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Collaborative relationships in construction: the UK contractors' perception

Akintola Akintoye
School of the Built and Natural Environment, Glasgow Caledonian University, Glasgow,UK, and
Jamie Main
Capita Symonds, Glasgow, UK

Abstract

Purpose – The purpose of this paper is to describe UK contractors' perceptions of collaborative relationships in construction.

Design/methodology/approach – Based on a UK wide postal questionnaire survey, the opinions of contractors were assessed on reasons for collaborative relationships and the factors that are responsible for the success and failure of collaborative relationships in construction development. The respondents were split into two groups (SME's and large) based on their number of employees, to determine whether their responses varied with size as part of the analysis. Statistical analyses, based on Analysis of Variance (ANOVA) and factor analysis technique were used to investigate the cluster of relationships.

Findings – The research shows that UK contractors are positive about collaboration and are engaged in collaborative relationships for construction developments. Factor analysis shows that the principal reasons why contractors are involved in collaborative relationships are for risk sharing, access to innovation and technology, response to market, resource efficiency and client requirements. The principal success factors are commitment of adequate resources from the partners, equity of relationship, recognition of the importance of non-financial benefits and clarity of objectives while the principal failure factors are lack of trust and consolation and lack of experience and business fit.

Practical implications – Drawing from the findings, the study confirms that construction collaborative relationships are customer driven with very little consideration for competitors, suppliers and subcontractors although a a true collaborative relationship should take into account all the parties involved in construction development supply and demand chains to reap the full benefits.

Originality/value – The paper makes an original contribution of exploring the area of relationships in construction in the UK from the contractors point-of-view. The contents within the paper will be of interest to those working within the field.

Keywords Strategic alliances, Partnership, Critical success factors, Supplier relations, Factor analysis, United Kingdom

Paper type Research paper

Introduction

In recent times, the landscape for construction development delivery has been fast changing with emphasis on partnering, joint venture, public/private partnership, strategic alliances, etc. In the UK, the need for private sector delivery of public sector construction facilities and services is on the increase, with the use of the Private Finance Initiative. In other countries, the use of project financing strategy such as Build Operate, Transfer (BOT), is recognised as important to deliver public sector services such as

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roads, rails, telecommunications, electricity, water and waste treatment, etc. These innovative procurement methods demand higher level of cooperation between the public sector and private sector and within private sector stakeholders

The early 1990s saw the increase in collaboration between companies in the manufacturing industry. This arose from commercial pressures relating to increased competition, higher research and development (R&D) costs, increasing pace of product innovation and technological development and the increasing internationalisation of industries (Leverick and Littler, 1993). To stay not only in business but to remain competitive, manufacturing firms had to look at ways that would improve performance and profits. For many manufacturing firms this was achieved by using collaborative processes. In the summary report of their conference on "Collaboration for Competitive advantage: the changing world of alliances and partnerships", Stiles (1995) identified the need that spurred collaboration across the world to include: increasing globalisation, competitiveness, risk and uncertainty within the business environment, businesses as diverse as insurances, airlines and computers are recognising the need to collaborate in order to survive. He noted that companies considering new market ventures or planning long-run research and development programmes are finding that collaboration offers the opportunity to spread the risks of this form of investment.

Crouse (1991) indicated that the demand from customers has been responsible for the push for partnerships given that they have become more knowledgeable and are faced with more choices over a shorter period of time. In addition he argued that customers want the best solutions for the best price without being locked in with any one vendor. Consequently, the response to this demand by industry while at the same time meeting the objectives of getting products to market faster, increase market share, improve quality and service, improve productivity, reduce cost and improved profitability has brought about the need for partnerships. The survey by the Economic Intelligence Unit in 2003 (cited by Anslinger, 2004) noted that the main reason cited by Chief Executive Officers for increasing dependence on external relationships are the need for fast and low-cost expansion into new markets and greater control/influence of the customer relationship.

In the UK construction industry, two government reports have specifically addressed the need for change to improve the industry: the Latham report (1994) and the Egan report (1998). These reports have a recurring theme in that they both suggest the industry could achieve expected improvement through greater teamwork not only at site level and organisational level but also with clients and suppliers. Recommendations within these reports have led to an increasing use of collaborative arrangements such as long-term/strategic arrangements, partnering, joint venture, public private partnerships, prime contracting and supply chain management in order to improve the construction development process. However, it may be anticipated that not all the collaborative relationships in construction developments will be successful. This paper therefore addresses reasons for the use collaborative relationships in construction development and the factors that may be responsible for the success (or failure) of construction collaborative relationships. The research that formed the basis for the paper replicated a survey undertaken on collaborative relationships in the manufacturing sector by Leverick and Littler (1993).

General overview on collaborative relationships

Latham (1994) and Egan (1998) highlighted the inefficiency of the construction industry and suggested that the construction industry needs to reflect the best practices of the manufacturing industry to provide a satisfactory product and meet customer needs. Consequently, they advocated the use of collaborative relationships for construction development. However, despite the industry reports highlighting these inefficiencies the construction industry still has the tendency to rely mostly upon traditional methods of selecting construction contractors although according to Naoum (2003). Black *et al.* (2000) however, shows that the use of collaborative relationship procurement strategies has been increasingly embraced by industry players since the publication of the Latham and Egan reports.

The use of collaborative relationships to deliver goods and service has been a subject of much research in the manufacturing and service industries. For example, Douma *et al.* (2000) tackled collaborative relations from a strategic alliances angle and noted that due to the ever-increasing pace of technological developments and access to new technologies, alliances have become a key success factor in many industries. In addition, they found that there is now a shift from "traditional" cost driven alliances to knowledge-intensive alliances, where inter-partner learning is a major objective. Spekman *et al.* (1996) concluded from their study, based on in-depth interviews with managers on both sides of five strategic alliances, that successful alliances have their origin at the top of the organisation. Even those alliances of lesser stature and which are managed at lower levels within the organisation must have the blessing and support of the top management.

