

A model to manage the water industry supply chain effectively

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The water industry is capital intensive and dependent on complex supply networks in the delivery of service characteristics, making procurement a critical activity. This paper rejects 'the lowest bid' form of procurement of the past and advocates the total cost and strategic relationship management procurement of the future. The authors develop arguments for more effective procurement leading to real cost reduction and service enhancement on a sustainable basis. This requires a range of strategic activities from the approach to the acquisition of major capital goods and associated services through to the management of relationships with contractors, suppliers and supply chains. The paper considers the differing procurement practices in Europe, Australia and the USA, and how, in comparison, equivalent practices result in higher costs in the UK than elsewhere. From this they propose a model for best practice procurement in the utilities industries and a step-by-step set of actions for improving performance. The proposed model begins with a strategic appraisal of procurement activity across an organisation focusing on overall objectives and desired outcomes leading to an effective operating model including the end-to-end management of the supply chain and the policy, resources and enabling technology required for successful delivery.

1. Introduction

With the value of external expenditure on goods and services amounting to around 55% of the revenue of companies in the water sector, procurement and related activities are significant elements of their operations. Procurement, therefore, makes a substantial contribution to the overall cost of operations and risk within the supply chain whereas the management of external suppliers and subcontractors has a significant impact on the timeliness and quality of services delivered. Procurement must therefore be world class if it is to fulfil its role within a world-class industry.

It is critical that organisations in the water sector strive for continual improvement in procurement operations and implement a procurement strategy that is fully aligned with, and integral to the organisation's overall strategic vision and objectives. In a sector in which the dependence on external suppliers and subcontractors is so high, continual improvements means not only adopting best practice but also embracing innovation and shaping best practice.

The water industry has a history of adoption of best practice in an engineering and construction setting not only in the UK but also globally through demonstrable achievements and awards for water utility companies and their suppliers (Anglian Water, 2010; SIWI, 2010; Southern Water, 2012).

Accordingly, this paper focuses on the context of procurement in the industry and promotes approaches to continual improvement in areas of activity that can have the most impact on the bottom line. The paper begins with the authors' definition of procurement, separates out programme from support procurement and outlines some of the history of procurement in the industry before going on to explore approaches to continual improvement.

2. Definition of procurement

Procurement, as defined by the authors, is the end-to-end process of acquiring goods and services from suppliers and sub-contractors that are generally, but not exclusively, external to the organisation. Procurement begins with the identification

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and challenge of the need to buy goods and services and then involves the development of specifications, the process of selecting suppliers, generally called sourcing, contracting and the management of contracts and the performance of suppliers and subcontractors. It is a truly end-to-end process which involves most employees in the organisation as specifiers, designers, authorisers, buyers or project managers.

3. Procurement in the water industry

At the risk of being accused of oversimplification, water industry procurement can be split into two major areas of expenditure, which, for the purposes of this paper, are classified as support expenditure and programme expenditure. Support expenditure is for the routine aspects of administrative functions for the organisation as a business and includes facilities management, information technology and services, and professional services such as legal services, banking, audit, consultancy and marketing, human resources and financial services, furniture, printing, stationery and a long tail of low-value purchases required on a day-to-day basis. Programme expenditure is for the delivery of services and the management of the assets and infrastructure that are required to deliver the services. In a water industry context, programme expenditure includes both operating expenditure (Opex) and capital expenditure (Capex). An alternative definition is that programme expenditure is for the capital and maintenance aspects of the business. In the water industry this expenditure is expected to be over £22 billion from 2011 to 2015, having been £90 billion over the previous 20 years (Water UK, 2011). Savings will improve all aspects of the business from financing the work for construction and maintenance to ultimate customer billing for the services they receive.

Support expenditure typically amounts to less than 10% of turnover and best practice in this area is generally well understood. Driving out cost and efficiencies in operating expenditure is achieved by focusing on reducing expenditure and minimising demand; aggregating demand, rationalising suppliers and outsourcing on the supply side; and simplifying procedures with e-Purchase-to-Pay technology including catalogues, invoicing and procurement cards, playing an increasing role.

Improvement in the management of programme expenditure has a more significant impact on overall business performance and shareholder value and is therefore the focus of this paper.

4. Context

The Latham Report, *Constructing the Team* (Latham, 1994), was not the first to point to some of the failings of the industry but it was probably the first to capture the construction industry's attention. Latham advocated partnering and collaboration as a way of improving performance – concepts that the water

industry had already grasped at a time when Thames Water's London Ring Main project was lauded for its collaborative approach and applauded for switching to the Institution of Chemical Engineers' terms and conditions as they facilitated the collaborative approach. Latham drew some parallels with the Cost Reduction in the New Era (CRINE) programme established by the North Sea oil industry in the early 1990s to deliver cost reduction through partnering.

The Australian Government carried out a number of similar procurement reviews in the 1990s, making observations about client dissatisfaction and recommending a course of action based on innovative contracting strategies, active contract management and improved supplier relationship management (APCC, 2003; BCSP Task Force, 2008).

Four years after Latham, the Egan Report, *Rethinking Construction* (DTI, 1998), continued the theme, promoting a range of cost reduction and client satisfaction initiatives based on comparisons with other industries. This report drew a specific comparison with construction in the USA where standardisation, modularisation and supplier-driven innovation were cited as explanations behind the fact that US construction was more cost-effective and more efficient than that in the UK.

