

Subcontractor perspectives on supply chain alliances

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Since the publication of the Egan report in 1998, there has been a strong and consistent emphasis on the need to integrate the project delivery process via partnering and strategic alliancing agreements throughout the UK construction industry. However, given the continued reliance on subcontracting within the sector, future performance improvement also requires an acceptance of the benefits of supply chain partnering and integration from the small-to-medium size businesses who carry out the majority of construction work. This paper presents the findings of a research project that examined subcontractor perspectives on supply chain alliances. The study has uncovered serious concerns among subcontractors that point towards a fundamental mistrust and scepticism within existing supply chain relationships. These have the potential to inhibit further improvements in the efficacy of the project delivery process. A range of attitudinal change requirements for integrating smaller companies into the drive for continuous improvement are identified. It is suggested that leading clients should take responsibility for engendering the necessary attitudinal change throughout their supplier networks if further performance improvement is to be realized within the sector.

Keywords: Subcontractors, supply chain management, partnering, integration, culture

Introduction

Traditionally, the UK construction industry has suffered from cost overruns, programme delays and poor productivity, as was recognized by both the Latham (1994) and Egan (1998) reports. These reports have suggested mechanisms for change within the industry, and have set ambitious targets to reduce costs, programme time and defects. They suggest that these targets could be met through improvements in product development, partnering of the supply chain and the standardization of components. Research addressing the Latham and Egan agendas has concentrated on improving interactions between clients and main contractors, and in particular the formation of partnerships and strategic alliances (Himes, 1995;

Barlow *et al.*, 1997; Crane *et al.*, 1997; Bresnen and Marshall, 1998).

There are many definitions of 'partnering', and overarching definitions have the potential to obscure its true extent (Barlow *et al.*, 1997). However, normally partnering is regarded as a strategic arrangement whereby a contractor is engaged in a series of projects with the aim of lowering costs and improving efficiency, or can be a short term single project arrangement (Harris and McCaffer, 2001). Partnerships can operate independently of strategic alliances, where collaborators, having demonstrated a commitment through previous behavioural attitudes, co-operate and share resources in pursuit of common goals. Thus, each team member is jointly anchored to project success (Walker *et al.*, 2000). Alliances can range in scope from an informal business relationship to a joint venture agreement, the common feature being that collaborators work towards a joint

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goal. However, establishing rigid definitions of what these concepts mean in practice is problematic (see Bresnen and Marshall, 2000a) and often the terms are used interchangeably.

Despite the huge level of fragmentation within the industry, the role and influence of small and medium-size (SME)¹ subcontractors and suppliers within partnering and strategic alliancing has largely been ignored. This is a serious omission, given the large number of smaller firms that form the supply chain of most construction projects, and could inhibit the achievement of better supplier integration, process conformity and alignment.

Clearly the UK construction industry has made advances since the publication of the Egan report. The establishment of the Construction Best Practice Programme² and the Movement For Innovation³ have helped to promote management techniques such as benchmarking, partnering, lean construction, whole life costing and supply chain management, all of which are now more prevalent within UK construction companies (Barrie, 1999; Cook, 1999; DETR, 1999a; Leitch, 1999). However, it is larger companies that have tended to take responsibility for managing change, with subcontractors and other suppliers having provided very little managerial input (London *et al.*, 1998). Although there are many good examples of strategic partnerships that have led to considerable improvements in construction project delivery (see Barlow *et al.*, 1997; Bennett and Jayes, 1998; McLellan, 1999) these have been restricted largely to client-contractor linkages, as opposed to developing strategic alliances throughout the supplier network.

