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Building partnerships: case studies of client–contractor collaboration in the UK construction industry

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Despite the enormous groundswell of interest in partnering and alliancing in recent years, there has been comparatively little research that has set out to investigate systematically the nature, feasibility, benefits and limitations of forms of client–contractor collaboration. This is despite the growing recognition that conditions conducive to partnering may well vary considerably and that partnering may not be the solution for problems within the industry that many commentators have taken it to be. This paper sets out to add to the growing literature and empirical database on partnering by reporting the findings of a research project designed to explore the economic, organizational and technological factors that encourage or inhibit collaboration in practice. The paper follows on from an earlier review and critique of the literature on partnering (Bresnen, M. and Marshall, N. 2000, *Construction Management and Economics*, 18(2) 229–37). It includes as its database nine case studies of medium-to-large-scale projects, selected from across the industry, on which processes of collaboration are examined from the viewpoints of clients, contractors, designers and subcontractors. In contrast to much of the prescriptive work in this area, the analysis of the data and the paper's conclusions stress some of the practical problems, limitations and paradoxes of partnering and alliancing when the effects of important economic, organizational and psychological factors are taken into account.

Keywords: Management, partnering, alliancing, clients

Introduction

Historically the construction industry has used procurement methods and contractual arrangements that have encouraged clients and contractors to see themselves as adversaries and that have reinforced any differences in values, goals and orientations that exist within the construction project team (e.g. Banwell, 1964; Higgin and Jessop, 1965; Morris, 1973; Cherns and Bryant, 1984; Ball, 1988; Latham, 1994). In

recent years, however, all this is expected to have changed and considerable attention has been directed towards forms of client–contractor relationship that move away from traditional ‘arms-length’ contracting and towards relationships based more upon cooperation and trust. Although such relationships can take a variety of forms (including joint ventures), debate has crystallized around the emergence of ‘partnering’ as the major vehicle of change within the industry (Barlow and Cohen, 1996; Holti and Standing, 1996; Rasmussen and Shove, 1996; Barlow *et al.*, 1997; Bresnen and Marshall, 1998, 1999, 2000a; Thompson

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and Sanders, 1998). Indeed, many commentators have argued that partnering can have a substantial positive impact on project performance, not only with regard to time, cost and quality objectives, but also with regard to more general outcomes such as greater innovation and improved user satisfaction (Construction Industry Institute, CII, 1989, 1991; NEDO, 1991; CRINE, 1994; Latham, 1994; Bennett and Jayes, 1995, 1998; ACTIVE, 1996; Bennett *et al.*, 1996).

This paper sets out to add to this growing literature and empirical database by reporting findings from a research project designed to explore partnering and related forms of collaboration in the UK construction industry and to investigate the economic, organizational and technical factors that encourage or inhibit collaboration between contractual partners. The paper follows on from an earlier review and critique of the literature on partnering (Bresnen and Marshall, 2000a). It includes as its database a number of case studies of medium-to-large-scale projects selected from a range of sectors within the industry and examines processes of collaboration on these projects from the perspectives of clients, contractors, designers and subcontractors. In contrast to much of the prescriptive and anecdotal work in this area, the analysis in this paper sets out to explore any difficulties or limitations in the use of collaborative approaches, as well as their benefits (see also Bresnen and Marshall, 1998, 1999, 2000b). In so doing, the aim is to contribute towards knowledge about collaborative working in construction that is more realistically grounded and, therefore, ultimately more practically relevant.

Partnering in construction

Partnering is now a well established approach to contracting in the USA, UK and Australia, and there exists a substantial literature that sets out to demonstrate its main principles, practices and benefits (CII, 1989, 1991, 1994; NEDO, 1991; Loraine, 1993; Weston and Gibson, 1993; CRINE, 1994; Latham, 1994; Thompson, 1994; Bennett and Jayes, 1995, 1998; Green, 1995; ACTIVE, 1996; Bennett *et al.*, 1996; Hinks *et al.*, 1996; Holti and Standing, 1996; Rackham *et al.*, 1996; Barlow *et al.*, 1997). Generally speaking, partnering involves a commitment by organizations to cooperate to achieve common business objectives (CII, 1991, p. iv; NEDO, 1991, p. 5; Bennett and Jayes, 1995, p. 2). The terms partnering and alliancing are often used interchangeably, although alliancing is perhaps more often used to refer to partnering on single projects (e.g. Green, 1995). However, there is still debate about whether or not single-project partnering is feasible, given the importance of

continuity of work as a commercial incentive (e.g. Green and McDermott, 1996).