Brouthers *et al.* (1995) identified 4Cs under which strategic alliances should be utilised; this they termed the major forces involved in helping assure success: complementary skills are offered by the partners, cooperative cultures exist between the firms; the firms have compatible goals; and commensurate levels of risk are involved. Medcof (1997) also identified different 4Cs for successful alliances: capability (are the prospective partners capable of carrying out their role in the alliance?); compatibility (are they compatible operationally); commitment (are they committed to the alliance and its strategic aims); control (are the control arrangements for the coordination of the alliance appropriate?). The conference report on collaboration by Stiles (1995) indicated that successful collaborative partnerships and strategic alliances need to be developed as part of the overall strategy of an organisation that requires initial identification of clear goals and objectives, and significant attention to the choice and type of partner.

Crouse (1991), on the power of partnerships, enumerated the clear advantages of a balanced partnership relationship: partnering provides the ability to leverage internal investments; focus on core competencies; leverage core competencies of other organisations; reduce capital needs, broaden products offerings; gain access or faster entry to new markets; share scarce resources; spread risk and opportunity; improve quality and productivity; having access to alternative technologies; provide competition to in-house developers; use a larger talent pool and satisfy the customer.

Anglinger and Jenk (2004) identified five forms of alliances that have application to the various forms of collaborative relations:

(1) Invasive where the partners share a significant amount of technology, personnel and strategy and derive value from a true combination of

perspectives and resources, often accompanied by co-location. However because partners objectives are varied, it is noted that it is harder to gauge success or monitor success hence this requires more elaborate governance and senior management involvement for this form of alliance to be successful.

(2) Multi-function which encompasses multiple spots on the value chain and brings together R&D functions or development and market with the aim to maintain or build momentum for commercialisation, improve approval chances and speed time to market.

(3) Multi-project which involves existence of multiple alliances within a single company to reduce transaction costs and give partners a first look at each other's products or right of first refusal.

(4) Coopetition which involves cooperating with competitors with the benefit of sharing development costs, along with access to cross-pipeline expertise and reduce transaction costs.

(5) Networks which is a case of multiple partners grouped in a single alliance to access diverse technologies and skills, share costs, build market momentum and bundle related products into a full customer solution.

Douma *et al.* (2000) are of the view that the need to cooperate is determined by pressure on continuity, market opportunities, time pressure or the number of alternative options (such as autonomous development or acquisitions). They identify the six drivers for strategic fit in collaboration:

(1) that cooperation is only advisable when partners have a shared vision of future development within the industry in which an alliance will be formed, and of the impact that these developments will have on their individual positions;

(2) that precondition for strategic fit is compatibility of strategies;

(3) that the alliance partners will only be prepared to make concessions when the alliance is of strategic importance to them;

(4) a successful alliance requires mutual dependency;

(5) any alliance should have added value for the partners and/or their customers; and

(6) partners must carefully consider whether the market will accept that alliance.

It was noted by Draulans *et al.* (2003) that rather than a strategic fit between the partners and the characteristics of alliance, the capacity which an organisation has been built up in managing alliances (including alliance training, cross-alliance evaluation, use of alliance specialists) makes an important contribution towards enhancing alliance success. Sonnenbery (1992) identified ten principles of a solid partnership as follows: both partners gain from the relationship; each party should be treated with respect; promise only what can be delivered; specific objectives should be defined before the relationship is firmly established, striving for a long-term commitment is important to both parties; each side should take the tie to understand the other's culture; each side should develop champions of the relationship; line of communication should be kept open; the best decision is one made together and preserve the continuity of the relationship.

Lorange and Roos (1991) came up with two political considerations (stakeholder blessing and internal support) and two analytical considerations (strategic match and delineation of strategic plan) as the foundation of a successful strategic alliance). Shaughnesy (1995) on the other hand argued that the most important prerequisite for success in international joint ventures is that the parties should share the same objectives without ensuring that each partner's total objectives and goals match, which is to invite disaster. He therefore identified pre-contract partner training needs to look at five factors for managing successful collaborations: communication goals (comprises training in interpersonal relationships and conflict management); performance goals (shared goals are identified and developed); dispute resolution (consideration is given to the need for timely resolution of disputes); evaluation (both parties agree a continuing evaluation of the team's performance during the length of the contract); and commitment (to a partnering agreement that embodies the spirit of collaboration and which is separate from the venture contract). Spekman *et al.* (1996) are of the view that successful collaborative relationship must implement blameless review processes at scheduled intervals to ensure that the relationship is on course despite those internal/external pressures that might affect its direction.

This review of previous publications has shown that collaborative relationships are used in many industries including manufacturing, retailing, construction and service sectors. Although, collaborative relationships can take different forms the literature review has drawn mainly from strategic alliance where this has been utilised to help assure success and complement skills. The review has shown that some of the factors responsible for the use of collaboration in the recent times are access to new technologies, fierce competition, the need to focus on core business, risk sharing, and market opportunities. However, there are different reasons for adopting collaboration relationships for business ventures. In addition, there are different factors responsible for the success or failure of collaborative relationships. The success factors identified include top management support, complementarities of skills, cooperative culture, shared goals and objectives; etc. The extent to which these factors are relevant to collaborative relationships in the construction environment are explored in the study that formed a basis for this paper.

