



# Advancing the integration of the supply chain in construction - the challenges for commercial practice

Final Evaluation Report  
Findings from Action Research 2006

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 **CONSTRUCTING  
EXCELLENCE**  
in the built environment

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# 1 Introduction and Overview

## 1.1 Background

Established approaches to construction procurement have been based on aggressive bargaining between buyers and suppliers over issues of price, delivery date and payment date, conducted within an atmosphere of legalistic mistrust (Latham 1994, Construction Task Force 1998).

Each player has been encouraged to optimise their own commercial position, often at the expense of the value delivered by the system as a whole. Responsibilities for different aspects of design, construction and maintenance have been fragmented and interfaces between them negotiated within a defensive and adversarial culture. The Construction Task Force Report *Rethinking Construction (1998)* and its successor *Accelerating Change (2002)* clearly defined a need for radical progress away from UK construction industry norms and such aspirations form a common thread that runs through most current initiatives in the sector, including the guidance for public procurement produced by the Office of Government Commerce, and the National Audit Office reports *Modernising Construction(2001)* and *Improving Public Services Through Better Construction (2005)*.

## 1.2 The initial conception of the project

The project ran from mid 2002 until late 2005, and was carried out jointly by the Open University (OU) Business School and Constructing Excellence.

It was funded by the Department of Trade and Industry and Engineering and Physical Sciences Research Council. It set out to develop guidance tools and processes for achieving greater integration between the members of the supply chains responsible for designing and delivering the built environment. The initial objectives of the project stemmed from a previous Scoping Study into the nature of the challenges being experienced by leading designers and construction contractors. This Scoping Study led to a working hypothesis, shared by the research team and the companies involved:

*“Integrated working at project level involving long-term supply arrangements will deliver better value to clients and more secure returns to industry. However this also requires new approaches to commercial practices, so ‘change’ needs to occur across a number of different areas of supply chain activity.”*

This led to an initial plan for the project to develop:

- a framework for describing and analysing costs for use in integrated design processes
- performance measurement systems with which to measure joint supply performance and demonstrate delivery of value to clients
- long term trading agreements that will support joint improvement over time.

The project used an action research methodology to help practitioners understand and create changes in their commercial practices within the UK construction industry. Action research combines scientific inquiry ('research') with real organisational change. It provides a framework for those who are experiencing a problematic situation in an organisation or workplace to collaborate with academic researchers. Together, they generate and refine hypotheses about solutions, analyse information needed to elaborate those hypotheses, and then take action to implement the agreed solutions. The final stage is an in-depth evaluation of how well the hypothesised solutions worked, leading to the refinement of a framework for action for other related contexts.

A further essential element of the research was the development of a methodology for introducing change in supply chain integration – for which the action research approach is highly suited. The research team started from the assumption that current challenges in achieving supply chain integration within the industry do not simply reflect a lack of available models. On the contrary, a number of toolkits already exist. The problem is that existing ways of working are embedded in commonly-held strategic assumptions and values which guide people's conceptions of how they should be working, as to what is sensible and right and what is perhaps risky and irresponsible. These pervasive assumptions and values may block, or cause the failure of, attempts at innovation which involve increasing collaboration.

The change methodology set out to provide guidance for those who wish to innovate, recognising these realities of human organisation. Its purpose was to help an organisation or a set of supply partners evaluate their strategic assumptions and devise specific proposals for achieving integrated ways of working.

### 1.3 Summary of action research activities

Over the three years of the project, the project team at OU Business School established action research teams with six Constructing Excellence member companies or groups of companies.

Each team comprised at least two researchers and up to three staff from the focal company. These staff have generally had a key role in leading some form of greater supply chain integration. Some action research teams also involved staff from members from other companies in the focal company's supply chain. All action research teams met on a regular basis over several months to establish an agenda for integrated supply chain innovation, to develop hypotheses about an area of integration of the supply chain development and to set about implementing the necessary changes. Very different levels of progress were actually achieved, and the reasons why are in fact a key part of the findings of the project as a whole. But before coming to these, Table 1 summarises the focus in each of our six cases.

Table 1: Key action research firms and their focus

**Laing O'Rourke** operates both as a main contractor and specialist concrete frame and groundworks contractor. The company has a strategy of being at the forefront of innovation in construction products and processes, including acting as a supply chain integrator. The Action Research Team's work was to support business-level innovation aimed at implementing forms of agreements with suppliers that require collaborative search for performance and profit improvement over time with sharing of risks and benefits. At the project-level, the team made considerable progress towards planning a collaborative costing framework to be used for cost planning, target setting and cost management on a series of health sector projects. This work stopped abruptly when the client decided it did not have the budget to proceed with these projects.

**Lend Lease Projects** and the **Building Design Partnership (BDP)** as project manager and architects, respectively, worked together on a large city-centre retail development. Their Action Research Team focused on understanding the opportunities for improving project-level systems for integrating detailed design and procurement to be able to respond to emerging opportunities to optimise the design and deliver value to the end client.

**Pearce Group** is a medium sized contractor operating in specialist niche markets within the public and private sector. The company recently returned to private ownership and has undertaken a major restructuring, creating client and market focused teams across its work streams. The Action Research Team looked at what would be involved in Pearce establishing a unique and unrivalled relationship with its suppliers, whereby the collaborative approach adopted becomes viewed by clients as an extension of Pearce's own service delivery. The team helped Pearce supply chain managers develop approaches for involving supply alliance partners in identifying opportunities for making process improvements and saving cost, and assessing joint performance.

Table 1: Key action research firms and their focus

**Stanhope Properties, Bovis Lend Lease** and **Irvine Whitlock** work together repeatedly as a portion of an overall supply chain. As developer, construction manager and specialist subcontractor they formed an Action Research Team to implement performance measures which relate value delivered to client value drivers on a commercial office development.

**Taylor Woodrow Construction** is a main contractor with an established policy of developing preferred supply relationships and supply alliances. The Action Research Team began by helping corporate supply chain managers to identify what would be involved in demonstrating to clients that the use of preferred suppliers can deliver improved value. The approach adopted was to evaluate a small number of demonstration projects involving some form of collaborative working with established supply partners, in order to establish what kind of performance benefit has resulted.

**Wates** is a main contractor heavily involved in Private Finance Initiative (PFI) consortia. The Action Research Team focused on what would be involved in implementing a shared costing framework and system that can be used by all parties for cost planning, target setting and cost management during a PFI project.

A further eight companies signed up to work with the OU Business School research team on a less intensive basis, forming action learning sets within an Action Learning Club, feeding off the concepts developed in the action research. The organisations involved are listed in Appendix 1.

#### 1.4 Modifications to the objectives of the project

Some significant developments during the first 15 months of the project led to a reformulation of the precise objectives of the project, as a response to difficulties encountered and the associated learning.

In effect, the experience of the action research led to considerable modifications and developments to the original working hypothesis.

On the one hand, companies interested in developing collaborative cost management approaches found perfectly adequate the guidance already developed by the research team on a previous action research initiative, the Construction Supply Network Project.

This guidance material takes the form of the 'Building Down Barriers' toolkit ([www.constructingexcellence.org.uk](http://www.constructingexcellence.org.uk)), a set of guidance notes on techniques for collaborative brief development, design, cost management and construction planning, and an indication of how these can be deployed by which members of a project team at different points in the project life-cycle. Appendix 2 summarises the contents of this toolkit. The first objective listed above thus appeared redundant.

On the other hand, the research team encountered considerable difficulty in finding more than a few of the core project participants who were prepared, in practice, to invest time and effort in action research trials of new practices. In all of our participating companies, senior management representatives claimed that developing integrated ways of working with supply partners was central to their business and organisational strategy. On this basis, they attempted to identify projects or supply partnerships they were involved in, that would be willing to refine and implement new practices. However, in the majority of cases, either the projects did not come to fruition, or those concerned decided they did not have time to absorb new approaches and began to work in a conventional way, and the design proceeded without significant supply chain collaboration and without collaborative cost management.

Encountering such ambivalence led the research team to propose an additional focus for the Integration of the Supply Chain project - understanding the dynamics of the decision to invest in collaborative supply relations.

This modified focus is expressed in the following revised research objectives for the Integration of the Supply Chain project as a whole:

- 1) Through action research collaboration with built environment supply chain leaders and their chosen supply partners, to develop deeper understanding of current commercial challenges in implementing supply chain management and integration in UK construction, namely:
  - a) the issues faced by potentially instigating firms in crafting a strategic rationale for investing in collaborative supply chain relations
  - b) the process of developing progressively more integrated ways of working with chosen supply partners over a sequence of built environment projects, including the challenges and potential pitfalls that need to be overcome
  - c) An evaluation methodology and measurement system that supply chain integrators and their key supply partners can use to measure their joint performance, and improve it over time to demonstrate delivery of improved value to clients.
- 2) On this basis, to develop and refine a methodology for initiating and developing integrated ways of working within built environment supply chains, taking account of different working contexts.

## 1.5 Overview of findings: the purpose and structure of this report

The purpose of this report is to summarise the lessons emerging across the six action research cases over a three year period and to draw conclusions relevant to the revised research objectives. The rest of the report is structured in terms of findings related to each of the revised objectives.

Section 2 examines the range of strategic rationales that motivated firms to invest in collaborative supply chain relations, as well as their associated ambivalences. It explores the kinds of value improvements Integration of the Supply Chain participants at various positions in the typical built environment value chain were seeking to achieve, as well as their perceptions of the costs and risks involved in going down this path. Section 3 summarises findings concerning the areas of operational and commercial practice that appear to be involved in achieving more integrated ways of working, and the challenges and pitfalls that participating companies encountered as they attempted to innovate across this spectrum of practice. Section 4 reports on experiences of developing and trying out approaches to evaluate the performance of integrated supply arrangements.

