negated (inter-organizational) mutual benefits (5b)—a situation borne out by participants, who often referred to as the 'one-sided' nature of supply and the authoritarian disposition of CMC (5a). The latter two characteristics conveniently summarize perceptions of *SCs now* (5) among this

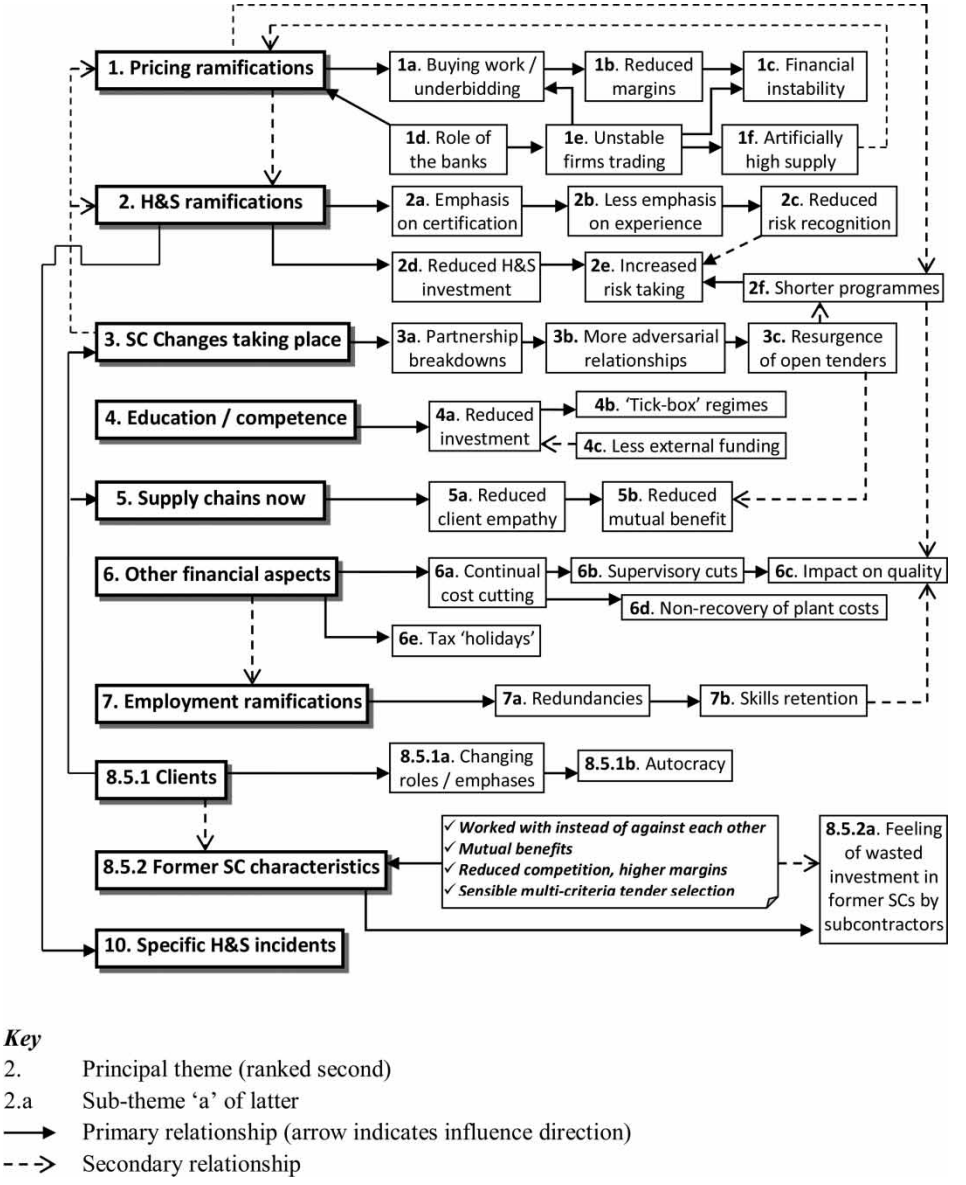

Figure 2 Model of thematic PrSC inter-relationships

study's sample. Unfortunately, this situation affects trust; hence, resulting transactions are exposed to increased scrutiny and transaction costs are elevated (Kwon and Suh, 2004). A pointer for the future, therefore, is that PrSC will require 'repair' if trading relationships are to recover for the benefit of stakeholders and one hopes that present problems will not prove a barrier to this. Will there, for instance, remain a legacy of resentment among stakeholders whose businesses have been pressured or terminated under current conditions?

Similarly to H&S ramifications, *Education and competence* (4) has witnessed reduced investment (4a) that has been compounded in part by reduced availability of external funding (4c). Participants generally felt that this has led to 'tick-box' regimes (4b) of education and competence assessment. Theme (4) is not aided by *Employment ramifications* (7) insofar as redundancies (7a) represent declining skills retention (most of the companies in the sample had shed workers since 2007) (7b). From an anthropological perspective, increasing unemployment combined with decreasing investment in training, education and experience should be of significant concern for the sector's future and for society at large.