The Egan Report resulted in a series of case studies published by the Movement for Innovation (M4i) in 2000 including South West Water's partnership with Babbie, Pell Frischman, MJ Gleeson and Paterson Candy in delivering two sewage plants (M4i, 2000a) and Thames Water's partnering with Morrison Construction in maintaining the South London water supply network (M4i, 2000b). Both of these provide evidence of improvements through partnering.

M4i was superseded by Construction Excellence, which features Dwr Cymru Welsh Water's multi-partner alliance as one of its case studies (*Constructing Excellence in Wales*, 2011). As reported in the Infrastructure UK Infrastructure Cost Review (HM Treasury, 2010a) this alliance delivered the asset management programme ahead of time and for 26% less cost. Collaborative procurement also saved them £500 000 per annum within the programme. Yorkshire Water and Anglian Water have also featured in Construction Excellence case studies.

The water industry has been at the forefront not only in partnering but also in other Egan recommendations such as using parametrics to develop top-down should-cost models, which provide for more informed cost management (DTI, 1998). As indicated in the 2010 HM Treasury and Infrastructure UK Cost Review (HM Treasury, 2010a, 2010b), these techniques have been successfully adopted by the Highways Agency also – saving 15% in negotiating target costs and £70 million on three projects.

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Despite having inherited neglected stock and operational inefficiencies, there can be no doubt that the water industry demonstrates a high degree of best practice in management of both Opex and Capex, but there is still more to be achieved.

The UK is still suffering from a worldwide recession but must maintain and improve its infrastructure for which water supply and water treatment are expected to provide some £22 billion over the next 5 years.

The 2010 UK Infrastructure report reinforces the recognition that major projects are more expensive and they take longer than anywhere else in the world. The latest comparative price index figures from Eurostat, shown in Figure 1, indicate that, out of 27 EU countries, only Sweden, France and Denmark have higher civil engineering costs than the UK (Eurostat, 2009).

Some of this difference is a result of specific issues such as the regulatory regime and more intense use of assets but, these apart, what is it that causes additional expenditure and time in the UK? The degree of subcontracting, the fragmentation of the market and higher transaction costs are cited as part of the reason, as is improved supplier and contract management as means to improving performance.

In addition, there is a growing need for energy use to be included as part of the overall cost equation. Peter Hansford (2011), the President of the Institution of Civil Engineers, said in his inaugural speech in 2010 that civil engineers need to provide not only value for money but also value for carbon. Again, there are front-runners in the water industry who have won awards for their environmental work, but there is more to be done.

Further pressures arise through the influence of Ofwat and the need to comply with European directives on procurement, both of which provide constraints on the supply chain. We can summarise that the big issues facing the industry are growth and climate change, economic uncertainty and consequent affordability issues for customers, customer expectations and rising environmental standards.

A significant water industry-wide procurement issue which is dominating the landscape this year is the forthcoming transference to the sewerage undertaker of responsibility for blockages for example on shared private property. All water company procurement departments will be involved with sourcing service provision to cover this work, the scale and cost of which is unknown (Water UK, 2010, 2012).

Taking into account the need to comply with regulations and the pressure from the continual aim to achieve more for less, what can procurement do to reduce costs, improve value, and bring projects in more effectively and efficiently? How can procurement help water utilities achieve success?

5. So where then?

The Egan Report (DTI, 1998) was a landmark in comparing the construction industry with other industries and it is fair to say that time has confirmed that most of this comparison was valid, for example, in applying lean techniques to construction and maintenance processes and there is room for more external comparison. The fact that there are only two 'engineering' companies, Schlumberger and Lockheed-Martin, in the AMR Top 25 supply chain management companies demonstrates that there is a large gap to be closed but it can be done (Gartner Inc., 2010; www.gartner.com).

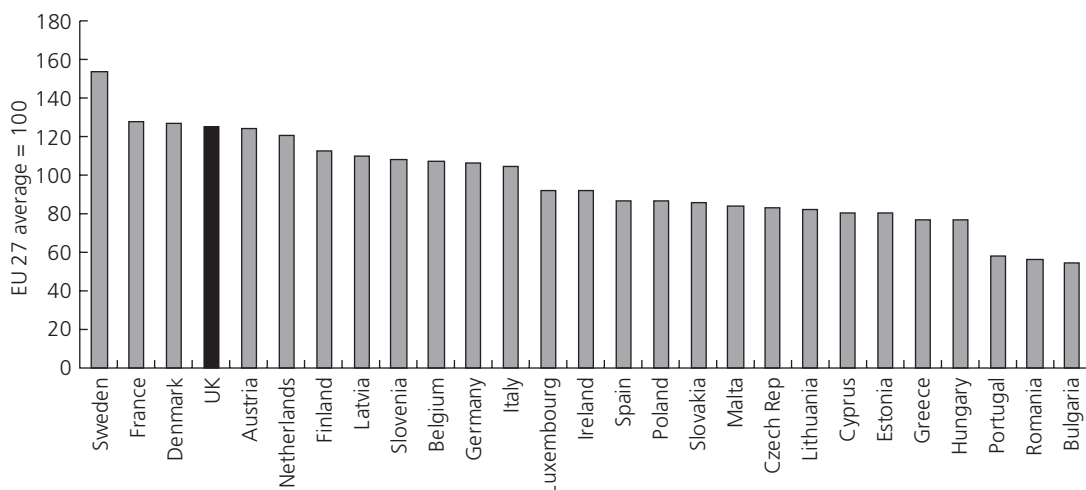


Figure 1. 2009 price level indices for civil engineering. Data source: Eurostat Construction Price Survey (Eurostat, 2009)

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This is an important issue because, as indicated by the Council for Science and Technology (2009), the UK water industry needs to move even further forward to be seen as world class and to meet the nation's water needs. Being world class means excelling in all aspects of operations including procurement.

