

EXTENDED CONSTRUCTION SUPPLY CHAIN MANAGEMENT: RELATIONSHIPS, REWARDS AND RISKS

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Abstract

Over the past decade, the UK construction industry has sought to exploit the rewards of supply chain management practice. This paper explores construction industry capability to implement an extended construction supply chain culture. Where commercial solidarity prevails and integrated supply chains, including small and mediums sized enterprises (SME's) vie for construction projects and economic advantage.

Despite recent advancements in construction supply chain management many barriers continue to inhibit the realisation of fully extended construction supply chains. Economic, social and cultural conventions require to be investigated to appreciate the complexity associated with the strategic alignment of extended supply chain stakeholders' interests.

Drawing on a model of supply chain maturity, the practicalities of extended construction supply chain relationships, rewards and risks are reviewed. Given the current structure of the construction industry, it is proposed that the attainment of extended construction supply chain management practice will require key industry stakeholders to develop innovative collaborative policies that will be progressive, organisationally supportive and commercially attractive to SME's.

Keywords: Supply Chain Management, Maturity, Integration, Relationships, Construction Industry.

INTRODUCTION

Supply chain management is an emerging theme within construction management theory and practice (O'Brien et al., 2009). Advocates of supply chain management now suggest that enlightened organisations within the UK construction sector may seek to take advantage of improved supply chain solidarity. Envisaging a scenario where extended supply chains, rather than discrete companies, compete and tender for future building projects (Tan, 2001). However, considerable critical debate has been directed at the apparent hesitancy of the construction industry to capture the opportunities afforded by supply chain management principles (Akintoye et al., 2000, Dainty et al., 2001a). Proponents are quick to suggest construction has failed to keep pace with contemporary management of supply chain practice, learning and innovation (Bankvall et al., 2010, Lonngren et al., 2010, King and Pitt, 2009). Many reasons for the lack of progress have been expressed. The most common criticisms include fragmentation (Saad et al., 2002), SME scepticism (Briscoe and Dainty, 2005), temporary relationships, short-term projections (London and Kenley, 2001), opportunism, an

infrequent client-base and particularly pertinent in a difficult financial climate, economic uncertainty. All of which individually and collectively conspire to undermine the efficacy of construction supply chain management when contrasted with the highly controlled environments of the automotive and retail sectors (Cooper and Ellram, 1993). It is, however not unexpected that the utility of construction supply chain management is benchmarked against the successes charted in the institutional homelands of supply chain management. In common with most key performance indicators, assessment requires careful interpretation. For some scholars, industrial context is crucial (Green et al., 2005). Context creates a spatial awareness (Jepperson, 1991) that formulates and frames our understanding of the developing situation.

The supply chain maturity model proposed by Lockamy III and McCormack (2004) offers a generic performance criteria against which current practice and future aspirations of construction supply chain management may be evaluated and discussed. Five stages of supply chain maturity are depicted, ranging from stage 1: immature (ad-hoc) to stage 5: mature (extended). Its usefulness is not necessarily comparison with other sectors per se, but a contextually rooted appraisal of what may or may not be realistically 'achievable' within the strict confines of UK construction supply chain management practice.

It is in this area of supply chain maturity and extended supply chain management practice in particular that the paper wishes to make a positive contribution and stimulate constructive debate. The discussion is arranged as follows. The supply chain maturity model is introduced with consideration given to the positive attributes as well as some inherent limitations and assumptions. The following section outlines the importance of the construction industry to the economic and social well-being of the UK. This is supported in the subsequent section with an overview of contemporary supply chain management practice within a construction context. The discussion concentrates on apparent levels of construction supply chain maturity with particular reference to the notion of an extended supply chain as depicted in the supply chain maturity model. Three key themes are identified and debated; relationships, rewards and risks. Finally, the conclusion comments on the likelihood of extended construction supply chain management practice as defined by Lockamy III and McCormack (2004).