Research method

The use of collaboration to deliver construction development involves different operators or parties in the construction industry. This could involve collaboration between a contractor and another contractor or with a client, subcontractor, supplier or consultant involving partnering, project or long term strategic alliance or joint venture. It could also be a relationship between construction clients and consultants, suppliers and construction clients. For example, in a public private partnership project, this could involve a consortium comprising a supply chain that includes main contractors, facilities management firm, sub-contractors, suppliers, designers, financial institutions, etc. This paper only presents the views of the UK contractors on construction collaborative relationships given that they have pivotal role in collaborative relationship upstream with clients and clients' representatives and downstream with suppliers and subcontractors. It presents the reasons for their use of collaborative relationships by the UK construction contractors and the perceived success and failure factors and how the success should be measured. This is part of a questionnaire survey that sought UK contractor's opinions on the risks and rewards of collaboration in construction

development. A four-page questionnaire, accompanied by a covering letter, was sent to managing directors of sample firms. The letter indicated the objectives of the research and requested that the questionnaire should be completed by a senior member of staff involved in construction development in the firm. The questionnaire design was based on a combination of an extensive review of literature dealing with collaboration in construction, the researcher's general knowledge of collaboration in UK construction and Leverick and Littler (1993) survey on the manufacturing industry.

The overall aim of the research was to establish whether collaboration can be used to improve the construction industry. The main limitation of the current study is that the research is based on the survey instrument derived from Leverick and Littler (1993) study. However, more recent literature on the collaborative relationships tend to suggest that the practice involved in collaborative relationships in terms of influencing factors have not changed much and that the factors identified by Leverick and Littler are still very much relevant in many industries where collaborative relationships have received continuous growth in usage. In an attempt to reflect on the validity of the current study the results were compared with Leverick and Littler findings. In addition, open-ended questions were included for the respondents to supply missing gaps.

The questionnaire was divided into six sections exploring collaboration in construction. Contractors were asked their opinion on the reasons for collaboration in construction, the role of collaboration in construction and the risks of collaboration. The questionnaire also looked at success and failure factors in construction collaboration. The final section of the questionnaire looked at the use of information technology within construction collaboration. The questionnaire used the five-point Likert scale with "5" indicating "great extent" or "most important" and "1" indicating "insignificant extent" or "least important". The questionnaire was sent to 250 companies of which 63 responded giving a response rate of 25.2 per cent. With the exception of two respondents, the questionnaire was completed by senior members of the industry. All the respondents firms have engaged in a form of collaborative relations involving various construction stakeholders (clients, other contractors, subcontractors, suppliers, manufacturers and consultants). For example 68.25 per cent of the contractors have had long-term strategic collaborative relationships with clients compared with 23.81 per cent with another contractor, 41.27 per cent with subcontractors, 39.70 per cent with suppliers and 28.57 per cent with consultants. In addition, 69.84 per cent of the contractors have had project collaborative relationship with clients, 38.19 per cent with another contractor, 63.49 per cent with sub-contractors, 38.10 per cent with suppliers and 57.14 per cent with consultants.

The respondents were split into two groups (SME's and Large) based on their number of employees, to determine whether their responses varied with size as part of the analysis. Watts (1980) highlights that the size of a company can be measured in terms of number of employees, net assets (capital employed), value added (net output) and Turnover. Table I shows the grouping of firms based on number of employees according to the UK Department of Trade and Industry that categorises as Small Medium Enterprises (SMEs) as firms with less than 250 employees. The Table includes the number in each group, the mean number of employees and the standard deviation for each. Statistical analyses, based on Analysis of Variance (ANOVA) F-statistics and associated probability values (p), were undertaken on the basis of the size of the companies (SME and large) to show if the two groups share the same views and

reasons for the use of collaborative relationships and the success and failure factors. Where p is less than 0.05 it means that the two groups have different opinion on that particular factor, otherwise their views are similar.

To capture the multivariate relationships in the reasons for collaborative relationships, success factors and failure factors, factor analysis technique was used to investigate the cluster of relationships. Various tests are required for the appropriateness of factor analysis for factor extraction; this include Kaiser-Meyer-Olkin (KMO) measure of sampling accuracy, anti-image correlation, measure of sampling activities (MSA) and Barlett Test of Sphericity.

The reasons for collaborative relationship variables, success factors and failure factors included in the questionnaire were subject to factor analysis, with principal component analysis and varimax rotation. The first stage of the analysis is to determine the strength of the relationship among the variables based on either correlation coefficient or partial correlation coefficients of the variables. According to Norusis/SPSS (1992) the partial correlations should be close to zero when factor analysis assumptions are met and that if the proportion of large coefficients are high, the use of a factor model should be reconsidered. The Measures of Sampling Adequacy (MSA) i.e. the value of MSA must be reasonably high for a good factor analysis.

Reasons for collaboration in construction development

Construction contractors can be involved in collaborative relationships for various reasons as shown in Table II. The Table shows that the large contractors rated reasons for using collaboration in construction development higher than the SMEs. The fact

Group	Employees	Frequency	%	Mean	Std Dev.
SME	Less than 250	32	50.8	109.53	67.28
Large	Greater than 250	31	49.2	3873.84	9473.41
	Total	63	100	3983.87	9540.69