5.1 Moving beyond choosing the lowest bidder

The traditional approach to construction was linear, beginning with concept followed by feasibility, design, tender, construction, testing, and finishing with handover and operation. By its nature, this approach is inefficient in that the benefits of innovations in construction planning and material selection are not evident at the design stage unless there is involvement of contractors and material suppliers. Even then, their input is limited as it is effectively free consultancy, and while it might be regarded as being part of their marketing, it rarely leads in a timely way to paid work for them. The cost has to be borne by those who become customers – always a numbers game.

Other approaches do cater for greater involvement of the contractors in the design process, for example through design-and-build contracts. However, these can become difficult due to the conflict that arises when, having bid on low margins to provide a winning tender, the contractor seeks to bolster their profit through higher margins on any changes. There are additional costs that arise from this, rarely included in overall costing – the time and effort required by the client in providing project direction, dealing with claims, and in the delays to construction arising from any disputes.

It should also be noted that the actual construction cost does not reflect the total cost of ownership. The client needs to consider long-term maintenance and eventual disposal as part of their commitment to the project.

To enable a consultative approach, client organisations need to develop a true partnering arrangement with their core team of

designer, main contractor, and key suppliers, as illustrated in Figure 2. This diagram shows a traditional relationship model where strategy, planning and management of a contract are carried out by the client and delivery by the contractor with a horizontal line of divide in responsibilities. This is then compared with a new model with partnering arrangements that increase in their importance as the work develops from concept to completion and also involve all parties in all aspects of the programme. The dividing line is drawn diagonally, with the angle and position of the line being established on a programme-by-programme, or organisation-by-organisation, basis. Establishing this kind of framework requires detailed understanding of all of the partners' needs, based more on trust than on contractual obligations.

Examples of this exist in many industries, including water utilities as described earlier, and are most often cited in manufacturing. Over recent years the construction and property sectors have introduced partnering with clear benefits to all parties. For example, the BAA Terminal 5 project at Heathrow, cited in Pryke (2009), reveals a range of benefits from their supply chain management including integration, innovative design, modular units, prefabrication, off-site assembly and testing, and just-in-time delivery. These combined to reduce overall time, risk during site erection, and although there was a cost, the time saving for erection made up for previous delays.

The benefits of this are testament to the core values in the Terminal 5 agreement of teamwork, trust and commitment, showing the way towards world-class procurement.

5.2 World-class procurement

Writing about world-class procurement 5 years ago would probably have meant writing about strategic sourcing – a concept that works in support of expenditure and, to some extent, in Opex but is difficult to apply in Capex. World-class procurement in the twenty-first century spans all areas and

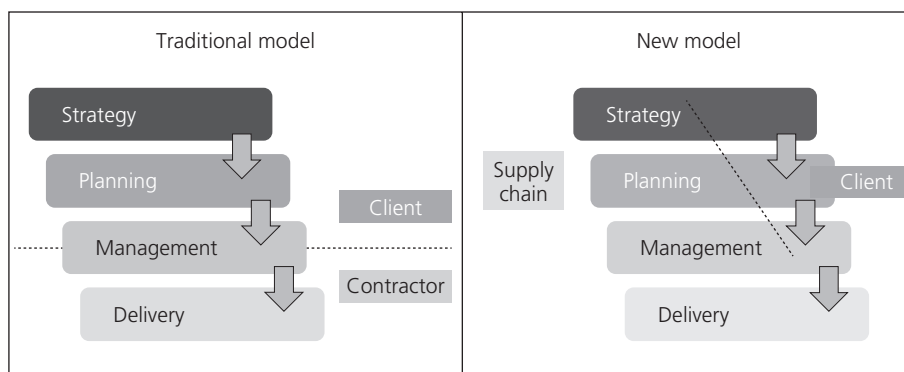


Figure 2. Traditional and new relationship models in programme delivery

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is much more complex. World-class procurement is about excelling in all the areas indicated in Figure 3 below with sustainability permeating throughout the whole of the strategy and processes.

Procurement strategy comprises supply chain management, processes and systems, and procurement infrastructure, subdivided to consider category and supplier management, technology and processes, policy, people, organisation and performance. Good contracts and good suppliers are critical in the optimisation of both support and operating procurement, which are more likely to be derived within a holistic strategic approach. In the experience of the authors, organisations often have all these elements in place but fail to join them together. This can lead to issues such as policy constraining innovation, systems constraining process improvement, and vice versa.

These strategic areas merit papers in their own right but this paper focuses on the following four areas which, in the authors' experience, contribute most to meeting corporate objectives, for the following reasons.

- (a) Category management aligns procurement with the organisation's strategic objectives.
- (b) Strategic supplier relationship management ensures long-term innovation, cost competitiveness and the effective sharing of risk.
- (c) Technology supports process efficiency, performance management and decision making.

- (d) Sustainable procurement derives cost and performance benefits as well as sustainability itself.

5.3 Category management

Category management was introduced into the retail sector in the 1990s and is defined as the strategic management of product groups through trade partnerships which aims to maximise sales and profit by satisfying consumer needs. It was later taken up by other sectors, mostly in areas of support expenditure, and is viewed, quite rightly, with some scepticism in an engineering environment because category management is often little more than another name for strategic sourcing. It also has a bad reputation for not aligning with high-level business objectives, being short term in outlook and from being implemented on a stand-alone basis.