There is also considerable uncertainty concerning the range of practices that partnering encompasses. Thus, there are different views not only on the duration of partnering arrangements but also the precise role of contracts and incentives, and whether or not formal teambuilding needs to take place (Barlow *et al.*, 1997; Bresnen and Marshall, 2000a). Many commentators adopt a very pragmatic approach to partnering, emphasizing the use of appropriate tools and techniques to 'engineer' collaboration (in both the short- and long-terms). These include, *inter alia*, charters and dispute resolution mechanisms, appropriate formal contracts and incentives, teambuilding workshops, continuous improvement programmes and benchmarking (e.g. NEDO, 1991; Loraine, 1993; Bennett and Jayes, 1995; Evans and Bailey, 1996). However, others stress instead the more informal and developmental aspects of partnering (see Bresnen and Marshall, 1999, 2000a for reviews). Either way, partnering is perhaps best conceptualized as making progress towards collaboration along a number of technical and organizational fronts (Holti and Standing, 1996, p. 5; Barlow *et al.*, 1997; Thompson and Sanders, 1998).

Despite the amount of interest shown in partnering, actual empirical research is rather thin on the ground, and much of the work to date is notable for its prescriptive tendencies and heavy reliance on anecdotal data. Certainly there is much case study evidence and, more recently, some survey evidence of the performance benefits of partnering (e.g. Cowan *et al.*, 1992; Weston and Gibson, 1993; Knott, 1996; Larson, 1997). However, there is also case evidence of the failure of partnering to meet performance expectations (e.g. Rackham *et al.*, 1996; Angelo, 1998). Moreover, there is very little research that uses comparative case study or survey work to investigate systematically the conditions under which partnering is more or less appropriate, feasible and effective in practice. There is even less research which systematically has sought to analyse partnering from different perspectives within the construction project team. This has not, of course, stopped attempts by companies to implement partnering or to learn from their experiences of partnering. Nor has it stopped a proliferation of reports and manuals that purport to provide practitioners with guidelines for best practice (e.g. CII, 1991; NEDO, 1991; Bennett and Jayes, 1995, 1998). However, it does mean that often the guidelines produced by such reports are based upon assumptions and ideas that remain largely unstudied and untested in any systematic way.

It has been argued elsewhere that frequently research on client-contractor collaboration in construction is

often insufficiently informed by the many social science concepts and theories (relating to motivation, team-building, organizational culture and the like) that are central to an understanding of cooperation and trust between organizations (Bresnen and Marshall, 1998, 1999, 2000a). First, often there is a lack of attention paid to the different forms that partnering can take, reflecting diverse circumstances and varying views about the appropriateness of different formal and informal mechanisms (cf. Barlow *et al.*, 1997). Second, the effects of economic and institutional context upon forms, processes and outcomes of collaboration are rarely systematically examined (cf. Green, 1998, 1999) and seldom is the experience of partnering explored from different perspectives (cf. Bresnen, 1990, 1991, 1996). Third, often existing research fails to grapple adequately with the complex relationship between individual or group behaviour and organizational culture (cf. Barlow and Cohen, 1996) which, nevertheless, lies at the heart of many prescriptions for improving collaboration within the industry (e.g. Bennett and Jayes, 1995, 1998). If ultimately the intention of research on partnering is to contribute towards the development of appropriate and useful practical recommendations, then clearly it is important that such issues and potential problem areas are addressed adequately (see Bresnen and Marshall, 2000a for a more detailed discussion).

Research aims and objectives

The aim of this paper is to help bridge this gap between existing research and useful practical recommendations by exploring the above issues in some empirical depth. What follows are the findings from a research project designed to investigate the use of collaborative approaches, such as partnering and alliancing, across a range of project circumstances in construction. The research had a number of specific objectives,

which included: (a) identifying the types of collaborative approach used by clients in practice (in terms of tendering, contractual and management arrangements); (b) identifying and examining the factors (economic, organizational and technological) promoting or inhibiting collaboration between contractual partners; and (c) investigating effects on project performance (in terms of time, cost and quality, as well as more subjective criteria such as client satisfaction). These objectives were used to inform and guide the research as a whole, although it should be noted that the data and analysis are presented here in a much more thematically structured way, consistent with the type of (qualitative) methodology used and its underlying exploratory logic (see below for details). A broad framework for the presentation and analysis of the research findings, which outlines the key issues focused upon and their inter-relationships, is presented in Figure 1. This framework has a number of key implicit features which need highlighting, since they are important in guiding the later presentation, analysis and discussion of the data (see also Bresnen and Marshall, 2000a for a more detailed discussion): (i) the importance attached to understanding the effects of context (economic, institutional) upon inter-firm collaboration; (ii) the emphasis placed upon examining interrelationships between internal organizational attributes (structures, cultures, management practices) and external forms and processes of collaboration; (iii) an acknowledgement that collaboration is a phenomenon that needs to be studied at different levels of analysis (individual, group, organizational); and (iv) the picture is not a static one and developmental dynamics and processes of feedback and learning are important too.