Table I. Employment

Factor		Overall	SME	Large	*F* Stat.	*P*-value
In response to customer needs	Rea1	4.111	3.969	4.258	1.365	0.247
In response to market opportunity	Rea2	3.825	3.719	3.935	0.862	0.357
To reduce construction development risks	Rea4	3.825	3.688	3.968	1.182	0.281
To reduce construction development costs	Rea6	3.651	3.500	3.806	1.533	0.220
To achieve continuity with prior developments	Rea14	3.476	3.250	3.710	2.804	0.099
Due to collaborative corporate culture	Rea13	3.429	3.375	3.484	0.122	0.728
To be more innovative in construction development	Rea10	3.397	3.313	3.484	0.423	0.518
To broaden construction development range	Rea5	3.349	3.375	3.323	0.044	0.835
To improve time to market construction product	Rea7	3.302	3.156	3.452	0.953	0.333
In response to a management initiative	Rea9	3.175	3.188	3.161	0.010	0.920
To be more objective in construction development	Rea11	3.175	3.156	3.194	0.025	0.874
In response to competitors	Rea8	3.048	3.094	3.000	0.127	0.723
To conform to standards required for construction	Rea12	3.048	3.188	2.903	0.812	0.371
In response to technology changes	Rea3	2.968	2.781	3.161	1.265	0.265
In response to key supplier needs	Rea15	2.889	2.938	2.839	0.151	0.699

Table II. Reasons for collaboration in construction development

that the large contractors rated the factors higher than the SMEs may suggest that large contractors enter into more collaborative arrangements than SMEs. More collaborative types of procurement method such as Pubic Private Partnerships and Framework Agreements tend to be undertaken by larger contractors due to the complexity and size of the contract. SMEs would probably not have the resources to enter into these types of procurement arrangements. Despite large contractors rating the reasons for using collaboration in construction generally higher than the SMEs, the responses did not differ on each of the reasons for collaboration in construction development at the 5 per cent level of significance.

The most important reason identified by the contractors for collaborative relationship in construction development is "in response to customers needs", which corroborates with Bennett and Jayes (1998) and Bennett *et al.* (1996). Collaboration can have a substantial positive impact on project performance, not only with regard to time, cost and quality objectives, but also with regards to more general outcomes such as greater innovation and improved client satisfaction. According to Hinks *et al.* (1996), collaboration can have many benefits like improved working relationships, effective information exchange, less conflicts and risks, higher productivity, cost savings, improved quality, faster processes and better customer responsiveness.

Like the first main reason, the second reason for collaborative relationship in construction is customer driven: in response to market opportunity. This could lead to economic and technical opportunities or timely use of expertise available within the firm to respond to the opportunity created. The incentive to be more innovative in construction development (reason 7) could depend to a large extent on the existence of strong demand for new construction product development which is was customer-driven)

Construction development risks are ranked third. Under collaborative arrangements such as joint ventures and PPP's parties have mutual interest in sharing and spreading the risk associated with large, complex or long-term contracts (Cheatham, 2004). According to the National Audit Office (2003) risk transfer in contracts such as PFI encouraged construction companies to manage construction risks effectively. Innovation in construction is ranked seventh out of 15 factors by the contractors. However, Lenard (1996) argues that by adopting a more innovative approach and improving links in the whole industry supply chain to undertake research and development, the construction industry would be better placed to innovate and as a consequence capitalise on the challenges and opportunities presented by the national and global market. Innovation can lead to larger scales of growth and provide the ingredients for increased competitiveness and can enhance competitive advantage exponentially.

Two factors in response to competitors and "in response to technology changes" were not ranked highly as reasons for collaboration in construction development. This may tend to suggest that the contractors are not that "bothered" by how their competitors carry out their business. This is not surprising given that the construction industry is highly competitive and its participants are used to the high level of competitive environment such that competition is no longer considered a major reason to enter into collaborative relationship. The survey has shown that the main reasons for construction collaborative relationships are customer-driven (response to market opportunity and customer need) rather than competitor-driven (pressure of competition

forcing firms to react) or supplier-driven (interactions with suppliers). The respondents are more interested in the opportunities (ranked high) presented by collaborative relationships rather than the threats (ranked low) from the competitors suggesting that they are willing to balance the risks and rewards involved.

The reasons for entering into collaboration by the contractors are vastly similar to the results of Leverick and Littler (1993) study into collaboration in the manufacturing industry. The top two reasons in this current survey of UK contractors are the same as their survey over ten years ago of the reasons for collaboration in the manufacturing sector i.e. in response to customer needs and in response to market opportunity. Not only was the top two reasons in each survey the same but the lowest response was also the same "in response to key supplier needs".

Similarly, Leverick and Littler (1993) study rates reducing development risks and costs as highly important reasons for collaboration as the respondents in this survey, showing that organisations in manufacturing and construction enter into collaboration to reduce research and development risks and costs. Leverick and Littler (1993) study showed that internal factors, such as collaborative corporate culture or responding to a management initiative, did not appear to prompt collaborative ventures as does this survey by its similar low rating. By comparing the results of the two surveys it could be stated that the construction industry now and manufacturing industry about ten years ago have similar reasons for entering into collaboration relationships.

Table III shows the partial correlation coefficient (same as the matrix of anti-image correlation) between the reasons for collaborative relationship. The results of the partial correlation matrix show that the variables share common factors, as the partial correlation coefficients between pairs of variables are small when the effect of the other variables are eliminated. The Table also displays the Measures of Sampling Adequacy (MSA) on the diagonal of the matrix. The value of MSA are reasonably high for a good factor analysis; this ranged between 0.521-0.802.

Barlett's test of spericity tests the hypothesis that the correlation matrix is an identity matrix. In this case the value of the test statistic for spericity is large (Barlett Test of Sphericity = 268.642) and the associated significant level is small ($p = 0.000$, df = 105), suggesting that the population correlation matrix is an identity. Observation of the correlation matrix of the risk factors shows that they all have significant correlation at 5 per cent level suggesting no need to eliminate any of the variables for the principal component analysis. The value of the KMO statistic is 0.688, which according to Kaiser (1974) is satisfactory for factor analysis. In essence, these tests show that factor analysis is appropriate for the factor extraction.