Having said this, it is important to reconsider the approach in the context of the water industry. Water is a long-term business requiring significant investment and has responsibilities to a broad range of stakeholders including customers, employees, shareholders, suppliers and contractors, neighbours, the community and the environment. Commentators on the industry, from Latham through to Infrastructure UK, suggest that, to maximise the investment in innovation and deliver value to stakeholders requires, among other operational improvements, greater focus on research and development and greater use of standards and modularisation, as in the USA and the rest of Europe. This represents a significant move away from the cost reduction approach to delivering value based on price.



Figure 3. Elements of supply chain strategy

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This requires water companies to become even more intelligent customers and focus on specific product, service and contract areas in the long term. This suggests a role for category management in which water companies augment their acknowledged strengths in contracting with in-depth knowledge of critical supply markets to drive out cost and enhance value through innovation, investment and long-term relationships. The category management required in the water industry is neither that of the retail sector of the 1990s nor that of other consumer markets today, but a more sophisticated model more suited to more complex, long-term, technical markets.

This development in category management has been called integrated category planning and differs from its predecessor in that it promotes cross-company and inter-company collaboration; it focuses on performance within the category to ensure that it is fully aligned with high-level business objectives; it is an ongoing and dynamic process spanning multiple projects and programmes; and promotes end-to-end performance improvement among programmes and over time.

In the water industry, integrated category planning will cut across Opex and Capex and span both water and waste water requiring a higher level of general business skills over and above excellent engineering and project management skills. If the industry is going to increase the levels of off-site assembly and modularisation, as in the construction of McDonald's restaurants, cells in new prisons, and motorway gantries, it is going to be more effective and provide a greater return on investment from developing this within an integrated category approach rather than project by project.

Lockheed-Martin and Schlumberger have moved from strategic sourcing through traditional category management to a more

integrated approach characterised by what Gartner Inc. (2010) calls 'an inside out focus' in which supply chain strategy is driven by stakeholder requirements; innovation is embedded in the category management process; metrics focus on high-level organisation goals; and training and development focuses on general business skills.

According to Gartner Inc. (2010) 'Schlumberger has built [procurement and contracts] influence across the company and improved strategic thinking about the complex flows needed to support big projects, such as offshore oil exploration and production. The organisation's commitment to the future is evident in its efforts to recruit and train top supply chain talent.'

6. Strategic supplier relationship management

World-class procurement is essentially world-class supply chain management, rather than order placing and contract drafting. Because of their reliance on external partners in capital programmes and maintenance operations, water companies have to be world-class supply chain management companies as much of the innovation and investment required is in the supply chain and not in the water companies themselves. This involves in-depth knowledge of the water industry supply chain and excellence in supplier management and development.

Supplier relationships are critical and the water industry has in recent years moved up the continuum from traditional relationships towards new business models including strategic partnerships as summarised in Figure 4 below.

In this diagram the traditional relationship is portrayed as one in which the buyer and supplier have little interaction,

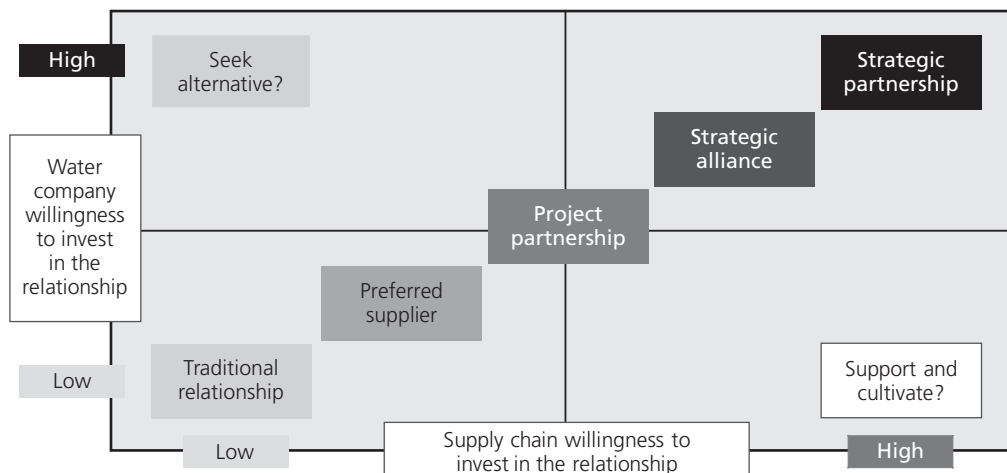


Figure 4. Potential supply chain relationships in the water industry

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the one providing a specification for the other to match. There is no consideration of capabilities or of improving functionality through innovation on the part of the supplier to meet the buyer's real needs, the usual option being to seek an alternative supplier. Where there are preferred suppliers there is increasing interaction, and where there is a project partnership the buyer and supplier share resources and information in order to achieve the project goal. Innovation is encouraged, and some sharing of the benefits of that innovation is built into the relationship. The relationships can be strengthened from being project based through an alliance which might be short term or exist for specific projects, to a formal partnership. This is likely to have required some support and might have grown over a number of years or projects. At this level there is sharing of strategic goals, information, and long-term planning, all of which foster the development of innovative approaches and benefits for both parties. This can be extended to include multiple suppliers and buyers to provide broader benefits for a coherent, cohesive approach to overall service delivery. Davis and Walker (2008) present a similar model of alliances in Australia with a transaction orientation delivering low value at one end of the spectrum and a relationship orientation delivering high value at the other, also described by Davis (2005).