Matthews *et al.* (1996) indicated that partnering with smaller firms will help to improve relationships. However, there remains a lack of recognition of the importance of subcontractors and suppliers, most of whom are SMEs, within the partnering literature. For example, other advocates of partnering (Bennett and Jayes, 1995, 1998; Barlow *et al.*, 1997) do not focus on these important contributors to the construction process. This may stem from the industry's traditional approach of vertically differentiating the construction process, which results in a subordinate position for subcontractors within the hierarchy of relationships forming the traditional design-management-construction process. Consequently, main contractor-subcontractor-supplier relationships are often found to be strained and adversarial (Hinze and Tracey, 1994; Latham, 1994). The widespread use of labour-only subcontracting has further complicated this process through the existence of several tiers of subcontractors within a single project environment (O'Brien and Fischer, 1993; Reed, 1999). This further fragments the project delivery process, thereby inhibiting a fuller

integration of those involved in the production process.

An espoused benefit of supply chain management is the closer relationships between parties involved in the flow of goods from the supplier to the end user (Stannack, 1995; Lamming, 1996; D'Souza and Frank, 1997; Spekman *et al.*, 1998). Supply chain relationships should extend beyond the simple exchange of materials or services, to integrate the design, distribution, marketing, and knowledge exchange between the parties (Levy *et al.*, 1995). However, the failure to involve smaller companies in the development and implementation of supply chain performance improvement measures raises questions as to the likely success of such initiatives, especially as main contractors frequently have had poor relationships with their subcontractors and suppliers (Matthews *et al.*, 1996). Previous research has shown that better relationships with subcontractors is likely to have a significant effect on lowering bids, and hence project costs (Uher and Runeson, 1985).

This paper explores supply chain management issues predominantly from subcontractors' perspectives. The aim is to identify the barriers to greater subcontractor and supplier integration, focusing on continuous improvement initiatives, and to establish the attitudinal change requirements for breaking down obstacles to downstream supply chain integration within the UK construction sector. Initially, the role of subcontractors in the UK construction industry is explored in order to identify the importance of their integration for performance improvement. The paper then goes on to outline the research study which explored the perspectives of a number of subcontracting companies on supply chain alliances. The results of the study are presented, and a framework for addressing current barriers to supply chain integration is established.

The importance of subcontractors in UK construction

The tasks of speciality subcontractors may appear straightforward upon first examination, but further consideration of their role shows that they have to concurrently engage in numerous preparation, production and scheduling tasks across many different projects (Tommelein and Ballard, 1998). The critical importance of subcontracting to the success of construction projects has long been recognized. Gray and Flanagan (1989), in their comprehensive study of subcontracting, concluded that it would account for an increasing proportion of total construction workload. This is because main contractors use subcontracting as a means of surviving the volatility of the construction business cycle.

Accurate data with which to quantitatively measure the importance of subcontracting (incorporating material supply) in the industry are difficult to obtain, but an approximation of the degree of subcontracting can be derived from published government statistics. Table 1 presents data produced by the Office of National Statistics (ONS) to indicate the large number of enterprises that comprise the construction sector. Gross output is disaggregated into material purchases, industrial services (construction sector subcontracting), non-industrial services and the residual net output component. Some 57% of the gross work done involves the buying-in of materials and subcontractor services. This overall average incorporates a large element of small-scale repair and maintenance, where subcontracting is relatively less common. On larger new-build projects the proportion of gross output involving purchases and subcontracting is likely to be significantly higher.

Statistics produced by the Department of the Environment, Transport and the Regions (DETR), using a different register of construction firms from that adopted by the ONS, provided further details on the nature of construction industry subcontracting. Table 2 shows the size distribution of the firms on the DETR register (some 163 000 as opposed to the ONS's 177 000 enterprises). It should be noted that these data exclude many material supply companies who usually are classified as part of the manufacturing sector. There is a marked dominance of very small firms, with some 93% of all such firms employing seven workers or less. It is among these firms that a majority of specialist subcontractors are to be found. Table 2 shows they are critical to the production capabilities of the industry, as they account for about a quarter of the industry's total work done.