Principal component analysis was undertaken, which produced a five-factor solution with eigenvalues greater than 1, which explains 64.014 percent of the variance. Varimax orthogonal rotation of principal component analysis is then used to interpret these factors. The factor loading based on varimax rotation is shown in Table IV. Each of the variables loads heavily on to only one of the factors, and the loadings on each factor exceed 0.5. The principal factors for the use of collaborative relationships by the contractors and associated variables are readily interpretable as: risk sharing strategy (factor 1), access to innovation and technology (factor 2), response to market (factor 3), resources efficiency (factor 4) and client requirement (factor 5).

Table III.
Anti-image correlation Matrix (the MSA is shown on the diagonal) for reasons for collaborative relationship

	Rea1	Rea2	Rea3	Rea4	Rea5	Rea6	Rea7	Rea8	Rea9	Rea10	Rea11	Rea12	Rea13	Rea14	Rea15
8Rea1	0.636														
8Rea2	−0.284	0.521													
8Rea3	0.073	0.018	0.686												
8Rea4	0.201	−0.136	−0.099	0.737											
8Rea5	−0.063	−0.134	−0.047	−0.127	0.752										
8Rea6	−0.131	−0.097	0.048	0.105	−0.237	0.633									
8Rea7	−0.043	0.019	−0.517	0.059	0.078	−0.261	0.633								
8Rea8	−0.148	0.051	−0.247	0.120	0.114	−0.131	0.205	0.653							
8Rea9	−0.077	−0.037	−0.230	0.098	−0.039	0.357	0.095	−0.209	0.625						
8Rea10	−0.001	−0.094	−0.136	−0.292	0.129	−0.315	0.051	0.009	−0.329	0.744					
8Rea11	0.040	0.111	0.090	−0.134	0.053	−0.215	−0.101	−0.012	−0.114	−0.327	0.802				
8Rea12	−0.122	0.030	−0.319	0.146	−0.196	0.249	0.176	−0.028	0.100	0.009	−0.373	0.604			
8Rea13	−0.082	0.128	0.100	−0.317	−0.125	−0.316	−0.173	0.102	−0.327	0.168	−0.114	−0.089	0.720		
8Rea14	−0.138	0.074	0.035	−0.250	−0.092	0.135	−0.009	−0.311	0.156	−0.174	0.088	−0.075	−0.198	0.736	
8Rea15	0.060	−0.009	0.086	−0.172	−0.036	−0.111	−0.205	−0.267	−0.158	0.195	0.009	−0.160	0.227	−0.150	0.567

Note: Measures of Sampling Adequacy (MSA)

Table IV. Varimax rotated matrix for reasons for construction collaborative relationship

Principal factors	Reasons	Code	Component 1	2	3	4	5
Risk sharing strategy	To reduce construction development risks	8Rea4	0.778				
	Due to collaborative corporate culture	8Rea13	0.691				
	To broaden construction development range	8Rea5	0.578				
Access to innovation and technology	In response to a management initiative	8Rea9		0.781			
	To be more innovative in construction development	8Rea10		0.658			
	To be more objective in construction development	8Rea11		0.583			
	In response to technology changes	8Rea3		0.574			
	To conform to standards required for construction	8Rea12		0.454			
Response to market	In response to key supplier needs	8Rea15			0.782		
	In response to competitors	8Rea8			0.683		
	To achieve continuity with prior developments	8Rea14			0.558		
Resources efficiency	To improve time to market construction product	8Rea7				0.892	
	To reduce construction development costs	8Rea6				0.629	
Clients requirement	In response to customer needs	8Rea1					0.784
	In response to market opportunity	8Rea2					0.752
	Eigen value Total		4.208	1.813	1.376	1.121	1.085
	Cumulative %		28.05	40.14	49.31	56.78	64.01

Factors responsible for successful collaboration in construction

Table V shows the contractor's opinions on the factors responsible for successful collaboration. The most important factor is senior management's close involvement in the collaboration process, followed by the relationship being perceived as very important to the partners coupled with the benefits between collaborators being perceived as 'evenly' distributed. These factors are generally rated higher by large contractors compared with the SMEs. The results corroborate a study by Bresnen and Marshall (2000) that found senior management support very 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 organisation and the general perception was that goal alignment and good relationships at these levels were crucial. Spekman *et al.* (1996) noted the importance of senior management support as they bear responsibility for several key aspects of the alliance formulation process: they ensure that the alliance is tied to the strategic intent of the firm; and must drive the alliance vision down through the organisation. In support of this Anslinger (2004) emphasised that a successful alliance must take one of two forms of structure: have a strong structure with centralised leadership or provide clear rules for decision-making.

For any collaborative arrangement to work, relationships between parties need to be good. Luck *et al.* (1996) consider teambuilding within construction project companies essential for achieving performance improvement, and successful construction projects. Teambuilding is performed by co-ordination and integration of project organisations to increase productivity, efficiency, motivation, goal attainment, group dynamics and dispute minimisation (Kumaraswamy, 1996). The issue is that such teams become acquainted and familiar with those working around them. However, the temporary nature of construction projects and role ambiguity are barriers and