The M4i (2000b) and Constructing Excellence in Wales (2011) case studies were of project partnerships, and more recent case studies indicate a move towards strategic partnerships. These include Anglian Water's @one Alliance which comprises Anglian Water Engineering (AWEng), Balfour Beatty Utility Solutions Limited (BBUSL), Barhale, Biwater, Black & Veatch, Grontmij and Skanska Aker Solutions, formed to deliver part of the AMP4 and AMP5 investment programmes, (Anglian Water, 2012; www.onealliance.co.uk) and Scottish Water Solutions' joint venture with Veolia, Laing O'Rourke and Jacobs UK, formed to deliver Scottish Water's capital investment programme (www.veoliawater.co.uk).

The @one Alliance was formed in 2004 to deliver a large part of the Anglian Water AMP4 and AMP5 investment programmes. Its partners cover the full range from design to handover. On the procurement front, major expenditure is channelled via the @one Alliance, which will deliver over half of Anglian Water's capital investment programme of £2.1 billion for 2010–2014. It is a company in its own right, sharing profits and driving efficiency savings.

In addition to the @one Alliance, Anglian Water partners with Black & Veatch, J.N. Bentley, Carillion Civil Engineering, Galliford Try, and Imtech UK Limited for the delivery of one-off capital investment projects or those requiring specialist skills (Anglian Water, 2012).

The @one Alliance is similar to Southern Water's arrangement with 4Delivery. The aim of these arrangements is to produce cost-effective solutions to the companies' asset management plans which are of vital long-term importance to Ofwat (Ofwat, 2011).

At the heart of these new business models is the fact that the supply chain can contribute to the whole spectrum of activity from strategy through planning and management to delivery rather than only delivery, as summarised earlier in Figure 4.

These new organisational models create ever more increasingly complex supply chain requirements and an integrated category planning process that facilitates the management of this complexity to achieve the right balance of risk, cost and performance throughout the life cycle of the project or programme.

In seeking to create a global brand the Australian water industry has put supplier relationship management at the heart of its development plan (Water Australia, 2010), bringing buyers and suppliers closer together to identify and act upon barriers to success.

Best practice in this area starts with supply chain mapping followed by informed analysis of the best place within the supply chain to build a strategic relationship; aggregate demand; manage risk; hold stock; or invest in innovation. So the information required to optimise the supply chain, as summarised in Figure 5 below, goes beyond the routine and the first tier to such as the balance of power, market share and competitive environment at every tier.

With supplier and market information at every level of engagement as illustrated, the water company will be able make informed decisions about potential benefits of a strategic partnership and the nature of the relationship. All organisations face similar issues which need to be considered for the mutual success of all parties, necessitating the development of a consistent approach at multiple levels.

The success of BAA's Terminal 5 project was due in part to the assessment of the supply chain and the management of risk at the most appropriate point in the supply chain rather than simply passing it on to the main contractor and incurring the additional cost that goes with it (Kanter, 2008; www.supplymanagement.com).

Taking a whole supply chain approach within an integrated category planning structure also provides the opportunity to examine and minimise logistics costs; leverage subcontractor competences and innovation more effectively; and, potentially, follow the automotive industry's lead and inject capital at the right point through supply chain finance (SCF).

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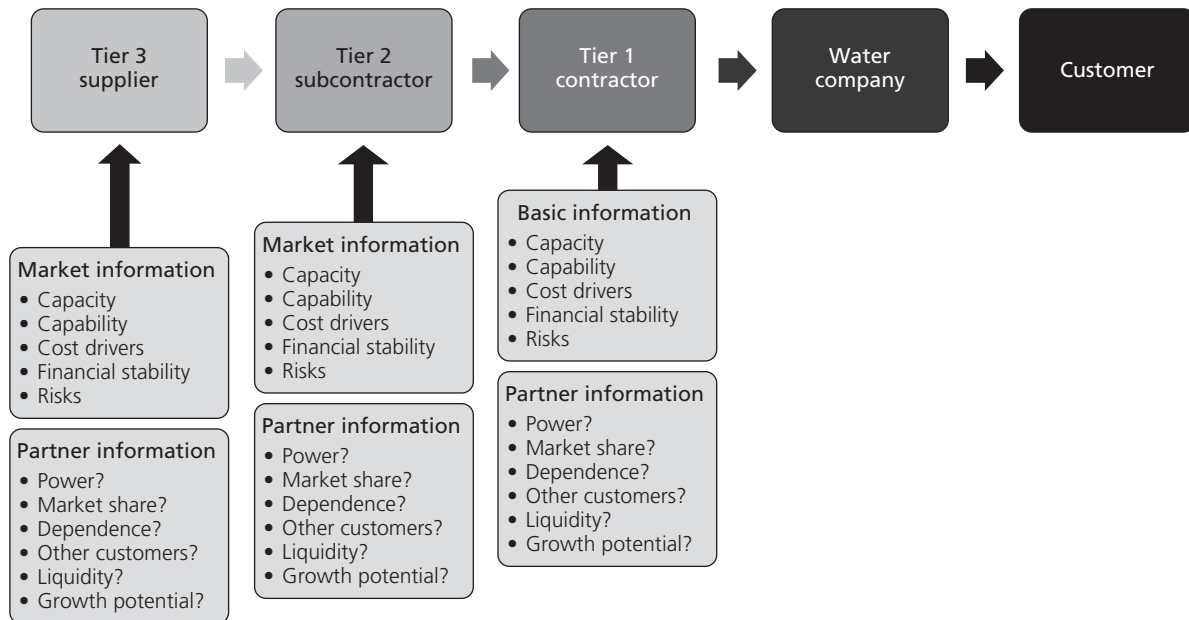


Figure 5. Supply chain mapping in the water industry

The Aberdeen Group (Aberdeen Group, 2006) defines SCF as

A combination of Trade Financing provided by a financial institution, a third-party vendor, or a corporation itself, and a technology platform that unites trading partners and financial institutions electronically and provides the financing triggers based on the occurrence of one or several supply chain events.