Further analysis of the DETR contractors survey yields information on the nature of the work done by

Table 2 The structure of private contracting in Great Britain for 1998

Size of firm (No. of employees)	No. of firms (%)	No. of employees (%)	Amount of work done (%)
1	53.8	9.5	9.1
2-3	29.4	18.2	8.8
4-7	10.0	10.0	7.3
8-24	4.4	12.4	11.8
2-114	2.0	18.6	22.0
115 or more	0.4	31.3	41.0
Totals	163 236 Firms	813 600 Employees ^a	£59.0 B p.a.

Source: *Housing and Construction Statistics 1988-1998* (DETR, 1999b).

^aIncludes working proprietors, operators and APTC non-manual staff, but excludes the self-employed.

all these small firms. Table 3 presents a breakdown of work done by the main trade of firm. Most small firms are specialists, although some are classified as general builders or civil engineers. Bricklaying organizations, for example, are treated as general builders. The data in Table 3 indicate that some 44% of the industry's firms are specialists, and many of these provide key production services to the main contractors who manage the new projects.

Methodology

Establishing the barriers to SME involvement in supply chain management presented several significant

Table 3 Distribution of construction work done by main trade of firm in Great Britain for 1998

Construction trades	Percentage of work done
General trades	55.8
Builders	30.3
Civil engineers	11.5
General contractors ^a	14.1
Specialist trades	44.2
Electrical contractors	10.0
Heating and vent. engineers	4.7
Plumbers	3.1
Painters	2.7
Roofers	2.5
Carpenters	2.4
Glaziers	1.9
Other specialists	16.9

Source: *Housing and Construction Statistics 1988-1998* (DETR, 1999b).

^aThese represent contractors providing both building and civil engineering services.

Table 1 Analysis of construction work done in Great Britain in 1997

1	Number of enterprises in construction industry	177 228
2	Value of gross work done in industry	£87.7 Billion (B)
3	Material and component purchases made outside of construction industry	£24.4 B (27.8%)
4	Cost of industrial services obtained within the industry	£22.5 B (24.4%)
5	Cost of non-industrial services bought in (includes plant hire, insurance and bank charges)	£3.2 B (3.6%)
6	Net output of the construction industry	£37.6 B (42.9%)

Source: ONS (1999)

challenges for the research design. First, supply chain management draws on a wide range of managerial practices, such as electronic data exchange, quality management, relationship assessments and the management of material flow, supplier relationships, costs and value (Saunders, 1994; Lamming, 1996; Macbeth, 1997). The relevance and impact of these diverse processes needed to be explored across a range of SME companies in order to establish how they could be integrated into the production process. A second problem existed in that supply chain management is a relatively new concept within the construction sector. Thus, finding SME companies who had been exposed to managed supply chains was likely to be problematic. A final difficulty concerned the need to provide results that were not restricted in applicability to a single supply chain or a unique set of supply chain relationships. This required the participating SMEs to be drawn from a number of projects that had been subject to a wide range of supply chain management concepts.

To overcome these difficulties, a number of large contracting organizations were approached to participate in the project. These organizations were involved with demonstration projects set up by the Movement for Innovation, and were committed to the wider implementation of supply chain management within the industry. These selected companies agreed to facilitate access to their supplier networks on some of their larger projects. Initially, simple 'relationship maps' were developed for each project; these identified all sub-contract linkages where some form of interaction took place (see Rummler and Brache, 1990). From these maps, a large number of SME subcontractors were identified who were approached to take part in the study. The companies were chosen on the basis that they had been exposed to a wide range of supply chain management practices on a number of different projects being managed by the large contracting organizations. The participating companies represented a broadly stratified spread of companies with turnovers ranging from under £1m to around £20m (see Table 4).