Research methodology

The research was based upon case studies of medium-to-large-scale construction projects undertaken by experienced clients across a range of sectors within the industry. A multiple case design was used to allow comparative analysis and to help assess the transferability of collaborative practices. No attempt was made to generate a representative sample, since the aim of this exploratory type of research is to produce analytical, rather than statistical, generalizations (Yin, 1984). Instead, case selection was based upon two criteria that consistently have been shown to affect organizational processes (Bresnen, 1990): variation in type of project (see below); and variation in project size (defined according to value). Availability was also an important practical selection criterion, since the work involved collaboration with eight industrial companies and the cases were selected mainly from the companies' current

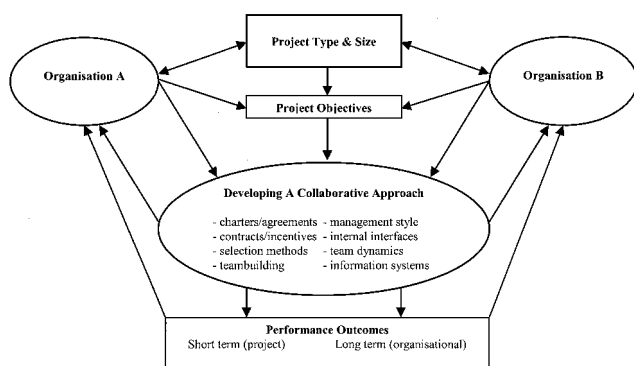


Figure 1 Model of inter-firm collaboration

portfolios of projects. Cases were selected also so that their period of study began roughly at the same point in time (the transition from design to construction stages) and so that some longitudinal 'real time' study was possible.

Given the need for in-depth analysis and flexibility in the field, qualitative research methods were used (Bryman, 1989). Semi-structured interviews were the main form of data collection, supplemented by direct observation and the study of relevant documentation. Overall, 158 interviews were conducted (on average, about 18 per case). In order to capture a range of perspectives, these included a selection of team members from different departments and levels within each main participating organization (client, designers, main contractor), plus interviews with subcontractors' representatives where possible. Although the length and focus of interviews varied, they were all based upon a nine page 'master' interview schedule. The fieldwork was conducted between March 1997 and May 1998. Details of the projects are given in Tables 1 and 2 (the latter summarizes some of the main features explored in the later analysis and discussion).

The projects ranged from £9 million to £400 million in value and included two oil and gas projects (one offshore, one onshore), two process plants, two civil engineering and three building projects. In order of level of formal commitment (cf. Barlow *et al.*, 1997, pp. 8–10), case A was a joint venture, cases B–E were partnerships, cases F and G were single project alliances and cases H and I were more conventional projects (a construction management and 'traditional' JCT contract, respectively). There was no simple and direct relationship between project type or size and method of procurement. Instead, the method selected reflected the particular commercial aims of the project and, in some cases (A, C, F and G), broader procurement policies or strategies (such as the rationalization of supply bases or a shift to outsourcing).

Developing collaborative relationships

The reasons given for using more collaborative partnering and alliance arrangements included, not surprisingly, the array of factors commonly identified in the literature. In particular, stress was placed on the benefits of cost and schedule reduction, as well as improved buildability and greater responsiveness to user requirements. There was also a clear recognition of the benefits to contractors of collaboration, including the prospect of future work (B–E) and the more indirect marketing advantages of a proven track record (B, C and E). At the same time, however, clients were acutely aware of the danger of allowing 'cosy

relationships' to develop. In some cases (A and C), dual or multiple sourcing was purposely retained in order to avoid this problem. In other cases, quasi-market mechanisms (such as financial incentives, continuous improvement and benchmarking) were the principal devices used.

In all projects (including the more conventional ones), collaboration was seen as important, and considerable emphasis was placed upon developing a team culture and fostering the 'right attitudes'. However, there were differences in the ways in which the companies set out to achieve this. It was generally agreed across the cases that there were significant benefits to be gained from the long term, informal development of trust (cf. Bresnen and Marshall, 1998). However, most of the cases investigated here were either short term alliances (F and G), or had only started to evolve into long term relationships (A, B, C and D). Admittedly, some of this evolution was quite informal: the partnering framework for project C, for example, was initially a semi-formal agreement consisting of an outline document, which was then further developed and refined. However, it was only on project E that the partnering agreement had evolved out of a long standing relationship (and in response to the high costs and legal disputes the client had experienced under competitive tendering).

What was common across the projects, however, was the view that senior management support was vital in making a collaborative approach both credible and legitimate. In all cases, partnering or alliancing had been championed at the highest levels of the organization and the general perception was that goal alignment and good relationships at these levels were crucial (C, D and F). There was also a widespread perception that the necessary culture change needed to extend throughout the organization, being led from and supported by senior management. However, whereas collaboration did continue to receive strong senior management support, often there were considerable difficulties reported in diffusing the concept throughout the organization and in translating agreement reached at senior levels into practice (e.g. in case E). Ironically, perhaps, it was the joint venture that was the best example of some of the difficulties of attempting to establish an effective joint decision-making structure when the companies' cultures were so significantly different. However, there were problems too on other cases and these are explored further below.