It will also involve a banking partner in helping organisations to manage working capital more effectively and answering the 'what if' question posed in Figure 6.

The essence of this is the problem of maximising cash availability for innovation and investment at the level where investment is required. Typically a major organisation will

have better credit facilities than a small organisation for which research and development can be prohibitively expensive because the return on investment is insufficient and the risk too high.

Referring to Figure 6, if a company is at tier 3 and has a weak credit rating, the cost involved in developing any innovation or capacity would be high and not worthy of investment in a one-off situation. Supply chain integration has a twofold benefit to both the buyer and supplier. If the supplier is involved in a long-term partnership it has a greater commitment to the work that is necessary as there are more opportunities for sales through its wider involvement in a programme. The results are lower risk for the supplier, lower cost research and

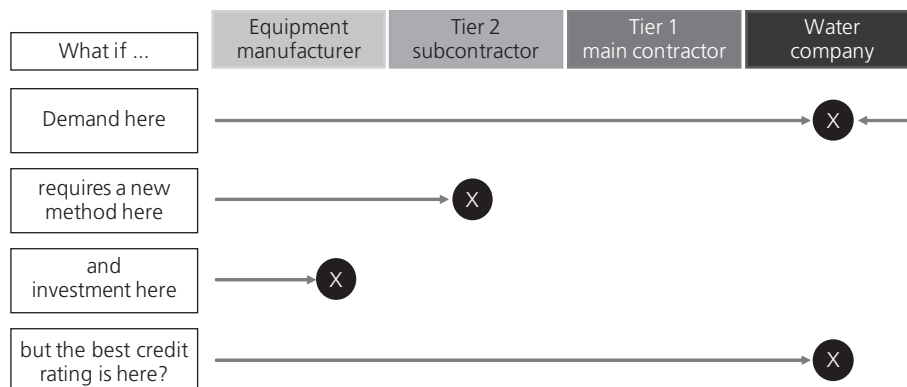


Figure 6. Supply chain finance what if ...

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development and, ultimately, a lower cost to the client and better margins all round.

6.1 Technology

Supply chain finance requires underpinning technology to succeed but, notwithstanding that specific requirement, the Council for Science and Technology (2009) has suggested that water industry technology is twentieth century in configuration, supporting processes that may even be nineteenth century in some cases. The same report suggests that there is an urgent need for a step-change and this is supported by Infrastructure UK (HM Treasury, 2010a, 2010b), which says that there is a need for whole supply chain integration and strategic rather than tactical investment.

So, where can technology contribute in the pursuit of world-class performance in integrated category planning? Three specific technologies can be most helpful: Spend Management Tools, eSourcing and Collaborative Working Environments. There are many Spend Management and eSourcing, tendering, auction and contract management tools on the market and water companies should seek to use the best tools available where there is a business case. The oversimplified business case is that Spend Management tools facilitate more informed decision making and eSourcing reduces the cost of competition and introduces more rigour and transparency into the bidding process.

However, collaborative working environments are a much more challenging concept even though they have been promoted as beneficial in successful partnering arrangements (Walker and Hampson, 2003). Organisations throughout the water industry supply chain have, in the main, invested substantially in systems for finance, customer relationship management, procurement, estimating, planning, contract management and evaluations to name but a few applications.

Within a long-term partnership, with a degree of certainty and continuity, organisations will be able to sponsor and fund a collaborative platform across the integrated category supply chain. These platforms are common in retail, the automotive industry and, increasingly, even in government, and comprise a buyer-supplier portal, secure shared working environments and catalogue, content and contract management and are likely to include an electronic eSettlements hub in the not too distant future.

The Council for Science and Technology (2009) suggests that there is much to be learned from the Netherlands' approach, which 'places a high value on developing, incorporating and sharing the latest technology' and involves the private sector in pan-industry collaboration. The UK may follow suit in the appropriate time frame but there is nothing to stop individual supply chains, alliances and partnerships showing the way.

6.2 Environment, carbon and renewables

Using 3% of UK energy, the water industry is the fourth most energy-intensive sector in the UK. With only 10% of energy coming from renewables, it accounts for 1% of UK greenhouse gases, providing an imperative for low carbon technologies but has to balance cost against the environment.

Value for carbon is an increasingly essential component of service delivery, many company strategies taking this into account as part of supplier selection for materials, waste management, and whole-life costing. Aspects include careful management during and after construction to minimise construction waste and maximise reuse of materials. Building this into the supply chain is part of the water industry's strategy, but, while some of it is very visible, the impact of it is likely to take many years to develop. Fetzer and Aaron (2010), write that

there is a growing awareness among stakeholders, including customers and, increasingly, governments, that businesses should be responsible for their entire supply chain.

This leads us to consider its importance strategically.

6.3 Sustainable procurement

Although sustainable procurement does not feature as one of the main elements of supply chain management strategy in this paper as it is not a stand-alone programme of work, sustainability needs to be regarded as 'business as usual' rather than a separate project. As is demonstrable from the previous section, it should be integrated into everything the water industry, and any other industry, does.

As recognised by Water UK (2006), the water industry is at the forefront of sustainability, not simply because it manages an increasingly scarce resource and detrimental waste but also because of the stand it is making in promoting best practice in sustainable development. The emphasis on sustainability on water industry websites and the plethora of awards that the industry achieves are testimony to the care taken.