In-depth semi-structured interviews were held with managing directors or senior managers within the participating companies. Each was asked a series of questions relating to their perspectives on the industry's current performance improvement agenda, their relationships with the other companies making up the supply chain, their attitudes towards partnering and strategic alliancing, and how further integration could best be achieved. In addition, each informant was asked to discuss the nature of the skills, knowledge and attitudes required by those within an integrated supplier network that would facilitate continuous improvement. The interviews were all recorded and transcribed verbatim, and then coded and analysed

Table 4 Summary of the project participants

	Key business areas	Turnover	No. of employees
A	Car park barriers	£1m–5m	1–19
B	Tiling	£1m–5m	40–59
C	Glazing	>£5m	60+
D	Services	>£5m	60+
E	Flooring	£1m–5m	20–39
F	Internal partitions	<£1m	1–19
G	Steel fabricators	>£5m	60+
H	Demolition	£1m–5m	60+
I	Services	£1m–5m	20–39
J	Tiling	£1m–5m	20–39
K	Services	£1m–5m	20–39
L	Labour only	<£1m	40–59
M	Steel fabricator	£1m–5m	1–19
N	Drilling and grouting	£1m–5m	20–39
O	Services	£1m–5m	20–39
P	Services	£1m–5m	40–59
Q	Services	£1m–5m	20–39
R	Civils	£1m–5m	40–59
S	Materials supplier	>£5m	20–39
T	Roofing and cladding	£1m–5m	1–19

using qualitative analysis software QSR NUD·IST NVivo. This software tool was used to model the data to identify the core issues that defined the nature of particular supply chain relationships. Collectively, the analyses allowed the identification of the generic requirements for supply chain integration.

From the 'NVivo' analysis, particular issues were identified that clearly were preventing satisfactory supply chain relationships between the subcontractors and suppliers and the companies at the head of the supplier network. In order to confirm the validity of these findings and to identify ways of improving the current situation, focus groups were then held with a selection of main contractors, subcontractors and suppliers. These meetings allowed a comparison of the perspectives of the participants with regards to the issues raised, and for mutually acceptable solutions to be identified for overcoming the barriers to further integration.

Results

Subcontractor interviews

The companies interviewed held generally negative views of partnering and supply chain management. They believed that some main contractors did not understand the principles of partnering and strategic alliancing, or that their motivations for adopting such practices were not for reasons of engendering mutual trust, support and benefit throughout the supply chain. Although some of the subcontractors had experienced

successful partnering relationships with client organizations, they believed that successful alliances with main contractors would be far more problematic. Key themes emerging from the subcontractor interviews are summarized below under headings drawn from the NVivo analytical framework.

Financial/cost-related issues

Directors of SMEs viewed partnering-related practices such as open-book accounting merely as mechanisms for main contractors to drive down subcontractor profits. Competitive tendering remained the principal mechanism for subcontractor selection, particularly for non-specialist services. This was seen as being against the ethos of alliancing, and as militating against long term relationships. Main contractors were criticized for accepting the lowest tender price, even where they knew that there had been a pricing error by a subcontractor, or where another supplier offered significant added value to the project. Adversarial relationships developed through the tender process were found to have led to serious problems with regards to payments during projects.

Traditional contracts were seen as being biased towards the main contractor and as encouraging bad practices and adversarial relationships. The legislation provided by the UK's 1998 Construction Act had failed to ensure on-time payments to subcontract and supplier companies, or to prevent main contractors from unnecessarily withholding retention payments at the end of contracts. Such practices commonly led to cashflow difficulties and to a breakdown in trust relations. Some SMEs had become so sceptical that they regarded supply chain management as merely another mechanism to ensure that they took on the burden of the short term finance of projects. This had led some firms to build in contingencies to their tender submissions to mitigate the risk of late payment.