SUPPLY CHAIN MATURITY

According to Lockamy III and McCormack (2004), the extent of supply chain management development, integration and experience may be evaluated and expressed in terms of a numerical grading by applying their supply chain maturity model. The model defines five stages of supply chain maturity;

- Stage 1 - Ad-hoc: An unstructured and ill-defined approach to supply chain management. If the term supply chain management is employed it is highly likely in response to management practice witnessed elsewhere and in this context represents mere tokenism.
- Stage 2 - Defined: Whilst the implementation supply chain management has structure and key supply chain facilitators are in place, working practices remain largely unchallenged and resolutely traditional.
- Stage 3 - Linked: Supply chain management takes on a strategic orientation, focusing on business objectives and customer satisfaction. Collaboration between supply chain stakeholders begins to cultivate an atmosphere of trust and 'budding' team spirit.
- Stage 4 - Integrated: Supply chain management principles become embedded in the commercial process, over-riding traditional practices in favour of

greater inter-dependency and commercial solidarity. Corporate investment in supply chain management principles begin to benefit from increasing levels of efficiency and effectiveness.

Stage 5 - Extended: Supply chains compete against other supply chains. Asset specificity is likely to be high and commercial interests are inextricably extended to the success of the collective supply chain participants.

A maturity classification of supply chain adaptation and application draws specific attention to key characteristics associated with various incarnations of supply chain management in practice (Morledge et al., 2009). Explicit within Lockamy III and McCormacks' (2004) interpretation is that ever-greater displays of maturity will generate superior levels of commercial performance. For example, as companies gradually pass through predetermined 'staging-posts' on a supply chain maturity continuum, organisational experience, trust, confidence and predictability in supply chain stakeholder behaviour will evolve.

Whilst a continuum may be well suited to charting key developmental stages of supply chain maturity, the exploitation of the continuum concept exhibits a number of intrinsic limitations and assumptions. A continuum, defined as continuous array of barely discernable points located in succession between two bipolar extremes (Pearsall, 2002) often fails to adequately capture economic, social and cultural idiosyncrasies (Boisot and Child, 1996). Thus a continuum may be perceived as "*too quiescent and mechanical*" (Powell, 1990). This limitation is compounded by an underlying assumption of continuous improvement regardless of context. Yet as stated earlier, context is increasingly recognised by critics as a central tenet to the efficacy of construction industry adaptation of supply chain management principles. Construction industry context will constrain supply chain management ideology with a fit-for-purpose pragmatism. It is therefore not necessarily automatic or 'natural' that supply chain participants would wish to progress to the next stage, even if their experience, learning and supply chain know-how is ideologically sound.

Limitations aside, simple classification of supply chain maturity may be useful as a barometer of stakeholder commitment to supply chain management policy, structure and custom. For some industry commentators the key to successful construction supply chain management is appropriateness (Cox, 2004, Cox et al., 2004); appropriateness to the commercial exchange, appropriateness to the parties involved and appropriateness to the cultural context in which it is enacted. A 'horses-for-courses' contention augments a pluralist supply chain management interpretation of the supply chain maturity model. For example, contingent upon the situation encountered; stage 1: ad hoc supply chain maturity may be wholly appropriate, conversely; stage 3: linked supply chain maturity may be best suited to a contrasting set of circumstances. Either way the policies, systems and procedures can be evaluated against the five distinctive criteria disclosed by the supply chain maturity model.

CONSTRUCTION INDUSTRY BACKGROUND

The importance and complexity of the UK construction industry cannot be underestimated (Thompson et al., 1998, Cox and Ireland, 2002, Ireland, 2004). Both a vibrant and volatile sector, the construction industry is defined by the Department for Business Innovations and Skills (BIS) as an eclectic assortment of construction service and product providers (BIS, 2010a). The economic and organisational structure of the construction sector has some distinguishing features. Construction output, in terms of monetary value is dominated by relatively few very large construction companies. In stark contrast, construction output measured in terms of volume is carried out by a considerably larger number of small and medium (SME's) sized specialist and general contractors (Cox and Thompson, 1997, Morton,

2002). Over the past three years construction activity across all but a few sub-sectors has declined at an unprecedented rate. Down from £110 billion in 2007 to an estimated £95 billion for 2010, representing a 14% downturn in construction output (Experian, 2009b). While construction output had grown steadily in the period up to 2009, the rate of growth failed to match the corresponding increase in UK GDP, indicating that construction industry share of the UK economy as a whole had been contracting (Experian, 2010).