Factor	Code	Overall	SME	Large	*F* Stat.	*P*-value
Senior management were closely involved in the collaboration	Suc7	4.063	4.031	4.097	0.063	0.803
The collaborative relationship was perceived as being very important to the collaborators	Suc2	4.016	3.750	4.290	5.565	0.022
Benefits between collaborators were perceived as "evenly" distributed	Suc1	3.778	3.688	3.871	0.642	0.426
Corporate systems and management style was flexible	Suc9	3.778	4.000	3.548	5.491	0.022
There was clear project planning with defined task milestones	Suc4	3.714	3.688	3.742	0.056	0.814
A long-term view of strategic benefits was taken	Suc3	3.683	3.688	3.677	0.002	0.966
Adequate staff resources were made available to the collaborators	Suc5	3.635	3.625	3.645	0.008	0.929
Sufficient time resources were made available to the collaboration	Suc8	3.619	3.531	3.710	0.632	0.430
Sufficient budgetary resources were made available to the collaboration	Suc6	3.603	3.688	3.516	0.662	0.419
Purely financial measures of progress in the collaboration were avoided	Suc10	3.365	3.344	3.387	0.030	0.864
The product or concept being developed was highly innovative	Suc11	2.778	2.781	2.774	0.001	0.980

Table V.
Factors responsible for successful collaboration in construction

constraints to such teambuilding in construction (Luck *et al.*, 1996). Given the deficiency of the current practice Särkilahti (1996) has proposed that the performance of construction project organisations could be improved if the temporary nature of project organisations could be changed by entering into collaborative arrangements to encourage repeated working among a number of firms beyond the scope of one-off construction projects.

Generally, however, large contractors rated the reasons for successful collaboration in construction development higher than SME's. The reason for this could be that large contractors tend to work in more collaborative arrangements than SME's due to their workload and the complexity of projects they undertake. With the exception of "the relationship was perceived as being very important to the collaborators" and "corporate systems and management style was flexible" the ANOVA analysis shows, however, that the opinions of the SME and large contractors did not differ on each of the factors at the 5 per cent significance level. The rating given to "corporate system and management style flexibility" by SME was significantly higher than large contractors; this is probably because SME's tend to be smaller partners or sub-contractors in the construction development process and therefore are more used to being managed than managing.

The factors responsible for successful construction collaboration in the development process are similar to Leverick and Littler (1993) study into collaboration in the manufacturing industry. Both surveys rate the "importance of the relationship" and "benefits being evenly distributed" high in their responses. However, the role of senior management in collaboration was not perceived to be a significant factor in the success of collaboration in the manufacturing industry. The reason for high importance of senior management support for collaborative relationships success in the construction industry compared with the manufacturing industry could be the nature of the construction industry: its renowned fragmented nature and therefore for collaboration to work in construction there needs to be effective communication between parties, with senior management taking control and responsibility for key decisions. The two factors rated lowest in both surveys for successful collaboration were "purely financial measures" and "the product was innovative". Generally, the results of both surveys are similar which might suggest that the construction industry and manufacturing industry agree on what are needed for successful collaboration relationships.

The respondents were further asked open-ended question to the identify factors that mostly contributed to success of collaboration in the construction environment. A high level of commitment and trust were the most frequently mentioned factors for successful collaboration. Other factors mentioned in an order of importance are shared risk; responding to clients needs; good communication; sufficient resources; improved efficiency; and understanding individual roles of the partners.

Table VI shows the partial correlation coefficient and suggests that the variables share common factors, as the partial correlation coefficients between pairs of the variables are small when the effect of the other variables are eliminated. The value of MSA are reasonably high for a good factor analysis; this ranged between 0.408-0.747.

The value of the test statistic for spericity is large (Barlett Test of Sphericity = 138.981) and the associated significant level is small ($p = 0.000$), suggesting that the population correlation matrix is an identity. The correlation matrix

of the risk factors are significant at the 5 per cent level suggesting no need to eliminate any of the variables for the principal component analysis. The value of the KMO statistic is 0.629, which is satisfactory for factor analysis. Principal component analysis produced a four-factor solution with eigenvalues greater than 1, which explains 62.14 percent of the variance. Varimax orthogonal rotation of principal component analysis is shown in Table V. Each of the variables loads heavily on to only one of the factors, and the loadings on each factor exceed 0.5. The only exception to this is Suc 10 that is loaded to factors 1 and 3. The factors and associated variables are readily interpretable as Commitment of adequate resources (time, cost and human) from the partners (factor 1), equity of relationship (factor 2), Recognition of the importance of non-financial benefits (factor 3) and clarity of objectives (factor 4) (Table VII).

Factors responsible for unsuccessful collaboration in construction

Anglisger and Jenk (2004) reported the Accenture research that about half of all alliances fall well of expectations due to the following causes in order of importance: shift in partners strategic direction, senior management attention wanders; champions move on; lack of career path and shortage of staff; and clash of corporate cultures. Sconnenbery (1992) identified important reasons why partnerships fail as lack of commitment, cultural differences, poor management, poor communication, and failure of individual relationships (i.e. where individuals involved in the partnership lack interpersonal skills or personal chemistry may be missing). Table VIII shows the UK contractors' opinions on the factors that are responsible for unsuccessful collaboration. The most important factor is collaborating partners' failure to contribute to the partnership needs, goals and objectives as expected. This is followed by lack of trust between the collaborating partners and lack of frequent consultation between them.

Lack of Trust was rated the second highest failure factor which supports Barlow *et al.* (1997) that relationships fail to work without trust. Lorange and Roos (1991) assert the reasons often emphasised for failure of collaborative relationship are "lack of trust" and "incompatible personal chemistry". Trust is said not only to reduce transaction costs, make possible the sharing of sensitive information, permit joint projects of various kinds, but it also provides a basis for expanded moral relations in business (Brenkert, 1998). Latham (1994) commented: " .... disputes and conflicts have taken their toll on moral and team spirit. Defensive attitudes are commonplace ..."