Section 5 draws out some overall conclusions from the action research work. It examines the implications for successful innovation in advancing the integration of the supply chain, including the possible benefits and the issues that need to be paid attention to in the process of implementation. It then offers an overview of a methodology for developing integrated ways of working within built environment supply chains that draws on this analysis.

## 2 Strategic rationales for, and ambivalences about, integrated supply chain relations

### 2.1 The range of strategic rationales

Our work with participating companies confirmed that the most basic rationale espoused for investing in collaborative relations and ways of working with supply partners is the idea that more integrated ways of working can produce better value for clients and users of built environment projects, whilst also delivering better or at least more reliable commercial returns to the supply team.

A closely associated assumption is that it is possible to identify significant programmes of projects (“repeat business”) with which the same supply partners can be engaged, then over time more integrated working routines can be developed which deliver better value.

Examination of what kind of value improvement our participating firms were seeking led to the conclusion that, in most cases, improving integration was seen as a way of reducing total costs in delivering existing conceptions of the built environment, i.e. as a route to competitive advantage through cost reduction. However, a number of companies were explicit about their intention of bringing together different areas of expertise from areas of the supply chain not usually closely involved in the processes of requirements gathering (“brief making”) and designing, in order to work out how a client’s underlying need can be met more effectively, in ways that go beyond cost reduction. Examples included involvement of suppliers in making decisions about how to make buildings easier to maintain, how to make retail environments more energy efficient yet appealing to shoppers and flexible for merchandising, or how to make hospitals more conducive to fostering patients’ general morale and sense of well-being, thereby potentially reducing recovery time.

Table 2 shows that we encountered those seeking to initiate or promote integrated ways of working at a number of different points in the typical built environment supply chain. The initiating role was not confined to those organisations who might be expected to use market power to provide continuity of work and establish control over substantial portions of the total supply chain – i.e. clients with continuing programmes of capital works who have decided to manage their own procurement of the supply chain, and main contractors seeking to respond as a supply chain integrator to substantial programmes of capital works being tendered by public or private sector clients. Firms who normally act as specialist suppliers or subcontractors, to main contractors or clients, can also act as instigators of more integrated working, but usually focus on their own upstream suppliers or subcontractors.

Unsurprisingly, we also found that it was only clients, such as Lend Lease, or main contractors, such as Laing O’Rourke, Taylor Woodrow or Wates, who harboured serious ambitions to achieve improved value in terms other than cost reduction. In different ways, each saw themselves as being able to muster the market power to bring a sufficient range of supply organisations, including designers, into dialogue about the nature of built environment design. More upstream instigators – such as the Pearce Group - aspired to taking part in this kind of dialogue with enlightened main contractors or clients. But, in the shorter term, they conceded that it made more sense to target cost reductions through improved integration with their own suppliers, without seeking to influence the overall nature of what was being provided.



Table 2: Conditions for instigating greater supply chain integration

	Lend Lease Projects/Building Design Partnership/Bovis Lend Lease	Laing O'Rourke
<b>Who is taking a lead on advancing supply chain integration?</b>	The Developer project management team takes the initiative on processes and systems for members of the project team.	Main contractor, bidding for public sector procurement opportunities which require an integrated supply chain.
<b>Who provides continuity of work?</b>	Developer has a continuing programme of major development projects in retail and other sectors.	Public sector agencies offer programmes of successive projects to suitably capable supply chain integrators. Contractor also intends to develop stream of business for a customisable standard building using a standing supply chain.
<b>What kind of value improvement is being attempted?</b>	Developer sees itself as at the forefront of design concepts, whilst seeking innovative approaches to achieving low cost and quick delivery.	Opportunities for comprehensive rethinking of what value means to various stakeholders and how to deliver it most effectively.
<b>What is the scope of innovative supply chain involvement?</b>	Developer focuses on close collaboration with design consultants, end client representatives and construction manager. Limited collaboration with first tier sub-contractors.	Contractor acts as supply chain integrator, selecting design consultants and first tier sub contractors on basis of quality, competence and strategic intent.



Taylor Woodrow	Wates	Bovis Lend Lease/ Irvine Whitlock	Pearce
Main contractor working across residential, healthcare and general building markets.	Main contractor responsible for design and construction of public sector schools procured through PFI.	Shared leadership between commercial property developer, construction manager and preferred specialist contractor.	Main contractor, positioned as delivering projects in a collaborative manner with selective clients in selective markets.
Public sector clients offer significant programmes of work to a contractor capable of leading an integrated supply chain. Property development arm of contractor offers similar opportunities.	Private Finance Initiative (PFI) provides opportunities for private sector consortia to bid for constructing and running public sector accommodation, incentivising buildability and maintainability.	Preferred supplier relations between developer, construction manager and specialist contractor, work together on successive projects.	Contractor has significant programmes of projects with a number of clients within the public and private sector.
Initial focus on improving cost and time in delivering concept designs already specified by clients and their designers.	Opportunities for comprehensive rethinking of what value means to various stakeholders and how most effectively to deliver it.	Improving cost and time of delivery of existing designs. Improving the marketability of properties whilst they are being constructed.	Initial focus on improving cost and time of delivery of existing designs. Future intention of being allowed to input ideas on design to the client.
Main contractor has identified alliances of first tier sub-contractors and suppliers in key trades or specialisms, where collaboration can make a major contribution in improving value.	Main contractor's control of the supply network is currently at first-tier sub-contractor level only. PFI offers the opportunity to work collaboratively with design consultants too.	Construction managers and a first tier specialist contractor attempting to improve how they work together, with some support from developer project managers.	Main contractor has created alliances of first tier suppliers on a trade basis. Now integrating teams around product streams where continuous working relationships create opportunities for innovation.

Table 3 generalises and extrapolates from the picture presented in Table 2, drawing also on data on the motivations for integrated working initiatives of companies involved in the Action Learning Club. The table shows the extent of the overall built environment supply chain that players in different positions can feasibly seek to mobilise to engage with an integrated working agenda, based on their market power. It also suggests that the greater the extent of the supply chain that is involved in an integration initiative, the greater the scope for using integrated working to improve aspects of value other than cost - through design that delivers benefits to clients and users on the basis of some form of superior functionality.

Table 3: Initiators and parts of the supply network they seek to influence	
<ul style="list-style-type: none"> <li>• Big clients with major programmes</li> </ul>	Funders, users, designers, contractors, suppliers, facilities managers
<ul style="list-style-type: none"> <li>• Main contractors responding to PFI and public sector procurement opportunities</li> </ul>	Funders, designers, subcontractors, suppliers, facilities manager
<ul style="list-style-type: none"> <li>• Main contractors seeking to establish a competitive position with private sector clients/streams of work</li> </ul>	Designers, subcontractors, suppliers & manufacturers
<ul style="list-style-type: none"> <li>• Specialist suppliers/ specialist contractors</li> </ul>	Suppliers, subcontractors, suppliers & manufacturers

↑  
Scope for using integration to improve aspects of value delivered other than cost

## 2.2 Causes of strategic ambivalence

Table 4 conveys a richer picture of the way that decision-makers in firms, aware of the basic rationale for developing integrated supply models, weighed up how far they should actually invest. In particular the amount of staff time to be committed to establishing supply relationships and developing integrated ways of working, beyond what was strictly necessary under the terms of a particular project.

The fact that most construction sector firms operate on the basis of both low levels of capital employed and low and far from certain margins appears to be a significant factor in the context of decision-making, but does not have a straightforward influence (*Tomkins: 2005*). Because construction firms generally have little working capital, they can often demonstrate returns on capital employed that compare very well with other sectors. However, low and uncertain margins make these returns insecure. Small changes in future margins can have major implications. In this context, even within the same firm, some managers may see the status quo as unacceptable, and see as a more viable alternative a strategy of investing in supply relationships, combined with a business approach of winning streams of business that exploit the capabilities to be developed. They are likely to be encouraged in this view if they consider that the organisation has already developed capabilities relevant to collaborative working, such as systems for design management and cost management which are explicit, and which staff from supply partners can readily contribute to.

Others may see investment in supply partnerships and integrated working as simply too risky. For them the envisaged streams of business may appear unreliable, and the capabilities of integrated design management, cost management and construction planning needed to achieve better margins may seem too difficult to achieve. Further, even if they are achieved, the supply partners who have benefited from this joint work may decide to take their new capabilities elsewhere, working with a different supply chain integrator. According to this second view, it is better to protect existing low margins and reasonable returns on capital, employed by sticking to the tried-and-tested business recipe of project-specific commercial opportunism, thus avoiding investments in new ways of working.

**Table 4: The contractor's dilemma: to invest in shared capabilities or not**

Forces for investment	Forces against investment
Low margins from established construction models, wish to avoid "bad jobs"	Low margins lead to caution about all forms of investment
Wish to build on nascent capabilities in design management, cost management, etc.	Awareness of gaps in existing capabilities or resources: cost management, performance measurement, design management
Growing importance of PFI for large public sector facilities, requiring an integrated approach	Fears of limited opportunities for obtaining returns on investment if current fashions in public and private sector procurement don't last
Other public sector construction increasingly let as "programmes", requiring an integrated supply chain	Perceived risks of investing in shared capabilities with others – danger of appropriation by others
	Lack of experience or investment routines in developing new capabilities

achieved clarity about the client market segment or building type that the integrated supply chain needs to deliver to. This leads to the possibility of clarifying the typical dimensions of value that need to be delivered, and the kinds of competitive capabilities that the supply chain as a whole will need to develop. Second, the successful emergence of an initiative is linked to the establishment of a supply chain management or supply development function within the overall organisation, with representation at senior management level. This needs to have significant staff resource to undertake the work of identifying supply partners and setting up a series of "off-line" workshops and working groups, to examine how the supply chain can work together more productively.