Post second world war, the construction industry has been the subject of numerous Government sponsored reports (Murray and Langford, 2003). To a greater or less extent the consensus of opinion is that the UK construction industry requires reformation in the way in which it conducts business (Latham, 1994, Egan, 1998, Strategic_Forum, 2002, BIS, 2010b). In the wake of the 'Egan Change Agenda' the latest Government review, 'Never Waste a Good Crisis' remains somewhat underwhelmed by industry achievement. Whilst acknowledging limited progress, Wolstenholme (2009) pinpoints a lack of supplier integration in the supply chain as an ongoing barrier to continuous improvement in the construction delivery process (Wolstenholme, 2009). In a challenging economic environment, construction service and product providers are looking towards their pre-selected network of supply chain companies to deliver ever greater levels of efficiency (Knutt, 2010).

SUPPLY CHAIN MANAGEMENT IN CONSTRUCTION

With dedicated journal publications and professional recognition of supply chain practitioners, supply chain management has made a notable impact on contemporary management theory and practice. Central Government have endorsed supply chain management as a vehicle designed to deliver enhanced quality of construction services and products (Latham, 1994, Egan, 1998, Strategic_Forum, 2002). As a consequence, the term supply chain management is now commonplace within construction management jargon. Despite increasing popularity, a universally agreed definition of supply chain management remains shrouded in a fog of semantic ambiguity. The complexity of the debate is compounded by confusion over its suitability and utility to a construction sector that exhibits quite unique characteristics when directly compared with the manufacturing heritage of supply chain management theory and practice.

Some commentators refer to an abstract interpretation citing the need for an "integrative philosophy" (Cooper and Ellram, 1993). Other supply chain management experts adopt a more corporate perspective, using terms such as supply chain strategy and structure (Alder, 2009). The Council for Supply Chain Management Professionals (CSCMP), the pre-eminent institute for supply chain practitioners, offer a long drawn-out definition capturing a wide-range of management functions associated with the provision of service and product not only across organisational boundaries but also internally between organisational subsidiaries (CSCMP, 2009). The subsequent lack of universal exactness may be perceived as a both a hindrance and an opportunity. A hindrance with regard to potential misunderstandings with other management fashions of the day such as, partnering and lean manufacturing (Gruneberg and Hughes, 2004). On the contrary, the lack of terminological precision presents an opportunity to root a definition of construction supply chain management within the strict context in which it is being enacted.

To date, much of the practice in construction supply chain management has focused on two distinct supply chain configurations; project and organisational supply chains (King and Pitt, 2009). Both of which are short, bilateral arrangements. The project supply chain relationship is the dyadic relationship between the client and first tier main construction contractors. This configuration has a patently client centric focus and is typified by contemporary procurement

arrangements such as partnering and framework agreements. Driven by the construction client, a project coalition is established with a few pre-selected principal supply chain partners (PSCP) for a predetermined duration. Although there are few restrictions within the private sector, public sector clients must adhere to EU and UK procurement legislation. Typically four years with the option of a further two years (4 + 2) for framework agreements (OGC, 2008).

The organisational supply chain is a bilateral relationship between the main contractors and second tier service and product providers. Driven by the main contractor, the relationship has a distinct business orientation and usually manifests itself as a list of preferred sub-contractors and suppliers. The main contractor would audit prospective sub-contractors and suppliers and grade them against a business criteria sympathetic to their own corporate values, such as predictability, financial security, health and safety, sustainability and in light of the recent investigation by the OFT, ethics.

Drawing on Lockamy III and McCormack's (2004) supply chain maturity model to review construction supply chain management practice, it may be contested that performance levels equate to stage 1, 2 and 3. Stage 1 (ad hoc) is representative of traditional contracting practice whereas stage 2 (defined) and 3 (linked) illustrate working practices commonly encountered via contemporary procurement routes such as partnering and framework agreements. Stage 4 (integrated) and 5 (extended) remain at present largely hypothetical.