Examples of the leading practice are the water industry being the first sector to record its performance in sustainability and 4Delivery, a consortium of contractors, working with Southern Water winning a procurement leaders awards for its sustainable approach to capital delivery.

From a supply chain perspective the Water UK Sustainability Indicators (Water UK, 2006) show year-on-year improvement in including sustainability in contract criteria; reducing the amount of chemicals used; using recycled aggregates; reducing the amount of waste going to landfill and energy consumption; and in using energy from renewable resources. An example is Dwr Cymru Welsh Water being one of seven organisations to

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win a Carbon Trust Standard for carbon reduction commitment in 2009.

Other industries have a lot to learn from the water industry which can provide advice and guidance to other organisations in the supply chain in the management of carbon, water and waste, the three priority areas identified in *Procuring the Future* (Defra, 2006), the report of the Sustainable Procurement Task Force.

At the same time the water industry can learn from other industries such as automotive, consumer goods and retail, with increasing emphasis on sustainability in the supply chain as well as sustainability in its own operations. Sustainable procurement is essentially about using sustainable products and services from responsible suppliers in sustainable supply chains. It is about managing risk in the supply chain and this may be two or even three tiers down.

Best practice sustainable procurement also concerns the management of social, financial and environmental risks; the triple bottom line of people, profit and planet, in the same way that all other aspects of the supply risk are managed. The principles of integrated category planning, supply chain mapping, supplier relationship management and integrated management information contribute to and benefit from embedding sustainable procurement into procurement and contracting ways of working.

It is not enough to ask contractors about their environmental management systems without having insight into the risks inherent in their products, services or supply chains. It is not enough to ask suppliers about the country of origin of their materials without being aware of the social issues in these supply markets. And it is not enough to ask about sustainability without being able to assess the fit between the policy and the key risks involved.

Egan talked about building cost management into design and specifications (DTI, 1998) and Latham talked about greater levels of collaboration and partnership (Latham, 1994). Sustainable procurement was just emerging from its 'green purchasing' phase in the 1990s and if these reports were being produced today they would include building sustainability into programmes at an early stage and working collaboratively throughout the supply chain. By its very nature the water industry needs to show the way in sustainable procurement by ensuring that the high standards it sets itself are replicated throughout the supply chain.

7. A step-by-step approach

In adopting the principles behind effective supply chain management, the authors advocate a step-by-step approach with the following steps.

- (a) Confirm the strategic ambitions of the organisation and identify the expectations and critical touch points with supply chain strategy.
- (b) Ensure that the supply chain strategy is in full alignment with the overall business objectives; that it takes an integrated approach to the seven elements outlined in Figure 3; has sustainable development as a core consideration; and is understood and appreciated throughout the organisation.
- (c) Confirm the roles and responsibilities of departments and individuals in procurement and supply chain roles.
- (d) Identify the key suppliers in tier 1 and supply chains.
- (e) Enable collaborative relationships with tier 1 suppliers.
- (f) Map the supply chain and engage with lower-tier suppliers as appropriate.
- (g) Promote good communication and information sharing at all levels within an appropriately managed long-term relationship.
- (h) Promote standardisation and innovation such as modular construction and off-site assembly, to benefit from multiple rather than one-off use.
- (i) Revise financing arrangements for the whole supply chain.
- (j) Monitor and manage performance at every level, consider reward mechanisms and promote success.

8. Conclusion

To deliver excellent service to its customers the water industry needs to continue its adoption and development of its approach to business, ensuring that it is clear on its strategic aims and that all functions of the business are aligned with this. Procurement plays a leading role in delivery through the total value of work required by the long chain of contractors and suppliers engaged directly and indirectly in the creation and maintenance of water treatment, sewage treatment, distribution and collection systems. Every aspect of the business plays a part in procurement, from finance and operations to marketing and customer services. The opportunities for creating value through this network can only be achieved through cooperation and collaboration or partnering arrangements from concept to completion and beyond, the old order of lowest bid being eliminated through a shared understanding of what matters most for the water utilities and their customers.

This requires a more consultative and more equitable approach, especially reducing risk which traditionally is passed on to those least able to accept it, increasing prices through the need to pay for any innovations on the basis of one project rather than many. An environment of innovation works best where it is directed to the facility for long-term, multiple use instead of one-off projects.

Similarly, construction can be achieved more quickly and routinely by adopting a modular approach wherever possible,

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this in itself being an aspect of innovation. Proof of buildability off site leads to the avoidance of problems on site, reducing overall cost and total time.

In addition, an open framework for communications is necessary to enable the many participants to share data freely.

For all of these steps to be achieved, a new approach to financing is required to ensure that the companies furthest down the supply chain are able to commit to the expenditure required in research and development. Adoption of supply chain financing arrangements with clear trigger points for payment from a project fund is a low-risk solution to ensuring that payment is provided for work done at the time it is done rather than many months later when materials are fully installed.