Another common theme was the perceived benefit of being able to build upon long standing relationships and carry across core teams and workforces from project to project (e.g. A, D). Project F, for example, was a second-stage project that used a complete roll-over of all companies involved in the first stage.

Table 1 The case studies

Project	Description	Value	Sector	Completion	Contractual arrangement	Tendering and incentives
A	Gas-fired power station	£150m	Process plant	1999 (middle phase)	Turnkey project (part of 7-year joint venture development scheme)	Negotiated fixed price contract
B	Airfield civil engineering work	£20m	Civil	Feb 1999 (final phase)	NECC contract under 5-year, £30m framework agreement	Negotiated target cost with risk/reward element
C	Hotel building	£27m	Building	Late 1998	Design/build (under long-term partnering agreement)	Negotiated fixed price contract with target cost risk/reward element
D	Water treatment works	£9m	Civil	April 1998	Modified IChemE Green Book contract under long-term partnering agreement	Competitive tender (suite of projects); target cost with risk/reward element
E	Industrial gases plant	£80m	Process plant	Mid 1999	Conventional project (but 5-year alliance with mechanical services contractor)	Various, including risk/reward element for alliance partner
F	Oil refinery plant upgrade	£25m	Process plant	Feb 1998	Project alliance (with standard ICE6 works contract)	Serial contracting; target cost with risk/reward element
G	Gas production platform (topside component)	£400m	Off-shore	1997	Project alliance (memorandum of understanding)	Competitive tender; conventional and target cost with risk/reward contracts
H	Corporate headquarters	£200m	Building	Early 1998	Construction management	Competitive tender; standard lump sum package contracts
I	Office building	£24m	Building	Oct 1999	Conventional JCT80	Competitive tender; fixed price contract

Table 2 Formal and informal aspects of collaboration

Project	Selection processes	Continuity of relationship	Teambuilding processes	Design-construct integration	Breadth and depth of collaboration	Performance (projected)
A	High level negotiation, based on technical, commercial and cultural criteria	7 year joint venture; some continuity of core personnel and familiarity within team	Formal workshops held throughout, involving various client and contractor staff (internal facilitators used)	Some overlap. Limited early user input into design; early contractor feedback on buildability	Appreciation of collaboration strongest at senior levels. Conventional approach to subcontractors	On time, and over cost (borne by contractor). Substantial claims from subcontractors against contractor
B	Very detailed, formal selection procedures; strong emphasis on commitment to partnering and continuous improvement	5 year term agreement; core team membership fairly constant	Formal workshop held early on, involving various client and contractor staff (external facilitators used)	Some overlap. Early user involvement in design; early contractor input into design	Managers at all levels involved. Mix of partnering and conventional approaches to subcontractors	On time and on cost. Contractor identified claims that would have been made on conventional contract
C	Detailed, formal selection procedures; emphasis on commitment to partnering	Open-ended term agreement; some continuity of key personnel	Formal workshops held early on, involving only senior client and contractor staff (no facilitators used)	Some overlap. User needs not fully addressed till late and some slowness in decision-making; early contractor input into design	Managers at all levels involved. Back-to-back partnering with selected suppliers	On time and on cost. £3m claim from contractor avoided due to partnering arrangement
D	Detailed, formal selection procedures; attitudes to partnering assessed	4–5 year term agreement, considerable changes of project personnel	Formal workshops held early on, involving only senior client, designer and contractor staff (external facilitators used)	Some overlap. Limited early user input into design; early contractor input into design	Appreciation of collaboration strongest at senior levels. Conventional approach to subcontractors	On time and under cost. Several claims identified that would have been pursued on conventional contract
E	High level negotiation formalizing previous long standing relationship	5 year term agreement; considerable changes of project personnel	Formal workshop held early on, involving only senior client and contractor staff (external and internal facilitators used)	Some overlap. Limited early user input into design; limited early contractor input into design	Managers at all levels involved, but failure to include design team. Mix of alliancing and conventional approaches to subcontractors	On time and on cost. Client noted reduction in claims, though some made by subcontractors
F	Detailed, formal selection procedures, including some assessment of attitudes	Core team membership fairly constant	Formal workshops held early on, involving various client, designer and contractor staff (external facilitators used)	Some overlap. Early user input into design, but some late costly design changes; limited early contractor input into design	Managers at all levels involved, but failure to include design team. Mix of alliancing and conventional approaches to subcontractors	On time and under cost. No claims made or obviously avoided