Table VI.
Anti-image correlation Matrix (the MSA is shown on the diagonal) for success factors

	Suc1	Suc2	Suc3	Suc4	Suc5	Suc6	Suc7	Suc8	Suc9	Suc10	Suc11
Suc1	0.747										
Suc2	−0.163	0.644									
Suc3	−0.086	−0.376	0.660								
Suc4	−0.323	0.012	−0.050	0.695							
Suc5	0.023	−0.236	0.095	−0.185	0.590						
Suc6	−0.027	0.277	−0.146	0.025	−0.471	0.565					
Suc7	−0.214	−0.084	0.023	0.047	−0.364	0.075	0.653				
Suc8	−0.065	−0.118	−0.002	0.055	−0.014	−0.177	−0.271	0.741			
Suc9	−0.203	0.047	−0.046	0.017	−0.017	−0.182	0.190	−0.304	0.660		
Suc10	0.027	−0.145	0.026	−0.056	−0.283	0.120	0.148	0.060	−0.169	0.496	
Suc11	−0.161	−0.064	−0.006	0.101	0.325	−0.135	0.010	−0.140	0.076	−0.389	0.408

Table VII. Varimax rotated matrix for collaborative relationship success factors

	Success factors	Code	Component 1	2	3	4
Commitment of adequate resources from the partners	Sufficient budgetary resources were made available to the collaboration	Suc6	0.787			
	Sufficient time resources were made available to the collaboration	Suc8	0.694			
	Corporate systems and management style was flexible	Suc9	0.671			
Equity of relationship	Benefits between collaborators were perceived as "evenly" distributed	Suc1		0.542		
	The collaborative relationship was perceived as being very important to the collaborators	Suc2		0.805		
	A long term view of strategic benefits was taken	Suc3		0.634		
	Senior management were closely involved in the collaboration	Suc7		0.558		
Recognition of the importance of non-financial benefits	Purely financial measures of progress in the collaboration were avoided	Suc10			0.712	
	The product or concept being developed was highly innovative	Suc11			0.700	
Clarity of objectives	There was clear project planning with defined task milestones	Suc4				0.817
	Adequate staff resources were made available to the collaborators	Suc5	.			0.557
	Eigen values Total		3.009	1.521	1.289	1.015
	Cumulative %		27.36	41.19	52.90	62.12

Factor	Code	Overall	SME	Large	*F*-stat.	*P*-value
The collaborating partners failed to contribute as expected in the partnership charter	Fail1	4.016	3.813	4.226	3.704	0.059
There was little trust between the collaborating partners	Fail3	3.952	3.844	4.065	0.708	0.403
There was a lack of frequent consultation between the collaborating partners	Fail2	3.714	3.906	3.516	2.340	0.131
Little attention was given to the issues involved in the collaboration	Fail5	3.571	3.750	3.387	1.936	0.169
Specific roles and responsibilities were not clearly defined	Fail6	3.571	3.750	3.387	2.131	0.149
There was little consultation between the personnel involved in the collaboration	Fail4	3.429	3.375	3.484	0.155	0.695
There was little previous experience of collaboration management	Fail8	2.984	3.313	2.645	6.113	0.016
The construction development did not fit naturally with existing businesses	Fail7	2.714	2.938	2.484	2.614	0.111

Table VIII.
Factors responsible for unsuccessful collaboration in construction

Latham's (1994) report attempts to re-build trust in the construction industry by advocating partnering. Co-operation among construction project participants requires mutual trust, commitment, involvement, common targets, good communication and joint problem solving (Marosszeky *et al.*, 1997). According to Cooper *et al.* (1996a) the success of long-term co-operation is highly dependent on cultural and attitudinal factors displayed by the participants. In addition, the success is also dependent on the achievement of identifiable and sustainable performance improvements, and mutual benefits for all collaborating participants (Cooper *et al.*, 1996b). A critical step towards collaboration in construction is to overcome the common culture of conflict, and adopt more ethical behaviour marked by honesty and integrity. Therefore, collaboration could be seen as a process of improving relationships, and a means for encouraging cultural shift from adversarial to non-adversarial behaviour (Hellard, 1995). Gambetta (1998) described reputations are a key to trust in relationships, reputations are expectations others hold of your likely behaviour in a partnering relationship; a partner with a "good" reputation is more likely to be trusted.

Another failure factor that the contractors rated high was "a lack of consultation between partners". Poor design consultation/management is a primary factor that contributes to poor quality (Love *et al.*, 1999) and time cost overruns in projects (Chan and Kumaraswamy, 1997). In a partnering relationship involving client, design and construction teams, such poor quality and time and cost overruns could emanate from lack of consultation and poor communication practices between the team members.

Undefined roles and responsibilities was the fifth highest contributing factor to unsuccessful collaboration. Collaboration requires clear understanding and distribution of responsibilities, authorities and roles. It requires adequate information flows and communication of these authorities and roles among the collaborating organisations and reliable access to the latest technological and management knowledge (Yashiro, 1996).

With the exception of the first two top failure factors, the SMEs rated the reasons for unsuccessful collaboration in construction development higher than the large

contractors. This is not unexpected as in practice, the smaller partners or sub-contractors (representing SMEs) tend to have subordinate roles in collaborating arrangements and are often ignored. Nonetheless, with the exception of "the collaborating partners failed to contribute as expected" and "there was little previous experience of collaboration management" the ANOVA analysis shows that the opinions of contractors did not differ on each of the factors at the 5 per cent significance level.

Comparisons show that the factors responsible for unsuccessful construction collaboration are similar to the results from Leverick and Littler (1993) study into collaboration in the manufacturing industry. Both surveys rate "failure to contribute as expected", "lack of frequent consultation" and "little trust" as the top three factors responsible for unsuccessful collaboration. The two factors rated lowest in both surveys for unsuccessful collaboration were "little experience" and "did not fit within existing business". The results of both surveys are similar which might suggest that the construction industry and manufacturing industry share similar views on the factors that do contribute to unsuccessful collaboration.