A further implication of our analysis is, of course, that the decision not to invest in supply integration is an option that needs to be considered seriously by an organisation. Supply integration involves considerable investment in the development of new capabilities and needs, to be directed towards delivering clearly articulated kinds of value in particular markets. There is no reason to believe that this is the only way to compete in the built environment sector.

To summarise, the decision by an instigating firm to invest in developing supply partnerships and the associated joint capabilities for delivering improved value, appears to depend on the establishment of a predominant management view that the risks associated with this strategy are outweighed by the potential benefits. The process of getting initiatives underway is not one where managers simply acquire knowledge of the universal benefits of supply chain integration and then pursue it. Initiatives emerge from a mixture of explicit and implicit debates between different management factions, each of which has defensible but different views of the risks and benefits. Our engagement with instigating firms led to a working hypothesis, that two factors are important for a viable consensus to emerge that a significant integrated supply initiative should be invested in. First, the business development function within the firm needs to have

# 3 Understanding the process of developing integrated ways of working with supply partners

## 3.1 The range of inter-organisational practices implicated

Our work with the seven main action research partners, and a further ten companies who participated in the Action Learning Club, allowed us to chart and analyse the range of practices potentially implicated in improving integration, between companies in order to deliver both superior value and commercial returns.

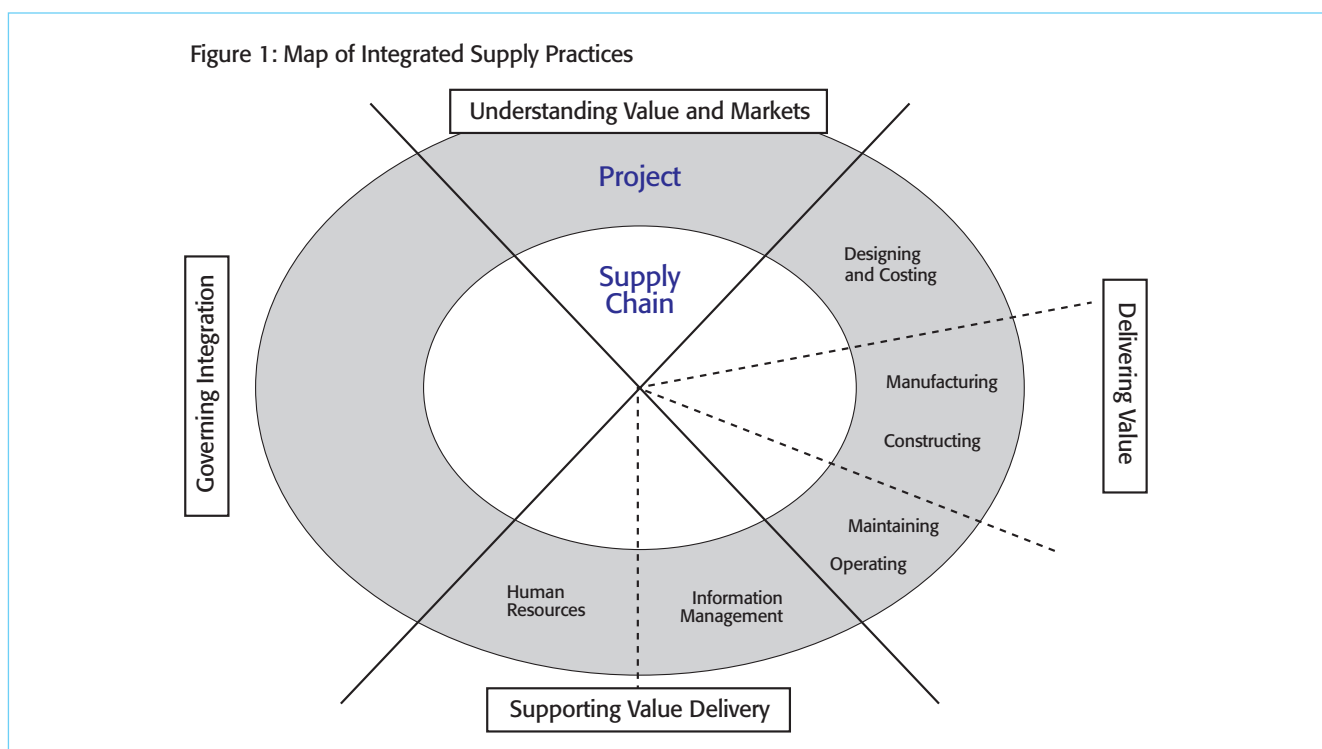
Figure 1 summarises these in term of four areas of practice involved in built environment supply chains.

To do so, we can apply a framework summarised in Figure 1. This focuses attention on four kinds of practice or activity involved in built environment supply chains, concerned with:

- understanding value and markets, including producing briefs or carrying out market research
- delivering value, including designing and constructing buildings to meet client needs
- supporting the delivery of value, including providing information technology systems or delivering training to support project teams

- governing or managing the relationships needed to deliver value, including managing projects and long-term framework agreements.

These four kinds of activities can be thought of as taking place firstly within individual construction projects, represented by the outer ring. When firms are involved in some kind of longer-term supply arrangement, these project level activities in each of the four categories may also be mirrored by activities that take place business-to-business. Such activities do not directly contribute to delivering any particular construction project, but are intended to provide the general basis for more effective delivery of projects. These “off-line” supply chain activities are represented by the central portion of the diagram.



Starting at twelve o'clock on the diagram and working around clockwise, project level activities concerned with understanding and negotiating what value means to clients and users might include value planning. Or involving users and client representatives in direct dialogue with members of the supply chain, such as designers and construction managers, who can provide information and perspectives on different ways of thinking about value.

Supply chain practices concerned with understanding value may take the form of market research, covering the general needs of clients or users in a particular sector of the built environment. A supply chain integrator may undertake or commission this kind of market research as part of its more general business development activities. Business development might otherwise involve developing and maintaining relationships with key clients in a market that the integrator wishes to serve, or promoting the relevance of the products and services that its integrated supply chain can deliver.

The next sector of the diagram covers the range of practices involved in delivering built environment facilities. These include designing and costing facilities so that they can be relied on to deliver the expected value; manufacturing the components from which they are to be constructed on site; managing construction itself; and finally, maintenance and operation. Supply integration at project level includes activities such as value engineering, risk management, collaborative cost management, designing for buildability, and designing for maintainability and total cost of ownership. These all draw on the combined expertise of the supply chain to improve the value delivered. Possible integration initiatives at supply chain level include the development of standard modular designs or design details that can be delivered more effectively through improved processes on a stream of projects. Or identification of standardised components which can be manufactured more effectively or in greater volumes and therefore more cheaply, and which can be used in a range of projects to enhance what the client receives.

The third sector of the diagram refers to activities that support these core value delivery processes. Electronic information management and information systems make up one important area where greater integration is now possible. Human resources development activities can also support value delivery across the supply chain. At project level, multi-organisational teams can receive training in particular techniques such as value management or collaborative risk management. Team members may also work with facilitators to help them learn how to apply these techniques and how they can adapt their roles on a collaborative model, to deal with the demands of their

particular project. Such training or facilitation may also be provided to groups of staff from several members of a supply chain convened "off-line" to examine how they generally work together on projects, and identify improvements.

The fourth sector of the diagram concerns how relationships between the various players involved in all the other activities described so far are "governed", i.e. established, maintained and made effective. "Governance" is a useful concept because it includes not only formal, legally recognised instruments, such as contracts, used to manage organisational relationships, but also the more informal understandings, codes of practice, charters, as well as arrangements for sharing economic benefits or set-backs. In combination, these mechanisms can have powerful effects on the way relationships function.

At project level, governance initiatives to improve supply chain integration typically take the form of ways of structuring the formal responsibilities of different organisations on the project team to integrate design and construction. For example, in some form of single point responsibility for the project as a whole or for substantial elements of it. This may be combined with a more collaborative form of contract, which specifies how issues are to be resolved in a spirit of partnership rather than blame. At supply chain level, governance initiatives may take the form of framework agreements between a supply chain integrator and a first tier of preferred suppliers, offering assurance of a continuing access to work opportunities in return for co-operation in improving overall performance from project to project.

This mapping is based on an analysis of the intentions of a range of different companies, but has been validated as a useful charting of the terrain to be navigated by several of our action research collaborators. It has allowed them to understand achieving supply chain integration in terms of developing a range of inter-connected practices across the different quadrants. This then raises the issue of what kind of sequence of development of different practices needs to be followed, on the assumption that not all can be developed at once. The starting assumption of the majority has been that the overall flow of development needs to follow something close to the normative models for the development of strategic supplier relationships, found in the supply chain management literature referred to in Section 1. This begins with an explicit strategic rationale, then involves selection of suitable supply partners, leading to formal agreements between companies, and then moving to development of explicit operational processes for collaborative decision-making and planning at project level. In terms of Figure 1, this flow starts from the "supply chain"

inner part of the “governing integration” quadrant and then moves first to the project level outer part of the “delivering value” quadrant. Several companies we worked with expressed ambitions of undertaking subsequent project-level initiatives in other quadrants, as well as ultimately developing firm-to-firm initiatives such as agreeing standardised design components. But their predominant focus at the time of the action research was working out how to achieve integrated design and cost management at project level. The next subsection presents some key findings as to what is involved in achieving such project processes.