Table 2 continued

Project	Selection processes	Continuity of relationship	Teambuilding processes	Design-construct integration	Breadth and depth of collaboration	Performance (projected)
G	Detailed, formal selection procedures, including some assessment of attitudes	3–4 year project relationship; some continuity of key personnel	Formal workshops held throughout, involving various client, designer and contractor staff (external and internal facilitators used)	Some overlap. Limited early user input into design; early contractor input into design	Appreciation of collaboration strongest at senior levels. Mix of alliancing and conventional approaches to subcontractors	Under time and under cost. Contractors absorbed extra costs instead of pressing claims
H	Detailed, formal selection procedures, including some assessment of attitudes	Minimum 2–3 years project relationship; some continuity of key personnel	Formal workshops held early on, involving various client, designer and contractor staff (external and internal facilitators used)	Some overlap. Limited user input and some slowness in decision-making; early contractor input into design	Managers at all levels involved, including professional team. Construction management approach to subcontractors	Under time and on cost. £1m claim against client by frame contractor; and counter-claim against structural engineer
I	Detailed, formal selection procedures, including some assessment of attitudes	2–3 years project relationship; some continuity of key personnel	Formal workshops held early on, involving various client, designer and contractor staff (internal facilitators used)	No design-construct overlap. No early input into design by either users or contractors	Some recognition of the need for collaboration at all levels. Conventional approach to subcontractors	On time and on cost. No claims made or obviously avoided

This continuity led to considerable familiarity with the technical specification and working environment, encouraged the direct transmission of lessons learned from the first stage and helped reinforce the integrated teamworking that had begun to develop. However, this case was the exception and it was apparent that lack of continuity of work or lack of staff availability were both significant constraints (e.g. B, D and E). Efforts were being made to address the availability issue (in F) and, in case A, the prestige of the project allowed managers to assign preferred individuals. It was also felt that lack of availability could even have a positive effect in helping 'freshen up' the team (B, F). However, it was apparent that lack of staff availability was a problem with potential long term implications for the development of partnering (returned to further below).

Building collaboration: the use of tools and techniques

Frameworks, contracts and incentives

The joint venture and all of the partnerships and alliances were underpinned by relatively standard forms of contract. However, all of the projects let under partnering/alliancing arrangements (plus project I) included some form of incentive system, commonly based upon an agreed target cost with risk/reward element. The precise details of these arrangements differed from case to case in a number of important respects (see Bresnen and Marshall, 2000b). However, joint target cost setting was common practice and generally was regarded as a useful means of accurate project costing because of the contractor's direct input. It also assisted cost or value engineering (e.g. C) and helped gain the contractor's commitment to project objectives (provided that the target was seen as achievable and the formula equitable). Although establishing a target cost might be difficult in the early stages when the project scope was relatively undefined (e.g. C, E and F), it was still regarded as possible, provided there was a 'give and take attitude' (C).

On the other hand, although there were some reports of positive motivational effects (B, C, D and F), in many cases they were much less clear-cut and direct (A, D and E), suggesting that there are limitations to the use of contract incentives as a motivational tool (see Bresnen and Marshall, 2000b for a fuller discussion). It was particularly noticeable that often site staff found that these incentives did not provide meaningful personal sources of motivation and reward. Moreover, it was clear that often broader organizational goals were

more potent influences on behaviour. This was especially evident in cases (such as C) where maintaining the relationship and winning further work were vital from the contractor's point of view.

Contractor selection

Contractor selection varied according to the nature of the relationship. The joint venture (A) was negotiated and the two more conventional projects (H and I) were based on competitive tendering. In between, there was some use of competitive tender (especially on project G), although serial contracting (project F) and bidding for term agreements with project by project negotiation (B, C, D, E) were also used.

Intense selection procedures, including interviews and presentations, were used in most cases and, in some (B, C and D), management attitudes often were seen as important as technical and commercial criteria. The emphasis, however, did vary, with considerably less emphasis being placed on judging attitudes in the closer, longer term relationships (projects A and E). However, the difficulty of measuring attitudes was also acknowledged. The most thorough use of structured selection methods was in case B, where a multi-stage selection process included detailed questionnaires, presentations, interviews and site visits; shortlisted contractors were also asked to sample price four projects (the cost element in selection comprised only 40% and, crucially, they were advised not to try to 'buy' the contract). The time and resources spent in selecting a partner could be quite considerable (in case B, the entire process took over a year). However, selecting the right partner was considered critically important and, given the number of projects carried out under any one framework agreement, the savings in future tendering outlay could be considerable (B, E, and F).

Teambuilding, charters and facilitation

Teambuilding was used in all of the case studies and tended to be quite formal and intense, with all of the cases using teambuilding workshops and most of them relying upon external facilitators (except A, C and I). In most cases (except A and I) the process included the agreement of charters or mission statements. Teambuilding was concentrated in the early stages, after which on-going interaction (plus more informal activities, such as awaydays or social events) became the main ways of sustaining integration or preventing 'stagnation' (B, C, H). Views on formal teambuilding ranged, however, from enthusiasm to scepticism. On the positive side, there was considerable evidence that teambuilding had helped

groups through formative early stages, promoting group identity and cohesion (D), encouraging feelings of ownership in the project (B) and helping avoid the ‘steep learning curve’ where early team availability had not been possible (B).