DISCUSSION: RELATIONSHIPS, REWARDS & RISKS

Analysis of extended construction supply chain relations with second, third and fourth tier suppliers and manufacturers have been comparatively limited. Many economic, social and cultural conventions require careful exploration to comprehend the inherent complexity associated with the strategic alignment of multifarious supply chain stakeholders. Sponsors of supply chain management contend that the construction industry must modify its default cultural disposition. Only by addressing deep-rooted traditions and customs can construction take advantage of the economic opportunities afforded by greater integration and commercial solidarity (Latham, 1994, Egan, 1998). However, it is essential that the adoption and adaptation of construction supply chain management respects the professionalism and intuitive observations of experienced industry practitioners. Environmental agencies will invariably fashion stakeholder perception and construction management enactment of the transactional arena. The following discussion highlights three avenues of supply chain interest integral to the concept of extended supply chain management, namely; relationships, rewards and risks.

Relationships

The dynamic contribution of the UK economic climate to the ongoing construction supply chain management debate needs to be readily acknowledged. It is widely conceded that commercial behaviour in the UK construction sector is largely driven by economic forces (Wolstenholme, 2009). In terms of business and commerce, neoclassical interpretation of transactional exchange remains the dominant economic model in Western society (Biggart and Hamilton, 1998). Broadly perceived as an asocial and largely autonomous interpretation of the marketplace (Biggart and Castanias, 2001, Hirschman, 1970), neoclassical economics promotes a lowest-cost mind-set amongst consumers. The core values of an orthodox economic policy and the fierce competition promoted by free-market values is believed to be both pro-market and pro-consumer (OFT, 2001). However, it is generally recognised even among advocates of neoclassical doctrine that neoclassical economics is an

oversimplification of trading relations (Granovetter, 1985, Uzzi, 1997). In other words, despite a dogged adherence to neoclassical values it is illogical to wholly exclude social reasoning from the economic calculus.

The challenge for the construction stakeholders is to craft the correct balance of economic and social interplay appropriate for the optimal exchange of goods or services. In relation to the bilateral arrangement between construction client and main contractor (Project Supply Chain) the procurement selection by the client is pivotal to the ongoing construction relationship. Hitherto, the Joint Contracts Tribunal (JCT), the construction industry's foremost suite of contractual governance has exploited the values of an orthodox, asocial, autonomous, fiercely competitive marketplace. Although traditional contracting remains the most popular procurement route in UK construction (RICS, 2006, RICS, 2010), the practice has been repeatedly censured for being adversarial, fragmented and short-term (Briscoe and Dainty, 2005). Over the past decade alternative procurement routes have become more commonplace (RICS, 2010). Contemporary procurement routes such as partnering, framework agreements and more recently the Scottish Futures Trust (SFT) initiative have sought to instil a greater emphasis on relations contracting between construction client and first tier service and product providers. Contractual agreements popular with contemporary procurement such as Project Partnering Contract 2000 (PPC2000) and the New Engineering Contract 3 (NEC3) are calculated to engender values of trust and mutual respect in accordance with industry best practice initiatives (NEC, 2005). That said, uptake in contemporary procurement practices is unlikely to result in a cultural sea-change however it is anticipated to induce behaviour modification.

Recent examples of public sector framework procurement in conjunction with NEC3 contracting have created an alternative project environment conducive to greater integration of the supply chain. Whilst the Health Frameworks in England (Procure 21+), Wales (Design for Life, Building for Wales) and Scotland (Framework Scotland) conform to the requirements of EU and UK procurement legislation, each framework agreement differs slightly to accommodate characteristics unique to national circumstances. Arguably, in terms of Lockamy III and McCormacks' (2004) supply chain maturity model and within the context of the NHS procurement, the Welsh NHS framework agreement presents the most advanced example of construction supply chain integration. It is mandatory for NHS Trusts in Wales to procure major capital construction projects (total costs exceeding £6 million) via the framework agreement (WHE, 2010). Three principal supply chain partners (PSCP) have an integrated supply chain that includes architects, health planners, cost managers, building services engineers, civil and structural engineers, building services installers, FM advisors and CDM Consultants (WHE, 2005). All participants have exclusivity within their integrated supply chain, creating a 'squad' of service and product providers with 'teams' selected for each project (WHE, 2010). As a result, 'squad members' are wholly dependent on the success of their PSCP for future workload. It may be contended that the Welsh Health Estates proactive management of the NHS framework agreement have initiated 'project' supply chain characteristics representative of a stage 4 (integrated) classification on Lockamy III and McCormacks' (2004) maturity model.