### 3.2 The role of social capital in developing collaborative routines and improved capabilities at project level

#### The research team were able to carry out two in-depth case studies of attempts to implement integrated working.

These were undertaken with one of the most active industry partners, a main contractor with an espoused strategy of developing long-term supply partnerships, identified here only by the pseudonym Bettersupply. The case studies evaluated the course of two construction projects over a number of months. Both were seen as part of the corporate vanguard in advancing the degree of integration, with supply partners responsible for delivering substantial portions of the overall project. Project A built a significant new multi-use structure as part of refurbishing a leisure complex. Project B was a residential accommodation development.

The two cases illustrate how various informal aspects of the relationships between parties involved can play a crucial role in determining whether there is actually a flow, from the basic strategic rationale of adopting integrated ways of working to improve value delivered, to the implementation of integrated practices at project level and improved competitive performance. We have found it useful to conceptualise these informal processes in terms of the development of social capital. This term has a variety of related meanings in various strands of social and organisational studies. For our purposes we take it to refer to: “the sum of the actual and potential resources embedded within, available through and derived from the network of relationships possessed by an individual or social unit” (*Nahapiet and Ghoshal 1998*). In the context of supply

relationships for the built environment, it expresses the way that the quality of relationships that have been built up between people from various organisations, the realm of the “social”, can be drawn upon as a kind of potential or “capital” in crafting new ways of working. This innovative potential stems from three distinct aspects of social capital: (a) a structural aspect, in terms of who has contact with whom, and so can gain access to their expertise and established goodwill; (b) a relational aspect, i.e. the norms of mutual obligation, fair exchange, and what constitutes acceptable professional behaviour that become established between people; and (c) a cognitive aspect, i.e. the concepts and systems for thinking, making sense of situations and reasoning about alternative courses of action, that have become established in the network.

#### Project A

In Project A, a previous working relationship between the client and a Bettersupply project team led to an agreement that the project manager would work with a set of selected suppliers, to develop a concept design and a cost plan for a residential development, which the client would consider without looking for any other bidders. The relationship between the client and Bettersupply led directly to them jointly choosing the architect for the project.

They chose this firm not just because it was on the Preferred Supplier list, nor for the fact that both the senior Bettersupply and the client staff knew it as a good company. It was selected because it had invested in the capability to take design all the way from concept to detail. Its management and professional staff had understood the need to work at a practical level alongside the contractors and suppliers who would build what it designed, and had invested in the systems and processes to do so. Neither the client nor Bettersupply wanted to appoint the type of architectural practice capable of developing a concept design, but incapable of subsequently working with the contractor and suppliers in optimising the design to deliver “best value”, and providing dimensioned and grid-referenced drawings that could be worked on collaboratively and in detail. Other design firms were selected jointly from the Bettersupply Preferred and Approved Supplier lists in a similar way. So arguably there was a strong cognitive element from the beginning in social capital that existed between the client, the main contractor and the team of designers.

Once the client had agreed to a concept design and target price, the Bettersupply project manager brought into the design process a number of key suppliers who would be involved in the delivery of the project.



These were principally:

- A steel-frame contractor – selected because of design capabilities and technical skills, but also because of a business relationship that had been established over a number of projects between the Bettersupply project director and its managing director
- A partitioning supplier – selected because of the technical standards of its product, in particular the contribution it could make to the very important acoustic elements of the design, and its willingness to work with Bettersupply and their appointed sub-contractors
- A mechanical and electrical building services supplier that was part of a national level “framework” agreement with Bettersupply, meaning that Bettersupply undertook to use only this firm and a handful of others also included within the “framework”. There was in this case no previous experience of working together of any kind between the Bettersupply project team and the supplier.

At the outset of the design process, there was thus an uneven picture in terms of the extent of relational and cognitive aspects of social capital between the Bettersupply project team and various other organisations involved. However, interviews towards the end of the design process, as the first stage of construction was beginning, suggested that these aspects were widely seen as being strongly present. This new social capital has been developed in the course of suppliers’ involvement in design. It appears that this investment has been aided by another form of investment – that made by the Bettersupply project director and his design manager in developing intellectual capital in the form of project processes that support practical collaboration.

Photograph courtesy of: East Thames Group.

Three aspects of the process are notable in helping to develop social capital. The first was the familiarisation of all the key members of the supply chain with what the client saw as their business objectives for the project as a whole. This was achieved by the Bettersupply team documenting the client’s requirements in some detail and communicating them to the whole project team.

The second is the control of interfaces between suppliers. The design manager developed a responsibility matrix for the project at an early stage. This matrix has been managed and driven by the Bettersupply Design Manager, but implemented through the delegation of the responsibility to manage interface issues to the supplier directly involved. The responsibility matrix has enabled team members to know precisely what they are doing, as well as what everyone else is responsible for on the project. The information from the responsibility matrix was fed into an interface schedule and a meeting schedule, where key interfaces that spanned different areas of responsibility were discussed. The responsibility matrix also helped minimise the need to allow for the cost of interface risk and allowed “buildability” issues to be tackled collaboratively at the design stage, resulting in efficient construction processes. Unlike the vast majority of Bettersupply’s construction projects, Project A was completed ahead of schedule rather than several weeks or months late. Further, the responsibility matrix and associated interface register facilitated the development of close working relationships between suppliers and between the suppliers and Bettersupply, thus building up relational and cognitive aspects of social capital for the construction phase and for future projects.

The third aspect of the process that was notable in helping to develop social capital was the delegation of authority to the members of the team to talk to one another about issues of mutual concern within the design, and to take decisions that would ensure “best-value” was achieved. This usually concerned issues relating to the design of interfaces between the specialist trades. The Bettersupply design manager stated that he wanted to be involved in discussions about interfaces only if the suppliers concerned could not agree on the optimum solution, or if they were encountering issues outside their delegated jurisdiction. That he operated in this way was reflected in the perceptions of other members of the wider project team. Such delegation needed, however, clear overall design process controls so that the integrity of the design was not compromised.

Together these three aspects of the design process appear to have resulted from cognitive and relational aspects of social capital that existed at the outset between some members of the overall team.

Crucially, they appear to have then provided the conditions for the strengthening of both relational and cognitive aspects, which in turn have provided the basis for further development of organisational routines and associated intellectual capital. For example, the use of the responsibility matrix and interface register as a tool for building the agenda of team meetings emerged during the course of the design process. This mutual reinforcement of evolving social and intellectual capital appears to spread to involve project team members, such as the partitioning manufacturer and the building services supplier, who were initially outside the pool of social capital based on previous working relationships. Interestingly, the process of being included and of developing shared understandings about how to work together, proved most difficult for the team sent by building services supplier, even though their organisation was at a formal level the most strongly allied with Bettersupply at national level.

### Project B

In Project B, a sports club wished to embark on a redevelopment of a significant proportion of its main city centre site, replacing a number of existing sports and leisure facilities with a large multi-use complex. The client at this juncture appointed a project manager to represent it and engage a project team to design and construct the new facility. They first selected – by competitive tender – an architectural firm with experience of designing large mixed use buildings for leisure use, based on steel structures, followed by a firm of structural consultants and a firm of landscape architects. They produced a concept design that was used to tender a contract to carry out detailed design, demolish some existing buildings and construct a large new integrated structure, to the tight deadlines associated with an existing programme of public events.

The business stream director for Bettersupply, had worked with both the project management firm and the architects on a similar leisure development and had maintained his contacts with them, and thus ensured that Bettersupply was on the bid list for the project, which included three other major national contractors. The business stream director then worked with Bettersupply's Bid Manager, selected for this role because of his experience with similar developments, first in the selection of the key suppliers and then in working with them to put together a bid.

They selected three key suppliers to be involved in developing their bid - described below, using pseudonyms:

- Structures Ltd as the structural steel supplier - Structures Ltd. was part of a group of steelwork companies, each of which was a Bettersupply Preferred Supplier. Structures Ltd had extensive

leisure complex steelwork experience and there was a “business friendship” between Structures Ltd senior executives and the Bettersupply Bid Manager

- Services Ltd as the M&E specialist supplier - Services Ltd had worked on similar leisure complex projects, was a Preferred Supplier to Bettersupply. The Bettersupply business stream director had well established business contacts with senior commercial executives at Services Ltd.
- Envelopes Ltd as the cladding supplier - Again a Preferred Supplier, Envelopes Ltd also had relevant leisure complex experience and a successful track record with Bettersupply. There were no established business contacts between any of the Bettersupply bid team and senior members of Envelopes Ltd, although there was a recent history of joint working between the two companies involving other individuals.

To summarise, these three companies all held the status of Preferred Suppliers to Bettersupply, all were judged as having relevant experience and, indeed, had worked together on leisure complex projects. The track record of previous related work and personal contacts at senior level appears to have obviated the need for any formal competence assessment to underpin their selection. It could be argued that both the structural element and the relational elements of social capital existed between the Bid Manager and the business stream director, as well as equivalent senior commercial people in Structures Ltd and Services Ltd. They regarded one another as significant members of a network of contacts through which opportunities for construction projects are acquired and negotiated, and had every reason to observe the standards or norms of mutual obligation understood between members of this network. There was no evidence of a significant cognitive element in this social capital at this point, in terms of detailed understandings about the tools and techniques to be deployed when working together to produce a bid or during the subsequent stages of a project. The researchers failed to detect any contact between the organisations involving operational people.