However, teambuilding did have its limitations and problems, and many respondents across the cases were quite sceptical or critical about the process. The most important reason given was that it was no substitute for the actual experience of ‘teamwork’ (A, B, D and E). Another source of criticism was that it rarely involved those at lower hierarchical levels (only in cases B and G was participation more inclusive). Moreover, team members in key positions in other organizations were included rarely (designers and key subcontractors were really fully involved in only the two alliances and, ironically perhaps, the two more conventional projects). Finally, teambuilding also sometimes failed to diffuse organizational or professional differences or to bring around those not considered to have the ‘right attitudes’ (A, B, D and F). In such instances, it was used instead more as a ‘filter mechanism’ to deselect staff. Consequently, although teambuilding might be valuable in helping promote collaboration, it was by no means sufficient, nor a panacea for overcoming team-related problems.

Organizing and managing the project team

The common configuration of partnering/alliance projects was a ‘tiered’ team structure, which allowed the separation of strategic and operational matters and which encouraged the resolution of any conflicts and disputes at the lowest possible levels. Decentralization was thus an important element, the aim being to promote self-governing, self-policing teams (C, D, F). Where joint project offices were used to co-locate teams (B, E, F and H), the effects were regarded universally as beneficial, due to direct effects on communications and indirect effects in reinforcing collaborative behaviour (in case A, a physical distance between the teams reinforced cultural differences and created communication problems, despite the ostensibly closer joint venture relationship).

Fully integrated teams were rare across the cases. However, considerable steps had been taken towards eliminating role duplication and levels of specialization were reduced correspondingly, with an emphasis placed upon flexibility in roles at site level (e.g. D). Having said that, some reservations were expressed about the lack of clear demarcations of roles, responsibilities and authority, especially in the early project stages (A, D). In most of the cases, an open book

approach was used and there was a strong expressed commitment to the sharing of information. Indeed, very positive views were expressed overall about the quality and openness of relationships and communications between clients, contractors and designers. On the partnering/alliancing projects in particular, dealings were considered much less formalized than many of the participants had encountered before and there was a strong emphasis on direct, personal contact (e.g. C, D). Nevertheless, respondents across the cases did report that there was still a good deal of formal correspondence and paperwork (especially in the joint venture case).

There were also a number of examples given of the problems of trying to introduce new ways of working. It was noted, for example, that site organization and management could still be quite traditional, with site staff and subcontractors seeing little practical change (C, D). Indeed, there were very mixed views on whether any details of the partnering agreement ought to reach right down to the workforce (fears were expressed that it would lead to claims for extra bonuses or benefits). The difficulty of instilling or sustaining changes was noted also: a very traditional command and control structure was used initially on one case (B); and occasional regressions to traditional management styles occurred in others (A, E). Moreover, also there were a number of unintended consequences of some of the more positive aspects of partnering: for example, tensions could emerge between the project team’s relative autonomy and the parent organization’s desire for control, leading to a conflict between project team identity and wider organizational culture (e.g. D).

Finally, often information technology is seen as important in supporting open communications and information sharing. However, the use of more sophisticated technology in these cases was surprisingly limited, with 3D CAD being used only on the process plants (2D CAD was used elsewhere) and electronic communications being limited mainly to e-mail. Outside the process plant sector, the need for 3D CAD was seen as minimal, because of the lower levels of complexity which made design clashes easier to identify. This suggests that more sophisticated information technology may be appropriate only in certain circumstances. Moreover, it was apparent that communication still relied heavily upon non-electronic means, especially hard copy drawings and personal contact. Indeed, particularly for the partnerships/alliances, emphasis was placed by all the respondents upon the importance of personal forms of communication. A good example of the limitations of new technology was on project F, where there was an oversight in failing to include sufficient detail on the existing pipework

layout. This led to a number of design clashes which were recognized only on site and which forced a return to manual systems and a reliance on the 'skilled eye' of the engineer. Other, unintended consequences were noted too in the use of new technology to enhance communication. In project C, for example, the architects noted how the ease of modifying the design electronically could encourage clients to make design changes at stages that were far too late for incorporation into construction plans.

Managing internal and external organizational interfaces

Although generally the level of direct client involvement in project management across the cases was high, there were more mixed findings regarding the incorporation of users' needs into the design. There were examples given of successful attempts to include end-users and facilities managers in the early stages of the design (A and H). However, in many cases this proved difficult to achieve (in D, for example, the speed of the project and the operations group's lack of familiarity with partnering were major inhibiting factors). What was also noticeable across the cases was the continued difficulty in trying to avoid late design changes (especially where speed was a key objective). In some of the partnerships and alliances (e.g. D and F), a 'no changes' culture was explicitly promoted. However, on other projects (e.g. C), there was still some slowness in client decision-making and some clients (e.g. H) still insisted on their right to make decisions late if necessary.