Programming/time-related issues

Programming difficulties constituted both a symptom and a cause of poor supply chain relations. Smaller supply chain companies generally felt that programming times were often unrealistic, resulting in poor quality buildings and latent defects. Other problems included frequent accounts of specialist subcontractors arriving on site to find that the main contractor was not ready for their input. Again, smaller companies complained of being expected to be flexible without any acknowledgement of their own business requirements. This suggested that risk was passed down the supply chain, rather than being shared amongst the parties in the spirit of a true partnership. These problems existed despite the availability of information and information communications technology which could easily be used to mitigate such programming difficulties. However,

little or no effort had been made to align the systems of subcontractor and supplier companies with those of main contractors, or to impart the necessary skills to enable such problems to be avoided. Such misalignment was seen as a demonstration of the lack of effort on behalf of main contractors to show a two-way commitment in investing in their supplier relationships.

Quality of information and related issues

Subcontractors complained about the quality of information received from the main contractor. Problems included missing, late and/or inaccurate data, and a general ambivalence towards subcontractors' needs for prompt and accurate design information. There was also believed to be a general reluctance to draw upon the expertise of specialist subcontract and supplier companies. Again, many of these problems were attributed to a lack of information technology integration and alignment between the parties, together with a lack of willingness by main contractors to develop an equitable 'involvement climate' between the parties.

Attitudinal issues

Main contractors' front-line managers were criticized by subcontractors as inhibiting better integration. For example, some contractors' quantity surveyors, with responsibility for managing payments during projects, were accused of acting aggressively towards subcontractors and suppliers and of preventing their early involvement in projects. Main contractors' estimators often were perceived to lack any understanding of the demands placed on subcontractors, and of expecting immediate quotations for complex works packages. Site management teams were felt to have greater concern for completing projects in the shortest possible time than in co-ordinating and integrating the specialist trades effectively. Subcontractors were rarely praised for adding value to a project through their own innovation, or made to feel an integral part of the delivery team.

Focus group discussions

A selection of the companies taking part in the initial interviews, representatives of main contractors and a selection of training providers were invited to attend a series of informal workshops in order to discuss the earlier research findings. The aim of these workshops was to confirm the validity of the interview findings, to establish the changes necessary to integrate construction supply chains more effectively, and to identify ways of overcoming current barriers to greater subcontractor involvement. Accordingly, a frank exchange of views was encouraged between the parties during these meetings. In particular, the focus groups sought to confirm the validity of the interview findings, not just from the

perspective of the SMEs but also from the standpoint of the main contractors.

The barriers identified were seen as being symptomatic of a lack of understanding and empathy with SME needs by main contractors, particularly with regard to cost and payments issues. Although it was accepted that partnership arrangements had the potential to resolve many of the payment issues, main contractors acknowledged that frequently they saw little benefit in forming alliances with companies with which they did not work regularly. While the benefit of project specific partnerships with clients was recognized, these were not seen as applying to downstream supply chain linkages. Subcontractors blamed the lack of trust between the parties on the adversarial nature of their working relationships that had characterized the industry's operation for many years. Indeed, the cultural issue of mistrust between the parties was seen as a fundamental barrier to the increased understanding of each others' needs and further supply chain integration.

In terms of finding solutions to the lack of integration within construction supply chains, it was agreed that subcontractors and suppliers must be integrated formally into communication and reporting structures within the project organizational structure. Both subcontractors and suppliers saw this as an effective way of allowing them to establish the closer relationships for better supply chain integration. Some of these barriers were also seen as capable of being broken down through 'soft skills' developments, and especially in terms of improving communication skills amongst project-based staff. It was agreed that future training should focus on engendering inclusive attitudes amongst such employees, and efforts should be made to address the lack of trust arising from traditional adversarial practices. Subcontractors also argued that better integration depended upon client actions in managing better supply chain integration. However, although this was possible for larger clients using a defined number of suppliers, it was seen as problematic for those who procured little construction work.