There is also no evidence that significant social capital pre-existed or was developed at this stage between people in the chosen supply firms and the nominated Bettersupply Project Manager, who was to take the project forward once it was won. Despite the Bid Manager's firm view that the Project Manager had been involved in the selection of these crucial partners, a few weeks after the bid had in fact been won, the Project Manager reported feeling unclear about the criteria used in their selection other than their leisure complex experience.





He felt that his main role during the bid preparation period had been attending value engineering workshops to improve the design, and visiting the site so that he could form a view about the overall schedule, the amount of demolition work and the kind of site facilities and plant that would be required.

During the development of the bid, the pre-existing structural and relational social capital appears to have led to a moderately innovative process of Bettersupply involving the three key supply partners in developing design ideas and their prices to deliver them. The goal was to make the bid as attractive as possible to the client, whilst making sure that the detailed design and construction plan were realistic and so convincing to the client.

The Bid Manager successfully involved the three key supply partners in a number of workshops to refine the concept design to a point where the bid team felt they could price it accurately but competitively. Both he and the business stream director were clear that the level and quality of involvement of these three Preferred Suppliers was substantially above industry norms for what happens during the preparation of a tender bid. For example, Structures Ltd and Envelopes Ltd worked with Bettersupply to redesign the roof of the main building to make it easier to build and more functional for the client.

The suppliers also played a constructive role in identifying potential problems. One important area of input came when staff from Structures Ltd and Bettersupply examined the drawings supplied by the clients' structural engineer. Both parties agreed that, once it had been fully designed, the steel structure as outlined would require a considerably greater volume of steel than specified in the tender documents. The Bettersupply Project Manager attended the workshops where this was being discussed, and observed afterwards that he had the initial impression that the representatives of Structures Ltd, were willing to "take on the risk" of the extra steel required, i.e. that they would price their part of the bid competitively and hold to their price, on the basis that they would be able to manage and predict the amount of extra steel involved by being involved in the detailed design of the structure. This seems to illustrate a degree of relational social capital – a mutual preference for entering into a strongly trusting relationship – between representatives of Bettersupply and Structures Ltd.

Subsequent developments suggest a more complex picture, with both parties to the relationship showing some uncertainty about how to find a way of working for the rest of the project that would both draw on the established social capital between the two companies and also provide appropriate protection for their commercial interests. Once

the client had in fact accepted the bid, whilst the business stream director was on holiday a new agreement was reached between senior Bettersupply management and a senior manager at Structures Ltd. According to which Bettersupply would take full responsibility for paying Structures Ltd all the costs of extra steel. However, there was still an understanding between the two firms that design staff from Structures Ltd would advise the project structural engineer on the detailed design development, spotting opportunities for reducing costs of steel and for making construction quicker and easier.

Bettersupply explicitly sought to demonstrate to the client that its proposals were based on a price that had been developed jointly with the key suppliers. These key suppliers had invested a great deal of time in getting to know the site – a task on which they worked with the Project Manager - and were clearly ready to start work immediately if awarded the contract. Representatives from the key suppliers attending the interview with the client and Project Manager, and could demonstrate that they had thought through the risks involved in delivering the project. All the actions of the bid team, the suppliers and the nominated Project Manager gave the client, up against tight deadlines, confidence that Bettersupply would satisfy their greatest concern, which was certainty of completion by the agreed date. The bid was accepted. As a member of Bettersupply's central supplier development team put it:

*"This is the first job we've won by involving people (i.e. preferred suppliers) in the tender process. We've won it against companies historically we wouldn't have won it against."*

Once the contract had been won, responsibility for the project within Bettersupply was passed to its Project Manager. Bettersupply needed its own team of designers to carry forward the detailed design. According to the business stream manager, there were reservations in engaging the client's architect for the detailed design. Although Bettersupply had recently worked with the firm in question on a similar project, in the director's view the architects had been overly dependent on firm direction from Bettersupply for the planning and sequencing of the production of their detailed drawings. They were likely to be hard work to keep on track. But the alternative of using another firm of architects was on balance more risky, because of the time it would take newcomers, however capable, to understand the design. The client's programme for the project was already extremely demanding.

A few weeks into this phase, the Bettersupply Project Manager appeared reasonably confident that arrangements in place for continued collaboration with suppliers would prove viable. Several suppliers were attending weekly design workshops, understood that the scope of their contract might need to change, and had also agreed to the establishment of a "risk pot" as part of their contract. Extras that emerged during design development could be claimed for from this pot provided there was an agreement with Bettersupply.

Within a further few weeks, relationships with some firms within the project team were in fact proving much more difficult to manage. In particular the relatively weak levels of understanding between the Bettersupply Project Manager, the architect and steelwork supplier began to demonstrate the transient nature of the social capital and practical understandings apparently established during development of the bid.

By the end of the first month, the architect had simply failed to produce drawings needed by the steelworks supplier who could not, therefore, begin fabrication. It became clear that the architect had done far less work prior to the bid stage than they had previously claimed. Above all, drawings had been produced without the use of any standardised co-ordinate grid. Both the business stream director and the Project Manager formed the view that the architect had put a team on the project with very little experience of the kind of leisure complex concerned. Moreover that there was simply not enough architects working on the project. In a project that was intended to adhere to the letter of their responsibilities, never mind facilitating supplier input.

A second event compounded these problems in the effective management of the project. A few weeks into the detailed design phase, Structures Ltd told the Bettersupply Project Manager that they were transferring the steelwork supply contract to their sister company, Spans Ltd. They gave as the reason the fact that their plant was too busy to cope with the work of the Leisurecomp project, having given far larger commitments to a major national client. They saw it as their prerogative to utilise capacity across their group of companies how they saw fit. At this point the Project Manager became concerned that the "mindset" with which Structures Ltd had worked on the bid would not transfer over to Spans Ltd. Not having been closely involved in the discussions about risk sharing in the development of the steelwork design, he was in fact already concerned that staff from Structures Ltd were not taking further design decisions strictly according to what he would consider to be the best interests of the project as a whole. The transfer of the supply of the steelwork to a new company and team was additionally worrying.

The Project Manager further rapidly found that, when they had an opportunity, staff from Spans Ltd understood their role in commenting on design as considerably more limited than he had been led to understand had been agreed by his bid team colleagues. Whereas Structures Ltd's business appeared to be to produce complex bespoke structural steel solutions, Spans Ltd's business appeared to be to produce standard sections at lowest possible cost in the shortest possible time. Its staff showed little interest in the niceties of design or collaborative decision-making with their customer. They proved reluctant to get involved in design issues beyond their contractual duty to design connection details, preferring to leave full responsibility with Bettersupply and its nominated architect. The Bettersupply Project Manager summarised the position thus:

*"They're taking a much more aggressive view...anything that's not in black and white on the drawings and they say 'that's down to you'...they're a lot more back-seat than we expected."*

Whilst the Project Manager prided himself on maintaining adequate relations between the various parties on site, the combined stances of the architect and Spans Ltd led to further difficulties. The amount of steel in the design was no longer being controlled adequately by Spans Ltd, who apparently did not feel bound by the earlier agreement between senior members of Bettersupply and Structures Ltd. Further, the drawings passed at the last minute to Spans Ltd proved to have a number of significant errors. Spans Ltd on a number of occasions fabricated parts that would not accept the units made by the pre-cast manufacturer causing lost time on site, scrap, rework and the need to invest in extra moulds to make up the lost time. According to the letter of their contract with Bettersupply, Spans Ltd charged Bettersupply for the extra labour time involved.

Overall, within six months of the award of the contract, there was little evidence that the key suppliers saw themselves as partners within an integrated supply chain that had been set up to deliver improved value for the client while making predictable and realistic commercial returns and looking forward to working with one another in the future. More established commercial attitudes and the swamping of orderly process by the need for expediency and fire fighting were more easily identifiable. Important areas of integrated working between designers and subcontractors had gone by the board. And with this had disappeared much of the social capital established between firms during the bid stage.