In most cases the contractor's input into the design was high. However, in two of the collaborative projects it was limited due to staff not being available (F) and due to the reluctance of the client's engineers to accept any contractor input (E). In contrast, even on one of the more conventional projects (H), trade contractors were encouraged to help develop the specification. As expected, where contractors were involved early, it was seen as particularly important in promoting value engineering and risk management, and a number of examples were given where significant savings were made (A, B, C, D and F). However, there were also some reports of no gains being made. Moreover, although virtually all of the cases made use of 'front-end' initiatives, such as risk management and value engineering, the processes varied widely according to their intensity and formality. In one case (C), the formal risk management system being used was even abandoned, because it was felt to be too time-consuming (although risks continued to be monitored and assessed informally).

Managing user and other stakeholder relationships

Although some examples were given of good internal relationships with users and other internal groups, these were far outweighed by the number of problems reported that were due to horizontal or vertical differentiation within the client organization (cf. Bresnen and Marshall, 1998, 2000a). These problems were in part due to persistent internal structural divisions or rigidities (e.g. F) or broad cultural constraints, such as the tortuous internal consultation processes within a large, complex client (e.g. H). However, many of the problems were due to clear differences in objectives between project teams and other internal departments upon whom the project team depended for resources (e.g. A, B). In two cases (B and H) there was even a need for influential managers to take action to avoid the project team's interests being ignored and the team being effectively marginalized. Similarly, albeit less dramatically, although dedicated project teams generally were seen as desirable, matrix organizations were much more common (B, D, E, F, G and I). However, these types of structure did pose some problems for project teams, where functional department goals and perspectives predominated and, especially, where a range of design groups were involved (B, D and E).

Managing relationships with subcontractors

Although supply chain management was not a main focus of the research (see e.g. CPN, 1997), nevertheless some attempt was made to examine collaboration with subcontractors as well. Across the cases, respondents felt that it was important to try to spread collaboration further down the supply chain. However, the evidence of this actually happening was very limited and piecemeal. Sometimes strategic or high value subcontractors were included in partnering or alliance agreements (e.g. B, E, F). Moreover, a number of efforts had been made, by both clients (e.g. H) and contractors (e.g. C), to develop more co-operative relationships with particular companies. However, concern was still expressed about subcontractors' tendencies to revert to adversarial attitudes and behaviour (F, H). From the point of view of subcontractors, although some were enthusiastic, others expressed strong misgivings about contractors' underlying intentions and concern about the effects of pressure for continuous improvement on their margins (e.g. C). A final point worth noting is that subcontractors not actually included in agreements perceived client-contractor collaboration as having very little, if any, effect on their own work (e.g. A, C).

Performance outcomes and learning from collaboration

There was generally a very high level of satisfaction expressed by clients, contractors and designers with the quality of relations found on more collaborative projects, particularly with regard to information flows, communications and decision-making (although this was true of the more conventional projects too). Moreover, although there were still problems experienced in integrating design and construction, there was considerable satisfaction expressed at the way in which any problems were approached and resolved.

With regard to performance outcomes, all of the projects had come in or were expected to come in within price and schedule. Client satisfaction at these outcomes and also other key project performance indicators (notably quality, but also safety and lack of disruption) was also generally high. These projects were by no means trouble free and virtually all of them did encounter some quite significant performance problems. However, what was telling was that these problems were solved without recourse to claims and litigation, as would have occurred (and, in fact, did occur in case H) under more conventional arrangements. Having said that, there was also evidence, in some of the cases, of problems effectively being solved by extra costs being absorbed by the contractor, in the interests of maintaining good relationships with the client and increasing chances of gaining future work (this occurred on projects C, D and G).

Across the cases there was considerable emphasis placed on continuous improvement and benchmarking, as ways of promoting long term performance improvement (e.g. B, C, H). In some cases, continuous improvement programmes had been developed fully and were linked in systematically with other initiatives, especially benchmarking (A, B, C). In other cases (D, E, F, G), there was less coherence between initiatives and, in the two more conventional projects, any initiatives were informal. The use of internal and/or external benchmarking was common to all cases (except I), although some difficulties in applying it were noted, due to lack of comparable projects or frequent changes in preferred methods (E). However, other more significant potential problems were noted: in particular, a concern that constant pressures to improve performance might cause rifts between the parties. It was therefore seen as vital that expectations of performance gains were clear, realistic and equitable (B, C) and that, although it was important to make continuous improvement a ‘way of life’, clients had to accept the possibility of diminishing returns.

Concluding discussion

The above findings offer some general support for the contention that there are many potential positive benefits for clients developing more collaborative approaches, not only with regard to key project processes (especially design–construct integration) but also with regard to ‘hard’ performance outcomes (notably time and cost, but also quality). The research does suggest that conventional projects can yield such benefits too and that a partnership or alliance does not guarantee them (cf. Green and McDermott, 1996). Moreover, the performance gains may be due to more indirect factors, such as more accurate costing or the willingness of contractors to absorb extra costs. Furthermore, it was also noticeable from the research that collaborative approaches did not necessarily remove conflicts at source and that there was still the persistence of major problems in integrating design and construction. Indeed, some of these problems might even have been exacerbated due to the greater pressure for improved time and cost performance that are two of the main espoused aims of collaboration. However, there is also clear evidence from the research of the avoidance of potential claims and disputes (due, for example, to unrealistically low tenders) and of the added benefits of early and repeat contractor involvement (namely, reduced tendering costs and greater contractor front-end input into costing, design and value/risk management).