Other financial aspects (6) highlighted that cost-cutting (6a) extends down the chain to other suppliers (nobody is immune); issues of cutting back on management (6b); cost-cutting that leads to problems elsewhere such as a

negative impact on quality (6c) and the non-recovery of some plant-related costs (6d) that should otherwise be included in a PrSC tender (ironically regarding the latter, the customer sometimes ended up paying for these items indirectly). 'Resentment' was felt among some that certain firms are afforded 'tax holidays' (6e).

The main theme *Clients* (8.5.1) highlighted what was perceived as their changing role (8.5.1a) that generally could be labelled 'autocratic' (8.5.1b). Clients were afforded a secondary relationship to *Former SC characteristics* (8.5.2) because the significant changes in Scs that have taken palace, have left a feeling of wasted investment (8.5.2a) by many PrSC, for instance in building up trading partnerships. Disappointment in SC breakdowns results from the fact that the former collaborative approaches have shown to deliver a wide range of benefits to stakeholders (BSI, 2010) and for PrSC, these are currently being denied.

And so to conclude this discussion of sectorial issues, one may postulate as to ways of rectifying them. Perhaps what is required is something of a public relations (or is it an educational) exercise? CMC need to be reminded of the importance of PrSC to their SCs —and maybe professional bodies have a role to play here? Continued competition and low profitability suggest that CMC will be trading with 'fragile' sub-contractors for the foreseeable future, which in a worst case scenario given their financial failure, and would bring significant (increased) costs and (unnecessary) project delays. Equally, PrSC failures would lead to decreased competition among them—a fundamental economic resultant of which—would mean increasing PrSC tender prices. Finally, underinvested plant fleets have a greater tendency to breakdown, contribute to a poor project image and may not be as efficient as they could be. They also contribute a larger carbon footprint. In addition to improved business relationships and lower transaction costs, surely these are inter-organizational value-adding benefits that CMC would embrace if adequately 'sold' to them? Perhaps most worrying, is the inability of PrSC to invest in (existing and new) plant for the future. None of these issues—and in particular the issue concerning investment—bode well for UK plc. Lack of investment in productivity-enhancing mechanization suggests that the sector would be held back in the event of an abrupt economic upturn.

Conclusions

Sub-contractors are critical of the construction industry and among this group are PrSC. While turnover, cashflow and profit are prerequisites for sub-contractor survival, this is more so for PrSC because they need to maintain and constantly invest in their mechanized plant fleets so crucial to their business activities. Post-recession economy has made the latter difficult to sustain. Based on this analysis of nine PrSC firms, their challenges with respect of inter-organizational relationships, business interactions, mutual trading benefits and ability to generate profit have been studied. The top five themes perceived as most important to PrSC were, in descending rank order:

- pricing ramifications—focussing in the main on effects of the present economic climate on tender prices, the ensuing competitive business environment within which tendering takes place and a reliance on cost as the superlative tender selection criterion;
- health and safety—a perceived decline in such resulting in the main from reduced ability to invest in H&S and from shorter project durations imposed as a function of cost pressures;
- SC changes taking place—especially the dissolution of former mutually beneficial inter-organizational arrangements and the resulting, increasing autocratic disposition of PrSC clients;
- education and competence—a general decline in standards and an over-reliance on certification as the mechanism to represent competence (at the expense of workers' experience); and
- SCs now—a feeling of wasted PrSC investment in fostering former partnerships and mutually beneficial arrangements, that no longer prevail.

With an eye to the future, two things seem apparent: first, that the breakdown of mutuality among stakeholders will require amelioration, if the imbalance in PrSC inter-organizational relationships and negative effects on PrSCs business survival are to be addressed; second, that resulting lack of profitability and therefore ability to sustain existing—and invest in new plant—fleets is of concern not only for PrSC but also for business generally. This is because inability to employ mechanization as a tool to increase industrial output and productivity is of relevance to UK plc. Indeed, given the market pressures upon construction throughout many countries, the findings of the study should be of interest to an international engineering community and of relevance beyond the study's geographic delineation. This will certainly be the case once economic activity returns to those countries experiencing construction downturn and especially if they are to successfully compete among international competition.

Notes

1. Here, taken to include *building* and *civil engineering*. For definitions of work types and economic activity see ONS (2011) and Squicciarini and Asikainen (2011), respectively.

2. Nonetheless, problems of construction supply chain management and the integration of its actors have equally been reported, see, for example Briscoe and Dainty (2005).
3. Does not include static items such as air conditioning units or pedestrian circulation.
4. Notwithstanding, benefits can also bring with them 'crisis risks' such as from stakeholder bankruptcy or from loss of a key client cf. Natarajarathinam *et al.* (2009).

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