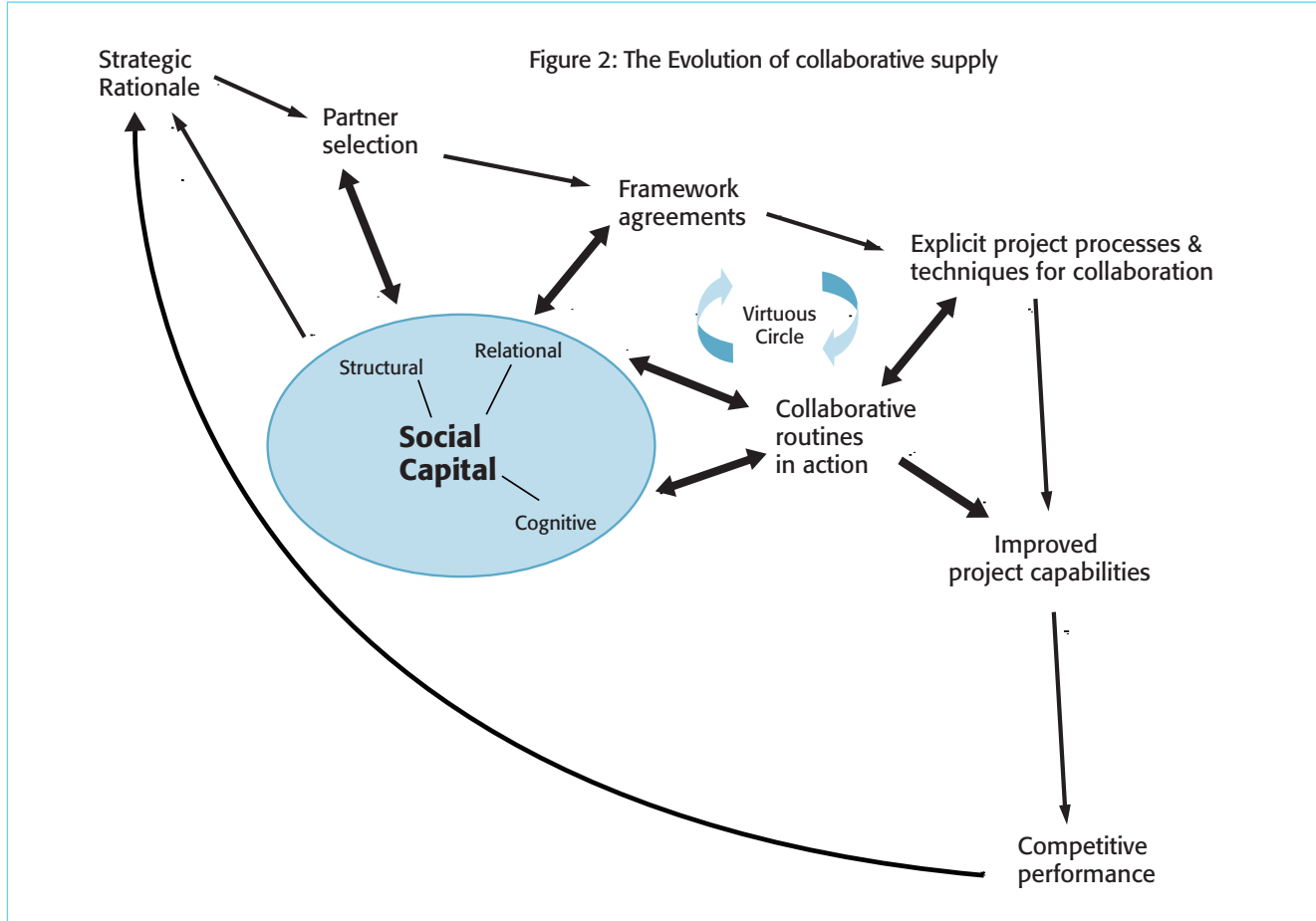
**Lessons from the two cases**

In Figure 2, the arrows flowing from left to right across the top and down the right hand side summarise the linear view of the process of implementing integrated supply models referred to earlier, that appears to have been in the minds of most senior managers involved in the Integration of the Supply Chain project. The remainder of the diagram attempts to capture the integrative and catalytic role of social capital in making it possible to move from a corporate strategic rationale to collaborative routines in action and improved competitive performance. This kind of analysis also suggests that the progressive development of collaborative supply relations is more of an iterative process than the linear model suggests.

A first working hypothesis emerging from our case studies is that all three aspects of social capital identified earlier are, indeed, important enablers of the emergence and further development of integrated

ways of working on an inter-organisational project. In particular, relational and cognitive aspects of social capital appear to have the potential to develop within a construction project, much as they do within single organisations, and provide the basis for developing intellectual capital carried by inter-organisational routines. They enhance more formal business-to-business supply agreements and the use of formal processes and techniques, such as value management and collaborative construction planning, that support integrated decision-making and planning.

But beyond this, social capital can itself be augmented by a successful experience of working in an integrated way on a project, providing a basis for future further innovation in the crafting of integrated project routines in action. This results in a virtuous circle of deepening innovation. Our case studies illustrate both the establishment of such a virtuous circle (Project A) and how the potential for establishing one can be disrupted (Project B).



In Project B, social capital and collaborative routines, developed amongst the members of the bid team responsible for earlier stages of collaborative work, failed to be transferred to the group of company representatives who took responsibility for subsequent detailed design and construction management. A variety of weaknesses in the structural connections between those who had developed the bid and those who took the project on afterwards led to an unravelling rather than a deepening of the relational and cognitive aspects of social capital, and a failure to make significant innovations in project routines. The project was delivered, but with a great deal of additional management intervention from Bettersupply and adversarial commercial relations, leading to mediocre commercial performance for Bettersupply and the supply chain, rather than collaboration for mutual commercial benefit. In particular one supply partner decided to transfer the work to a sister company in the same group, and none of the informal understandings developed during the bid phase as to how the supplier would work with Bettersupply during detailed design were passed over. There were also deficiencies in all aspects of social capital between the group of companies that had worked on the bid and the design firms they took over from the client to work with on the detailed design, once the contract had been won. So, apparently agreed collaborative design processes were not honoured, and the routines-in-action during detailed design and construction showed little integration.

This suggests that when aspiring supply chain integrators seek to bring about innovations in integrated supply, it is vital for them to assess the pools of social capital available amongst people and organisations implicated in the entire web of practices and routines that need to be changed. Project B suggests that strong social capital developed between people involved in only one part of the total web of practices (those involved in the bidding stage) may actually undermine the expansion of the pool of social capital to include others. On this project, this localised social capital worked to facilitate a new approach to collaboration during bidding, but lack of attention to linkages with the practices involved in the later and equally crucial stages of the project meant that the coalition that developed the bid came almost to be seen by others as having sabotaged the rest of the life of the project; as having acted irresponsibly according to a limited view of in its own collective interest without relational or cognitive connection to the people who had to deliver the project.

This is not to say that it is only possible to embark on the implementation of collaborative supply relations when there is strong and balanced social capital in existence between all relevant participants. Rather, it is important to be aware of where there are gaps in informal relationships and understandings on the one hand, and where there are potentially collusive bonds that will perpetuate a localised view of how to carry out work that will block innovation. Those seeking to lead innovation can then consider how either situation can be compensated for by some form of community building - to see the development of social capital as something that can be facilitated if not directly managed. But this means paying critical attention to all three aspects of social capital, and how far they are present amongst the range of people who need to be involved in seeing through the strategic logic of an integrated supply arrangement.

In Project A the virtuous circle of development of social and intellectual appeared to become established, including the potential to include new members of the project team. Above all, the commercial performance for virtually all members of the project team proved well above average, and this also appeared to lead to general interest in working together further, using the techniques that had been learned. A further dynamic revealed by this case is then that social capital developed between key individuals within the network of supply partners has strengthened awareness of the strategic logic for each supply partner, for making further joint investments in refining integrated ways of working on future projects. There is feedback between the development of collaborative routines at project level and the development of a shared strategic logic.

## 4 Evaluating performance of integrated supply arrangements

The emphasis on configuring an integrated supply chain to develop the capability of delivering value to a particular kind of client, or for a specific type of building, poses a basic paradox in terms of the purpose of measuring performance. If project performance is to be assessed in terms of whether the specific aspects of value that matter to a client or client group have been delivered, this means understanding in depth the needs of a particular set of stakeholders and what counts as evidence that these needs have been met. These measurements are inevitably context-bound to a considerable extent. Indeed, the better the needs of a particular client have been understood, the more specific relevant measures are likely to become. It then becomes all the more complex to compare the performance achieved, in terms of specific benefits delivered by the building and the capital and operating costs of doing so, with the performance achieved in other contexts. Our research has encountered situations where even apparently similar kinds of buildings, for example leisure centres, proved to have significantly different requirements, and so the extent to which the desired functionality had been achieved and the costs of doing so became difficult to compare with any precision.

This means that it is difficult to demonstrate in any simple way that the application of an integrated supply chain actually leads to better performance. There is rarely, if ever, an exact comparator of a like enough project procured in a more traditional way. The main contribution of the Integration of the Supply Chain project in the area of performance measurement has therefore been twofold. First, the research team has worked with a number of integrated project teams, to develop project-specific performance metrics that allow tracking of performance at various stages of project progress, in terms that are directly related to the most important aspects of client value. Such value-based metrics inevitably draw on generic industry KPIs, such as cost and programme predictability, or safety performance, but recast them in a group of locally-relevant measures concerning issues such as the maintainability or marketability of the building being produced. Second, we have developed directions for comparing the performance of integrated supply teams with industry norms, in a way that goes beyond simple context-independent or generic KPIs. These include benchmarking particular common elements likely to be replicable across a series of projects, such as standard masonry work in city centre commercial developments, and setting performance targets for a particular project and then evaluating the effectiveness in meeting or surpassing these through value-improving techniques associated with integrated working.

### 4.1 Stakeholder evaluation as an approach for measuring the performance of integrated supply

Government policy and influential groups within the construction sector itself are encouraging the adoption of collaborative working within multi-organisational project teams and integrated supply chains. The aim is to develop the capability to deliver superior value to the client.

Current approaches to performance measurement, however, appear seriously flawed in their ability to demonstrate that such value is being delivered. Interestingly, this state of affairs is echoed in other sectors. Beamon (1999) argues that, regardless of sector, one of the most difficult areas of performance measurement is the development of an appropriate performance measurement system for supply chains, adequate to demonstrate the delivery of superior value to the end client or customer. The limitation of many of the current performance measurement techniques within the construction industry, particularly generic performance indicators, is that they fail to balance the need to be sensitive to measuring what matters locally whilst also providing a basis for comparing with what has been delivered elsewhere.