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REFERENCES

- Aberdeen Group (2006) *Global Supply Chain Benchmark Report, Industry Priorities for Visibility, B2B Collaboration, Trade Compliance, and Risk Management*. Aberdeen Group, Boston, MA, USA, p. 9.
- Anglian Water (2010) *Anglian Water wins Global Green Award*. Anglian Water, Huntingdon, UK. See <http://www.anglianwater.co.uk/39183AC9521A403C82D4AA6E2F6BA909.aspx> (accessed 22/06/2012).
- Anglian Water (2012) *Capital Delivery Partners*. Anglian Water, Huntingdon, UK. See <http://www.anglianwater.co.uk/about-us/suppliers/partners/> (accessed 22/06/2012).
- APCC (Australian Procurement and Construction Council) (2003) *National Procurement Reform Principles*. APCC, Deakin, ACT, Australia, pp. 1–4.
- BCSP Task Force (Building and Construction Sector Productivity Task Force) (2008) *Developing an Improved Approach to the Procurement of Construction Projects*. Department of Building and Housing, Wellington, New Zealand, pp. 3–4.
- Constructing Excellence in Wales (2011) *Dwr Cymru Welsh Water Asset Management Alliance*. Constructing Excellence in Wales, Cardiff, UK. See <http://www.cewales.org.uk/demo-projects/demo-examples/dwr-cymru-welsh-water-asset-management-alliance/> (accessed 22/06/2012).
- Council for Science and Technology (2009) *Improving Innovation in the Water Industry: 21st Century Challenges and Opportunities*. Council for Science and Technology London, UK, pp. 3, 10, 15.
- Davis PR (2005) *The Application of Relationship Marketing to Construction*. PhD thesis, Royal Melbourne Institute Technology, Melbourne, Australia, pp. 71–74.
- Davis PR and Walker DHT (2008) Trust, commitment and mutual goals in Australian construction industry project alliances. In *Procurement Systems* (Walker DHT and Rowlinson S (eds)). Taylor and Francis, Abingdon, UK, pp. 378–399.
- Defra (Department for the Environment, Food and Rural Affairs) (2006) *Procuring the Future. The Sustainable Procurement National Action Plan: Recommendations from the Sustainable Procurement Task Force*. Defra, London, UK, p. 17.
- DTI (Department of Trade and Industry) (1998) *Rethinking Construction, the Report of the Construction Task Force*. DTI, London, UK, ch. 4.
- Eurostat (2009) *Comparative Price Levels for Investment*. Eurostat, Luxembourg. See http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Comparative_price_levels_for_investment (accessed 22/06/2012).
- Fetzer A and Aaron S (2010) *Climb the Green Ladder*. Wiley, Chichester, UK, p. 154
- Gartner Inc. (2010) *AMR Research Announces Rankings of its 2010 Supply Chain Top 25*. Gartner Inc., Stamford, CT, USA. <http://www.gartner.com/it/page.jsp?id=1379730> (accessed 22/06/2012).
- Hansford P (2011) Delivering value. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **164(1)**: 3–8.
- HM Treasury and Infrastructure UK (2010a) *Infrastructure Cost Review: Main Report*. HM Treasury and Infrastructure UK, London, UK, pp. 16–18.
- HM Treasury and Infrastructure UK (2010b) *Infrastructure Cost Review: Technical Report*. HM Treasury and Infrastructure UK, London, UK, p. 100.
- Kanter J (2008) Procurement's role vital to success of Terminal 5. *Supply Management*. See <http://www.supplymanagement.com/news/2008/procurements-role-vital-to-success-of-terminal-5/?locale=en> (accessed 22/06/2012).
- Latham M (1994) *Constructing the Team: Joint Review of Procurement and Contractual Arrangements in the United Kingdom Construction Industry*. Her Majesty's Stationery Office, London, UK, p., 20, 39, 61, 62.
- M4i (Movement for Innovation) (2000a) *Partnering Success at South West Water*. M4i, Watford, UK.
- M4i (2000b) *Thames/Morrison Network Partnering Pioneers*. M4i, Watford, UK.

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- Ofwat (2011) *Water and Sewerage Bills Rise in Line with Inflation in 2011/12*. Ofwat, Birmingham, UK. See http://www.ofwat.gov.uk/mediacentre/pressnotices2008/prs_pn0211bills (accessed 22/06/2012).
- Pryke S (ed.) (2009) *Construction Supply Chain Management*. RICS Research, Wiley-Blackwell, Chichester, UK, pp. 163–167.
- SIWI (Stockholm International Water Institute) (2010) *Phnom Penh Water Supply Authority Wins Stockholm Industry Water Award 2010*. SIWI, Stockholm, Sweden. See <http://www.siwi.org/sa/node.asp?node=950> (accessed 22/06/2012).
- Southern Water (2012) *Our Awards and Achievements*. Southern Water, Worthing, UK. See <http://www.southernwater.co.uk/Aboutus/awardsAndAchievements/> (accessed 22/06/2012).
- Walker D and Hampson K (eds) (2003) *Procurement Strategies – A Relationship-based Approach*. Blackwell, Oxford, UK, pp. 45–46.
- Water Australia (2010) *The New Global Brand for the Australian Water Sector*. Water Australia, St Leonards, NSW, Australia.
- Water UK (2006) *Towards Sustainability 2004–2005*. Water UK, London, UK, pp. 4–11.
- Water UK (2010) Response to Defra's Consultation on Draft Regulations and Proposals for Schemes for the Transfer of Private Sewers to Water and Sewerage Companies in England and Wales. Water UK, London, UK. See <http://www.water.org.uk/home/policy/statements-and-responses/private-sewers/private-sewers-consultation-response-final-7-october-2010.pdf> (accessed 22/06/2012).
- Water UK (2011) *Water Prices and Investment in England and Wales*. Water UK, London, UK, Briefing 2011–12, p. 4.
- Water UK (2012) *Private Sewers Transfer*. Water UK, London, UK. See <http://www.water.org.uk/home/policy/private-sewers-transfer/customer-info?s1=unknown&s2=cost> (accessed 22/06/2012).

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