Discussion: a framework for improved supply chain integration

A central tenet of construction supply chain management is that the greater provision of integration will solve many of the problems that fragmentation has caused within the sector. This assumption relies upon the notion that those involved in the construction process have an inherent preference to become integrated into project delivery systems. However, the nature of construction and its products means that there are no easy answers to developing a fully integrated

supply chain solution (Thompson, 1998). The findings of this study have suggested that significant barriers remain to supplier integration, and to the further development of supply chain alliances. The lack of trust and negative attitudes towards many of the essential requirements of supply chain management suggest that the industry is a long way off being able to align systems and procedures for improved project performance.

The key barriers to greater integration seem to stem from the historical fragmentation of project delivery systems, and the contractual and adversarial nature of construction project relationships. Clearly, leading companies must agree to share the benefits of greater integration with their supply chain partners. However, there appears to be a belief at present that existing supply chain management techniques seek to enhance main contractor profitability at the expense of other supply chain companies. This is symptomatic of a lack of trust between main contractor and subcontractor/supplier organizations. Bresnen and Marshall (2000b) showed that even further up in the supply chain contracts let under partnering arrangements still retained quasi-competitive methods of control which led to the maintenance of mistrust and conflict between main contractors and client organizations. This seems to be reflected further down the supply chain in the second-tier supplier relationships between main contractors and subcontractors. This mistrust and scepticism appears grounded in the ingrained adversarial practices that characterized the industry in the past. Hence, persuading construction SMEs of the benefits of supply chain partnering and integration is likely to be extremely problematic.

Despite the problems inherent in managing and integrating construction supply chains, essentially the alignment of systems and cultures is improving the performance of the industry. In order to convince SMEs that the motives are mutually beneficial to the strategic alliance, the partnering processes would need to include mechanisms for engendering an 'involvement climate' (see Barlow and Jashapara, 1998). Such integration is likely to require those further down the supply chain to align their systems and procedures with those at the head of the production process. This points towards two specific needs for better integration: a greater degree of client leadership in order to drive the integration process and an insistence on transparent and mutually beneficial processes for all parties in the supply chain. Initially, this would require defined protocols for ensuring the inclusion and fair treatment of smaller companies within the process. These could come in the form of an integrated contractual system that ensures a parity of responsibilities and obligations at each level of the supply chain. If backed up by appropriate legal sanctions, such a system could be used to develop better integration in the future.

Engendering the attitudinal change required for effective supply chain integration is unlikely to be possible without fundamentally rethinking the current inter-organizational relationships and dynamics that exist within the construction industry. This change needs to come from a variety of sources, including the education of the construction workforce. For example, communication skills, knowledge of other types of organization operating in the construction supply chain and the benefits of partnering can all be taught in classrooms (Briscoe *et al.*, 2001). Change relating to contractual documents need to come from the organizations responsible for their preparation, not just in refining contractual provision but also in espousing the benefits of these new documents. Finally, the most important change at an organizational level, particularly within main contractor and client organizations, is to accept that subcontractors can bring added value to the construction project delivery process. This must be accompanied by a willingness to share knowledge and communication, because if this change does not occur internally then criteria such as trust between parties, fair payments and early involvement with projects will not take place. Only if such changes are made will it prove possible for longer term relationships to evolve between the parties in the supply chain.

Conclusions and future work

This study has identified some significant barriers to supply chain integration by smaller subcontractors and suppliers. It has shown that the UK construction sector is a long way from being able to derive benefits from true downstream supply chain integration. Apparently the 1998 Construction Act has made very little difference to this situation. There remains a general mistrust within the SME companies that make up the construction supply chain, and a general lack of belief that there are mutual benefits in supply chain integration practices. This appears to be preventing the active involvement of supplier companies to the construction process improvement agenda. Failure to address this issue will result in only minor improvements in project performance and the industry will lack the added value that SME companies can contribute. This is a problem not only for the subcontracting and supply companies but also for the main contractors, as it impairs their efficiency and performance.