The respondents were asked an open-ended question to identify the factors that most contribute to the failure of collaboration in construction project development. This generated many responses which are summarised in the order of significance from the highest to the lowest as: lack of trust; communication breakdown; lack of belief in the system; clash of organisational cultures; unchanging attitudes; lack of planning; varying financial objectives; lack of appreciation for contractual risks; client interference; clash of personalities; disputes not being resolved; and lack of senior management support. This might suggest that the major criteria by which respondents assessed failure of construction development collaborations is behavioural; these measures were mentioned by over half of the respondents as the major criteria for the failure of collaboration. Surprisingly though, lack of senior management support was not mentioned as a major criteria for assessing collaboration failure given that this was listed as the top reason for successful collaboration (see Table II).

Factor analysis of the factors responsible for failure in construction development collaborations produced two principal component factors. Table IX shows that the partial correlation coefficient between pairs of the variables are small while the value of MSA ranged between 0.617-0.770 suggesting there is no need to eliminate any variable from the analysis. The value of the test statistic for sphericity is large (Barlett Test of Sphericity = 100.747) and the associated significant level is small ($p = 0.000$, df = 28). The value of the KMO statistic is 0.685 suggesting that factor analysis is appropriate

	Fail1	Fail2	Fail3	Fail4	Fail5	Fail6	Fail7	Fail8
Fail1	0.617							
Fail2	0.032	0.677						
Fail3	−0.183	−0.308	0.690					
Fail4	−0.209	−0.302	0.030	0.677				
Fail5	−0.104	−0.241	0.069	−0.177	0.770			
Fail6	−0.038	−0.410	−0.129	0.075	−0.091	0.714		
Fail7	0.309	0.083	−0.113	−0.009	−0.122	−0.269	0.636	
Fail8	0.063	−0.007	0.163	0.161	−0.156	−0.169	−0.223	0.667

Table IX. Anti-image correlation matrix (the MSA is shown on the diagonal) for failure factors

for the factor extraction. The principal component produced a two -factor solution with eigenvalues greater than 1 and explains 53.99 percent of the variance. Table X based on Varimax orthogonal rotation of principal component analysis show the two-factor loading. The principal failure factors and associated variables are interpretable as lack of trust and consultation (FACTOR 1) and lack of experience and business fit (factor 2).

Conclusions

The literature review included in the paper have shown that there is an abundance of new and existing thinking on how various forms of collaborative relationships are and should be used in the business environment. The study has highlighted that the UK contractors enter into collaboration with the hope of financial gains from reductions in development costs and risks. The results also suggest that contractors would only enter into collaboration if it is a viable proposition for them and not as a result of what their competitors are doing. The reasons for entering into collaborative relationships in the construction industry are generally the same as the manufacturing industry. These reasons are mainly in response to customer needs and market opportunity and to reduce construction development risks. The factor analysis of the reasons for the use of collaborative relationships in construction shows that these are to achieve risk sharing, access to innovation and technology, response to market, resource efficiency and client requirements.

The paper also identified the success and failure factors of collaboration within the construction environment. The principal success factors are commitment of adequate resources from the partners, equity of relationship, recognition of the importance of non-financial benefits and clarity of objectives while the principal failure factors are lack of trust and consolation and lack of experience and business fit. Collaborating

	Failure factors		Code	Component 1	2
Lack of trust and consultation	There was a lack of frequent consultation between the collaborating partners		Fail2	0.836	
	Little attention was given to the issues involved in the collaboration		Fail5	0.628	
	Specific roles and responsibilities were not clearly defined		Fail6	0.667	
	There was little trust between the collaborating partners		Fail3	0.618	
	There was little consultation between the personnel involved in the collaboration		Fail4	0.596	
Lack of experience and business fit	The construction development did not fit naturally with existing businesses		Fail7		0.748
	There was little previous experience of collaboration management		Fail8		0.717
	The collaborating partners failed to contribute as expected in the partnership charter		Fail1		− 0.621
	Eigen value	Total		2.51	1.82
		Cumulative %		31.31	53.99

Table X.
Varimax rotated matrix for collaborative relationship failure factors

relationships have been prescribed by various reports from the construction industry as an important tool for dealing with conflicts and adversarial relationships in the construction environment and for attaining and maintaining a competitive advantage. Stiles (1995) concluded that:

> During the life time of a partnership, key skills associated with relationship building, trust and flexibility need to be developed and applied. If done well, the benefits can be significant, not simply in respect of the current operation, but also in terms of learning that can be achieved and drawn upon in future collaborations.

This is a major advantage that can come from collaboration.

However, while such relationships can pay off, it is important that collaborations are carefully considered to ensure that they fit into the business plans of the organisations that are considering entering into partnerships. The failure factors that the construction industry should consider carefully and address before entering into collaboration are possibilities of lack of trust; communication breakdown; lack of belief in the system; clash of organisational cultures; unchanging attitudes; lack of planning; varying financial objectives; lack of appreciation for contractual risks; client interference; clash of personalities; disputes not being resolved; and lack of senior management support. Some of the factors that are known to contribute to the success of partnerships in construction are a high level of commitment and trust, ability and willingness to share risks amongst partners; responding to clients needs; good communication; sufficient resources; improved efficiency; and understanding individual roles of the partners.

Finally, the reasons, success factors and failure factors in collaborative relationships in the construction industry are not particularly different from that experience by the manufacturing sector. This may suggest that there are generic collaborative relationship practices that are independent of industry set-up.

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Corresponding author
Akintola Akintoye can be contacted at: akin@gcal.ac.uk