Having said that, the picture is complicated somewhat when one considers a number of subtle but important influences on processes of collaboration. First, fully fledged collaborative approaches do not always appear to be necessary, desirable or feasible. There did appear to be a number of significant tangible benefits to be gained from the development of long term relationships between clients, contractors and designers. However, a number of practical constraints may need to be overcome, including difficulties in providing continuity of work (important for contractor commitment) and overcoming misgivings about long term relationships being too ‘cosy’ and uncompetitive. Clients might be able to deal with the continuity problem by ‘smoothing’ peaks and troughs in workload; and any scepticism might be overcome by using quasi-market mechanisms to ensure that performance remains competitive (including benchmarking and continuous improvement). Also it may still be possible to ‘engineer’ collaboration in the short term, using formal mechanisms such as incentives and team-building. However, these strategies are most likely to be successful where clients already have appropriate experience and capabilities, and there are always likely to be some clients and/or projects (smaller, one-off,

less complex, of less strategic importance) for whom the direct and indirect set-up costs simply do not justify a collaborative approach.

Second, the research suggests that there are limitations in the efficacy of many of the formal mechanisms commonly used to develop partnering. Limitations in the use of financial incentives as a tool for generating motivation and commitment have been mentioned briefly above and are discussed in more detail elsewhere (see Bresnen and Marshall, 2000b). With regard to contractor selection, the research suggested that well developed systems, where attitudes are assessed and selection criteria extend beyond a narrow concern with price, can produce significant tangible returns. However, this requires an investment of time and resources and the difficulties of accurately judging likely future behaviour in the context of a selection process should not be underestimated. Teambuilding consistently emerges as a desirable and often necessary way of helping align teams behind project goals and objectives (even with long term partnering, since collaboration depends so much on individual behaviour). However, one obvious limitation is the danger of not setting aside enough time or resources for effective teambuilding, because of the need to 'get on with the real work'. It is also important to realize that formal teambuilding by no means guarantees collaboration, and that teams can suffer from the dysfunctional effects of over-cohesion (e.g. Arnold *et al.*, 1998, pp. 304–310).

Third, these limitations of formal systems stress the importance of emphasizing the informal in understanding processes of collaboration. Here also the research highlighted a number of limitations in both the breadth and depth of penetration of new ways of working across the wider project team (cf. Schein, 1985). It was particularly noticeable how relationships at site level sometimes were relatively unchanged and how relationships with internal client groups often were still a cause for concern. A similar point can be made with regard to subcontractors and the obvious lack of diffusion of collaborative norms down the supply chain (despite clear evidence that it was feasible and that some clients and contractors had taken positive initiatives). Certainly, new methods of working within the project team did appear to make problems easier to resolve, and there were consistent benefits shown in the use of shared offices and the encouragement of more open and informal ways of working (although the lack of inclusion of designers in collaborative arrangements was a noticeable omission in many cases). However, although there was thus a good deal of evidence that change efforts had been successful, collaboration was still 'fragile' and had yet to extend fully and be internalized fully. Therefore although these

findings are consistent with the view that there needs to be continued senior management support for collaboration, they suggest also a need for attention to be paid to the more effective diffusion of appropriate norms and values throughout the wider project organization. Moreover, although there is a potentially important symbiotic relationship between internal and external processes of collaboration (cf. Bresnen, 1990), clearly problems can be caused if project team cultures clash with wider organizational values and norms.

Finally, this emphasis on the informal does highlight some important problems and limitations in the long term development and diffusion of collaborative approaches. It was clear from the research that people and relationships were considered to be the heart of collaboration, but that lack of continuity of relationships (at company, team and individual levels) frequently undermined attempts to secure the full benefits of collaboration and to transfer experience across projects. In the short term, therefore, lack of staff availability poses a problem. However, in the long term, the problems are potentially much greater, since this reliance upon individuals and their tacit knowledge (Nonaka, 1994) leaves the organization at a disadvantage if those individuals should leave or be unavailable. Furthermore, it tends to emphasize secondment and recruitment practices, rather than training and development, as the main means of diffusing knowledge about innovative ways of working. Although direct personal contact and related socialization processes may be the most direct and intense ways of transferring knowledge, they are highly inefficient, since knowledge is retained by the individual and diffusion can be piecemeal and haphazard (Nonaka and Takeuchi, 1995). Consequently, relying on having the appropriate staff with the right skills restricts the codification of knowledge and, through this, potentially inhibits organizational learning processes.

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