A change in this situation will require main contractors to make efforts to address the integration and partnership of smaller companies as well as client organizations. However, developing an operational process framework for the implementation of effective supply chain management throughout the value chain clearly is a long term objective. It will require tools to facilitate

supply chain relationships at key project interfaces (client/contractor, consultant/contractor, contractor/subcontractor, subcontractor/supplier, etc). This will require the facilitation of better supply chain relationships across the production process, through a contractual system that emphasizes parity of obligations and responsibilities at each level of the supply chain. In the interim, subcontractor integration could be influenced by the clients' approach to construction procurement. For example, if clients who practice good supply chain management principles within their primary business activities transfer these principles to the management of their construction supply chains, then this could benefit the integration of subcontractors into the process.

In order to address the issues arising from this study, further work is now being undertaken to establish how the supply chain management practices of large client organizations can be applied to their construction supply chains more effectively. The general procurement practices and resulting relationships at four tiers of the supply chain are being investigated with a range of major construction clients. Best practice with regard to managing relationships at each level is being identified for their core procurement operations and developed to provide an improvement framework that can be applied to their construction procurement activities.

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References

- Barlow, J., Cohen, M., Jashapara, A. and Simpson, Y. (1997) *Towards Positive Partnering: Revealing the Realities in the Construction Industry*, The Policy Press, Bristol.
- Barlow, J. and Jashapara, A. (1998) Organisational learning and inter-firm 'partnering' in the UK construction industry. *The Learning Organisation*, 5(2), 86-98.
- Barrie, G. (1999) Clients group calls for contractors league tables. *Building*, 264(17), 10.
- Bennett, J. and Jayes, S.J. (1995) *Trusting the Team: The Best Practice Guide to Partnering in Construction*, Centre for Strategic Studies in Construction, The University of Reading.
- Bennett, J. and Jayes, S.J. (1998) *The Seven Pillars of Partnering: A Guide to Second Generation Partnering*, Thomas Telford, London.