Possibly as a result of this situation, many in the construction sector who otherwise advocate integrated supply models complain that construction clients tend to cleave to the established mechanisms for assessing value for money - the competitive tendering of designs, to be built by constructors who have not had any input into design, selected on a lowest-cost basis. And this is then seen as a barrier to the progression of more collaborative working and the delivery of superior value, however it is to be measured.

In this context there are first of all a number of related reasons why there is a need for context-specific, client-relevant performance measures. These are supported by research findings in other sectors, whether or not, like construction, they are organised primarily through multi-organisational projects.

First, there is a need for a focus on the stakeholder perspective during a construction project, and the movement away from using universal KPIs as the exclusive measures on a project. Love and Holt (2000) have suggested that successful business strategies in general require a stakeholder perspective to performance measurement. This allows an organisation or extended business system to be monitored and judged in a manner that provides the foundation for maximising stakeholder value. Traditional financial and time-related performance measurement techniques may fail to provide information on what customers really want, and what they are actually getting.

Second, following directly from this, there needs to be a focus on what 'value' means to the client. Reliance on a standard set of performance measures from one project to the next is of questionable practicable benefit to the construction industry, where the products and value priorities generally differ from one project to the next, even when the client remains the same. Even where clients may appear to suggest that same thing is of value, this is not always the case. Gibb and Isack (2001) found that the term 'value for money' was one of the most quoted client requirements for a project. Yet, when they analysed what was meant by this, the views of client representatives differed. For example, 17.5% of interviewees felt that 'value for money' meant lowest life cycle cost, 15.7% felt that it meant having satisfied end-users, and 5% felt that it meant early project completion. Therefore it is necessary to determine precisely what value means to a client.

Third, context-specific performance measures are needed because of changes in the types of procurement and contractual arrangement for projects, which lead to a greater emphasis on life cycle aspects of value, rather than initial capital cost alone. For example, PPP (Public Private Partnership) and PFI (Private Finance Initiative) projects have shifted value considerations from an emphasis on a low initial capital cost to include also whole life costs and benefits, such as ease of operation and costs of cleaning and maintenance.

The process for determining what the client values is an evaluation – a term which was used by Ralph Tyler in the 1940s because evaluation implies 'a process by which the values of an enterprise are ascertained' (Norris 1990). We suggest that the term evaluation can be usefully applied not only to assessing what the client values but also to attempt to measure what has actually been achieved. In what follows, we argue that a stakeholder-based approach to both aspects of evaluation can be suitable not only for understanding what is being achieved relative to local criteria but also for making performance comparisons across different contexts.

One highly developed example of a stakeholder based evaluation methodology is that of Guba and Lincoln's Fourth Generation Evaluation (Guba and Lincoln: 1989). This approach was termed 'Fourth Generation Evaluation' because it espouses moving beyond the previous three 'generations' of measurement and evaluation. The first generation of evaluation is considered to be measurement-oriented, where the evaluator performed a 'technical' role. The purpose of second generation evaluation was descriptive. The role of the evaluator was to describe patterns of strengths and weaknesses with respect to stated objectives. Third generation evaluation was judgement-oriented, and the role of the evaluator was as 'judge'. The problem with these first 'three generations' of evaluations are that stakeholders are not represented; none of the evaluation approaches of the first three generations accommodate stakeholders having different perceptions of value or different views as to what is reliable evidence that value is being delivered.

Fourth Generation evaluation takes the position that evaluation outcomes are emergent interpretations that individuals or groups in the stakeholder audience form to 'make sense' of situations in which they find themselves. Guba and Lincoln's evaluation approach is based on the idea that different stakeholders need to articulate their distinctive conceptions of what value means. There then needs to be a process of discussion and negotiation so that areas of agreement as well as difference can be identified. It will then be possible to identify a set of evaluation indicators that address the range of stakeholder concerns. This approach is particularly applicable to the problem of measuring the performance of integrated supply because of its emphasis on the stakeholder in the evaluation, and the focus on how different stakeholders understand value. Whilst some stakeholders may be concerned predominantly with the achievement of locally defined objectives, others – typically senior managers – will be strongly interested in comparing performing across contexts. A stakeholder based approach in principle allows both local relevance and wider comparisons to be addressed.

## 4.2 Experiences with stakeholder-based performance evaluation

This section describes two cases where researchers applied the principles of stakeholder evaluation to develop approaches to project performance measurement for two construction companies engaged in developing integrated supply.

Both firms are responsible for assembling and leading project teams drawn largely from established supply chain partners. Both firms espouse the advantages of such supply partnerships and integrated working at project level, but are concerned at the lack of clear mechanisms for demonstrating the delivery of superior value, linking value measurement in one context to clear comparators. In what follows, both firms are referred to using pseudonyms.

### Case One: Company T

Company T is a large main contractor with an established policy of developing preferred supplier relationships and supplier alliances. The action research collaborators were a group of senior managers in the central procurement and supply chain management function. They identified a problem in demonstrating to clients and sceptical colleagues alike that using preferred suppliers, as opposed to those who had been acquired through traditional procurement routes (i.e. competitive tendering) could deliver superior value in projects. They were keen to deepen their understanding of how different aspects of construction project performance could be measured and so compared.

Integration of the Supply Chain researchers assisted these managers in running a workshop involving Company T operational managers, project managers and senior staff from 16 of its preferred suppliers. The purpose was to consider what value drivers could be measured on different construction projects to demonstrate that an integrated supply chain is able to deliver superior value. The participants were divided into three groups, each including the mix of disciplines and trades of typical project team. Each group was given a different project "brief", based on a real project recently worked on by the company, but not familiar to the workshop participants. The projects concerned three different building types: a residential development, a sports stadium, and a hospital refurbishment.

Table 5: Different building types and the respective value drivers for Company T

Building Type	Value drivers for the client of this building type
<b>Residential Building</b>	<ul style="list-style-type: none"> <li>• Cost certainty</li> <li>• Programme reduction so that the client can advertise the building to potential residents as quickly as possible</li> <li>• Reduced through life costs for the building</li> <li>• 100% occupancy</li> <li>• Social acceptance of building in the environment</li> <li>• Safety and security of occupants.</li> </ul>
<b>Sports Stadium</b>	<ul style="list-style-type: none"> <li>• Predictability and achievement of programme (in order to start seasonal sports fixtures as planned)</li> <li>• Maximum capacity for spectators</li> <li>• Intelligent phasing of the job so that sports events can be held during the construction process.</li> <li>• Project delivered to the budget</li> <li>• Value Engineered for the best construction solution</li> <li>• Experienced, high quality team who have delivered a sports stadium previously</li> <li>• Unimpaired sight lines for the spectators in the stadium</li> <li>• Flexibility of use enabling stadium to be used for other sports, or other types of events</li> <li>• Design values</li> <li>• Safety.</li> </ul>
<b>Hospital Refurbishment</b>	<ul style="list-style-type: none"> <li>• Meeting programme dates consistently, so that clinical disruption is predictable and minimised.</li> <li>• Cost predictability, as well as getting something 'extra' for the budget.</li> <li>• New, but appropriate innovative layouts which will generate reduced clinical operation costs and higher throughput of patients</li> <li>• Increased staff satisfaction and staff retention</li> <li>• Increased patient satisfaction</li> <li>• Least disruption to the hospital operation, and less hospital 'downtime' during construction</li> <li>• Least disruption during maintenance, zero defects</li> <li>• Standardisation of layouts that conform to NHS requirements</li> <li>• Safe working environment.</li> </ul>

Each group was asked to consider what 'value' meant to the range of stakeholders involved in their project. They also explored what performance measures, during and at the end of the project, would be perceived as providing meaningful evidence of value delivered to this range of stakeholders, taking account of their distinct, albeit often overlapping, priorities. The value drivers produced for the different building types are presented in Table 5. In most cases the value drivers identified have clear implications for meaningful and practical operational performance measures.

A number of interpretations emerge from considering this workshop output. First, the workshop participants found it possible to apply a stakeholder perspective to produce specific value drivers and performance measures for their projects. Second, there are common themes for these value drivers across the three building types. The three most identifiable themes are unsurprisingly cost, time and quality. However, these common themes are expressed quite differently for the specific building types. For example, for the residential building, the 'time' element refers to a reduction of the programme enabling the client to advertise the building to potential residents as quickly as possible. Whereas for the sports stadium, 'time' is of value such that the programme is predictable and achievable enabling planned sports fixtures to be held. The client might also value intelligent phasing of the construction programme so that events can continue to be held during the construction process, maintaining revenue for the stadium, as well as its reputation. For the hospital refurbishment, 'time' is important such that programme dates can be met to minimise clinical disruption, and minimise the period of time when the hospital is out of use. This supports the findings of Gibb and Isack (2001) that even where clients apparently suggest the same thing is important (e.g. "time") the unique aspect of each client, and of the specific building type, needs to be taken into consideration in defining what is actually meant by that.

All this suggests that simple and universal time, cost and quality performance comparators are unlikely to be meaningful across these different building types. There is, however, scope for exploring the establishment of performance benchmarks within particular classes of building.

### Case Two: Project P

Project P involves a property developer, a construction manager and a specialist subcontractor. The companies work together repeatedly as part of a supply chain, and are keen to develop project-level innovation, to implement performance measures which relate the value delivered on a project to the client value drivers during a

commercial office development. The project team was attempting to develop new approaches to performance measurement that would allow each organisation to demonstrate to the other that they were adding greater value by working together, and thereby also demonstrating this to their clients.