- Bresnen, M. and Marshall, N. (1998) Partnering strategies and organisational cultures in the construction industry. In Hughes, W. (ed.) *Proceedings of the ARCOM 14th Annual Conference*, 9–11 September, University of Reading.
- Bresnen, M. and Marshall, N. (2000a) Partnering in construction: a critical review of issues, problems and dilemmas. *Construction Management and Economics*, 18, 229–37.
- Bresnen, M. and Marshall, N. (2000b) Motivation, commitment and the use of incentives in partnerships and alliances. *Construction Management and Economics*, 18, 587–98.
- Briscoe, G.H., Dainty, A.R.J. and Millett, S.J. (2001) Construction supply chain partnerships: skills, knowledge and attitudinal requirements. *European Journal of Purchasing and Supply Chain Management*, in press.
- Cook, A. (1999) Wanted: Egan converts with industrial leanings. *Building*, 264(34), 20–1.
- Crane, T.G., Felder, J.P., Thompson, P.J., Thompson, M.G. and Sanders, S.R. (1997) Partnering process model. *Journal of Management in Engineering ASCE*, 13(4), 57–63.
- DETR (1999a) Contractors lead race to improve performance. *Construction Monitor*, May, Department of the Environment, Transport and the Regions, p. 8.
- DETR (1999b) *Housing and Construction Statistics 1988–1998*, Department of the Environment, Transport and the Regions and HMSO, London.
- D'Souza, M. and Frank, D.N. (1997) Total supply chain management in contract manufacturing. In *40th International Conference Proceedings: Target Breakthrough Ideas*, 26–29 October, APICS, Washington DC, pp. 53–5.
- Egan, J. (1998) *Rethinking Construction*. Department of the Environment, Transport and the Regions and HMSO, London.
- Gray, C. and Flanagan, R. (1989) *The Changing Role of Specialist and Trade Contractors*, Chartered Institute of Building, Ascot.
- Harris, F. and McCaffer, R. (2001) *Modern Construction Management*, 5th Edn, Blackwell, Oxford.
- Himes, P.E. (1995) Partnering in the construction process: the methodology for the 1990s and beyond. *Facilities*, 13(6), 13–15.
- Hinze, J. and Tracey, A. (1994) The contractor–subcontractor relationship: the subcontractor's view. *Journal of Construction Engineering and Management*, 120(2), pp. 274–287.
- Lamming, R. (1996) Squaring the lean supply with supply chain management. *International Journal of Operations and Production Management*, 16(2), pp. 183–196.
- Latham, M. (1994) *Constructing the Team*, Final Report on Joint Review of Procurement and Contractual Agreements in the UK Construction Industry, HMSO, London.
- Leitch, J. (1999) Steering in a new direction. *Contract Journal*, 400(6239), 18–19.
- Levy, P., Bessant, J., Sang, B. and Lamming, R. (1995) Developing integration through total quality supply chain management. *Integrated Manufacturing Systems*, 6(3), pp. 4–12.
- London, K., Kenley, R. and Agapiou, A. (1998) Theoretical supply chain network modelling in the building industry. In Hughes, W. (ed.), *Proceedings of the ARCOM 14th Annual Conference*, 9–11 September, University of Reading, pp. 369–70.
- Macbeth, D.K. (1997) Definition of supply chain management. In *Pocket International Encyclopaedia of Business and Management*, International Thomson Business Press, London, pp. 271–2.
- Matthews, J., Tyler, A. and Thorpe, A. (1996) Pre-construction project partnering: developing the process. *Engineering, Construction and Architectural Management*, 3(1&2), 117–31.
- McLellan, A. (1999) Brixton boys make good. *New Civil Engineer*, November, 16–17.
- ONS (1999) *Production and Construction Inquiries*, Business Monitor PA1002, Office of National Statistics and HMSO, London.
- O'Brien, W.J. and Fischer, M.A. (1993) Construction supply-chain management: a research framework. *Civil Comp 93: Information Technology for Civil and Structural Engineers*, 61–4, Civil Comp Press.
- Reed, M. (1999) *Working Together: Tools for an Integrated Construction Supply Chain*, University of Cardiff and Trant Engineering.
- Rummler, G.A. and Brache, A.P. (1990) *Improving Performance, How to Manage White Space on the Organisational Chart*, Jossey-Bass, San Francisco.
- Saunders, M. (1994) *Strategic Purchasing and Supply Chain Management*, Pitman, London.
- Spekman, R.E., Kamauff Jr, J.W. and Myhr, N. (1998) An empirical investigation into supply chain management: a perspective on partnerships. *International Journal of Physical Distribution and Logistics Management*, 28(8), pp. 630–50.
- Stannack, P. (1995) Building organisational communities: the role of purchasing and supply chain management. In Kemp, R. A. and Lamming, R. C. (eds), *Proceedings for the First Worldwide Research Symposium on Purchasing and Supply Chain Management*, Arizona State University, Tempe, USA.
- Thompson, I. (1998) No pre-fab solution. *Supply Management*, 3(13), 30–1.
- Tommelein, I.D. and Ballard, G. (1998) *Coordinating Specialists*. Technical Report No. 87–98, Construction Engineering and Management Programme, Civil and Environmental Engineering Department, University of California, Berkeley, CA.
- Uher, T.E. and Runeson, G. (1985) Subcontractor–general contractor relationship in Australian building industry. *Project Management*, 3(1), 35–8.
- Walker, D.H.T., Hampson, K.D. and Peters, R.J. (2000) Project alliancing and project partnering – what's the difference? – partner selection on the Australian National Museum project: a case study. In Serpell, A. (ed.), *CIBW92 Symposium on Information and Communication in Construction Procurement*, Santiago, Chile, Vol.1, pp. 641–55.

Endnotes

¹Small to medium-size enterprises (SMEs) have been defined within this study as companies employing less than 100 people.

²<http://www.cbpp.org.uk>

³<http://www.m4i.org.uk>

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