Action research was carried out on a single package of work for the commercial development – the masonry façade (stonework and brickwork). Through a series of workshops with key project stakeholders, i.e. the client, the construction manager and specialist subcontractor, a number of value drivers were identified, and the associated key performance indicators were developed for the respective drivers. In this case, the stakeholder perspective was used to explore value and measurement not only from the perspective of the client, but also key supply chain members. The value drivers and associated forms of measurement were:

- **Construction cost and margin.** This value driver led to performance indicators of: labour productivity, in terms of the amount of labour time involved in laying standard sections of brickwork and stonework; buildability, in terms of whether actual site delays can be traced to the occurrence of key buildability issues identified in advance, or whether these have been successfully avoided through process simplification and site logistics planning; and predictability of programme, in terms of actual progress against the programme.
- **Maintainability.** This value driver was measured in terms of the budgeted annual cost of maintenance implied in the operating procedures handed over to the client.
- **Marketability.** This value driver referred to the attractiveness of the building and construction site during construction itself, as a basis for attracting potential tenants. It was measured in terms of the quality of appearance of the product during construction and at handover, as assessed by client project managers. Staff from the property developer were asked to evaluate the quality of the appearance of the building, its visibility during construction, the orderliness of the site, and the presentation of the workforce at regular intervals, noting factors that enhanced or detracted from its quality of appearance.
- **Safety.** This value driver led to the site accident rate as the performance indicator.
- **Environmental performance.** This value driver led to two performance indicators: the re-use of demolition waste on site and elsewhere; and carbon dioxide emissions through the recording of the transportation mileage of materials delivered.



Project P was developed on a city centre site of historical interest, and amongst existing buildings of architectural and historical significance. This particular characteristic of the project had an influence on several of the value drivers, including environmental performance, marketability and maintainability. This case provides a further demonstration of how metrics can be linked to detailed stakeholder-based value drivers on projects; and how the specific context of a project is an important determinant of these value drivers.

In terms of providing a basis for making performance comparisons across projects, the industry practitioners concerned reached similar cautious conclusions to those of Company T. Although the parties to Project P has been involved in similar projects in the recent past, they had not collected data according to the performance measures now identified as meaningful for this kind of project. They anticipated being able to use these metrics to show performance improvement on future projects, but could not on the current project demonstrate directly the impact of supply chain collaboration. They also intended to provide future clients with evidence that they were able to link performance measurement with the application of value-improving techniques such as value management during design and collaborative construction planning.

### 4.3 Implications for future development of measurement

There are two main implications of the experiences reported above for the development of project performance measures that address both local context and the need to make wider comparisons.

First, how do companies demonstrate that the use of an integrated supply chain has led to systematic superior performance from one project to another when the measures are unique across the projects? The unsurprising answer is that this cannot be done in simple terms. But there are directions for demonstrating performance improvements associated with supply chains. For example, there will be replicable elements across a series of projects of a common type and, therefore, it is possible to use these measures. Additionally, it is also possible to show a client specifically how other projects or series of projects for other clients have benefited from the use of an integrated team.

Second, how will construction companies be able to benchmark themselves against other companies and the construction industry in general, if the performance measures differ from one project to the next? As with the first point, there will be replicable elements of projects that can be used for benchmarking and comparison. For evaluating competitiveness it is, however, not good enough to rely simply on the comparison of universal measures. Some construction companies may be more competitive because they can better identify and reflect the customer's idea of value. The issue is then not so much how to evaluate competitiveness relative to simple or universal benchmarks. Rather it is how to communicate that a company can first of all identify measures of context-specific, client-relevant value delivery, and then demonstrate performance improvement from one related project to the next.



Photograph courtesy of: Rok.

# 5 Conclusions and implications

## 5.1 Conclusions on forces that shape successful innovation

Figure 3 summarises the findings of the research team concerning forces that help and hinder progress with integrated supply arrangements in the built environment.

The first, and perhaps ultimately determining factor, is the strength of the strategic logic of the aspiring supply chain integrator for making an investment in the substantially new routines and techniques involved in working collaboratively with carefully chosen supply partners. If there is not a consensus within the supply chain integrator that this investment will result in returns from, substantial streams of business, for which integrated working is required to achieve competitive performance, then the initiative is unlikely to progress very far. Likewise, supply partners too need to be able to see the returns from the investment that will be required from them. A one sided strategic logic will not engage the full capabilities of supply "partners".

Second, once strategic issues have been resolved, achieving

integrated ways of working involves engaging with a wide range of practices, across the four quadrants of Figure 1. Supply partnerships that make progress appear to do so steadily, picking off one area of working after another for focused attention, and then moving on to another, covering the full range of practices in an iterative way. A key element in making this kind of continual change and progression work is the development over time of social capital between representatives of firms in the supply chain. Gaps in social capital are however bound to occur, as new firms and new representatives of existing firms are brought into the supply chain. In such circumstances it is vital to recognise that collaborative norms and understandings need to be built through workshops. The greatest danger comes from assuming that collaborative ways of working can be built amongst people who have no established informal relationships with one another. Or from assuming that just because high level firm-to-firm collaborative commercial arrangements are in place, collaborative and integrated practices will simply emerge at project level. These need to be worked on specifically.

Finally, making progress with supply chain integration requires the development of a sophisticated approach to measurement that allows value to be understood in particular circumstances, and measurement of the contribution of integrated ways of working to achieving it.

Figure 3: Forces for and against successful implementation of integrated working

Forces for change →	← Forces against change
Clear, compelling and shared medium/long term strategic logic	Weak or one-sided strategic logic
Existing islands of informal collaborative routines based on social capital	Self reinforcing web of existing adversarial routines
Awareness of existing adversarial routines and gaps in social capital that block progress	Lack of awareness of existing adversarial routines; cultivation of superficial social capital oriented towards maintaining the status quo
Value-based approach to performance measurement	Cost-based approach to performance measurement

## 5.2 Overview of the guidance material on developing supply chain integration

The project has developed and piloted a set of guidance material for companies in the built environment sector who wish to evaluate and act on a strategy for developing collaborative and integrated ways of working with others in the supply chain.

This guidance builds on all the findings set out in this report, and in particular the insights summarised above. The guidance material starts from the premise that collaborative supply relationships require a considerable investment by the parties concerned in developing integrated ways of working. Such investment only makes sense if there are clearly identified streams of business which give the parties concerned a firm basis for expecting returns on their investments.

The supply chain leader and key partners all have to be able to see

that by collaborating they can out-perform others who are competing from the same stream of business. Senior managers will rightly be suspicious of any over-generalised statements that integrated working and supply chain collaboration delivers superior performance in all circumstances. Rather, they need to understand the key parameters of performance for a particular market or business stream, and then delve into the specifics of how developing a capability to work in an integrated way can lead to superior competitive performance in that particular market or set of markets. Such market specific business cases are much easier to articulate and hence more compelling.

The guidance resulting from the research and development project offers a three-stage process that a supply chain leader can use, first to establish the case and will for embarking on a programme of integrated supply chain working, and then to identify and manage the organisational and inter-organisational change initiatives required. Each stage consists of a central workshop event, as well as some preparatory and follow-up activities.

### Stage 1: Developing a strategic logic and outlining the programme of development initiatives required

The main workshop takes place over 1-2 days, and involves senior managers from the supply chain integrator. They examine the capabilities the supply chain integrator needs to have within its supply chain, in order to meet the business challenges it faces in a particular market or sector. They then decide the priorities in terms of identifying existing and new supply chain partners, taking account of where informal collaboration and social capital have already been developed, as well as where new capabilities for integrated working need to be developed.

### Stage 2: Planning and implementing integrated supply initiatives at operational level

The central workshop event here involves key managers from the supply chain integrator and from identified supply chain partners, possibly including clients. They examine what will be involved in developing new capabilities through integrated working, in order to meet the business challenges previously identified. They explore the challenges and uncertainties to be faced in moving down this path, and identify and map out a sequence of initiatives in collaborative working which will represent significant but manageable progress for a three to six month period. They also identify criteria against which progress can be measured, taking into account the conceptions of value they are seeking to deliver and the kinds of measures of value that will be meaningful.

### Stage 3: Evaluating progress and adapting plans

The Stage 3 workshop involves the same people as Stage 2, reconvening between three and six months later. The workshop design allows all to share their evaluations of progress against identified criteria, and how implementation plans need to be adapted for the next three to six months. The Stage Three workshop can then be repeated, to provide further on-going evaluation.

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# Appendix 1

## Members of the Action Learning Club

### Action Learning Set 1

Manchester City Council

Somerfield

Marshalls

### Action Learning Set 2

Faber Maunsell

Interserve Projects

Lloyds TSB

# Appendix 2

## Contents of the 'Building Down Barriers' handbook

### Getting started with a project as a client

- Developing the strategic brief
- Selecting a prime contractor
- Deriving the historical through-life cost baseline

### Getting started with a project as a supply chain integrator

- Selecting supply partners for the project
- Setting incentives and shared savings schemes
- Applying risk management in practice

### Working together to clarify project values

- Value planning in practice
- Drafting the project brief

### Collaborating in design and construction

- Forming supply clusters and appointing cluster leaders
- Value Engineering in practice
- Collaborating to plan and sequence design activities
- Collecting and documenting through-life cost data
- Getting started with collaborative costing
- Planning and managing construction to optimise programme and minimise waste
- Forming new teams and inducting new project members
- Proving through-life cost: the compliance plan and proving arrangements

### Assessing project performance

- Assessing the products a building project
- Assessing business and engineering processes



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