A key feature of construction activity is the high level of subcontracting (Hartmann and Caerteling, 2010). A typical construction project may witness up to 90% of its total value outsourced to an array of specialist and general subcontractors (Dubois and Gadde, 2000, BERR, 2004). A statistic that may suggest construction stakeholders are ideally placed to benefit from greater integration of the supply chain. At present the main contractor driven organisational supply chain remains short. Corporate preoccupation is typically focused on the development of a second tier preferred suppliers list. Second tier subcontractor and supplier information is centralised on a company database and formal auditing procedures are

put in place to evaluate the strategic nature of the ongoing commercial ties. From the resultant inquiry the main contractor will establish an inventory of validated subcontractors and suppliers within key construction disciplines. Subcontractors and suppliers cannot tender for work unless 'validated' via corporate supply chain protocol. Preferred suppliers will be continuously monitored on a criterion of predetermined key performance indicators (KPI's) complete with feedback loop. Whilst it remains rare for main contractors to proactively manage relations with third and fourth tier members of the supply chain, 'pinch-points' could on occasion jeopardise project deadlines. Consequently, the main contractor may be required to adopt a more 'hands-on' approach to 'downstream' supply chain management to protect their business interests.

Rewards

The benefits of supply chain management have been extensively extolled in management literature. Commercial solidarity has potential benefits for all the participants. The client secures a reliable and trustworthy construction provider who understands and appreciates the trials and demands of the client business. During period of economic growth the client has also insulated the provision of major construction services and products from inflationary price hikes due to demand outstripping supply. The client also benefits from project learning and information sharing throughout the supply chain. Challenging entrenched practices where organisational learning is usually at the expense of the client without either the client or the main contractor benefiting from the project experience (Strategic_Forum, 2002).

Industry ingenuity may also have an opportunity to thrive in an extended supply chain environment. Modern methods of construction (MMC) may be prototyped, developed and refined via supply chain collaboration. Minimising the financial risk of implementation and increasing the rewards for successful innovation. For example, off-site building techniques challenge the predominately craft approach to the traditional building processes. Although MMC are widely believed to improve construction productivity (Goodier and Gibb, 2007), it requires considerable capital and human investment plus economies of production to justify a business case. From a supply chain management perspective, the advancement in industrialisation and assembly processes will also begin to mirror the applications used in manufacturing supply chain management. Second, third and fourth tier construction providers will benefit from a near continuous stream of work. Alleviating excessive fluctuations in demand and supply that construction companies often find difficult to adequately manage (Hartmann and Caerteling, 2010).

Other rewards are less obvious. Health and safety, for example is a prime concern for all parties engaged in the building process. Off site working coupled with increased assembly processes and strong supply chain leadership can help facilitate an incident and injury free working environment (Doherty, 2008). Reducing near misses and accidents not only reduce otherwise hidden costs but also sets a standard of working and performance that transgresses from the exceptional to the norm. Sustainable working practices will also reap benefits from MMC. Embedding working relationship within the supply chain increases both formal and informal communications channels. Efficient dialogue among stakeholders will mitigate project risks via comprehensive risk register, especially in high profile, complex construction projects. Integral to the communication and information sharing is the development of ICT channels. This will not only improve communication but depending on the sophistication of the communication and information exchange systems the prerequisite for capital investment may act as a barrier to market entry for those organisations outside the supply chain coalition (Powell, 1990).

Risks

Engaging in extended supply chain management within a construction context is not without risk. Inextricably linking business interests with the success or possible failure of other discrete organisations may mitigate risks on the one hand but on the other if the failure is catastrophic then there will undoubtedly be collateral consequences for the extended supply chain participants. It is possible that due to the fragmentation of the industry and high incidence of insolvency (Chevin, 2010) within the construction sector that construction firms remain wary of high levels of interdependency. A narrow relationship portfolio may be detrimental to their self-interest over the longer-term. Over embeddedness within a supply chain may also be accompanied by corporate lethargy. The competitive edge may be compromised by an over-reliance on collaborative arrangements that insulate the organisation from the competitive pressures of the free market. There is an inherent risk, as with most administrative tasks that supply chain management practice and procedures become victim of increasingly bureaucratic processes, the sharpness of the supply chain enterprise blunted by an administrative encumbrance.

Whilst relationships are stable and the informal social contract remains intact, the efficiency of the commercial solidarity is likely to mitigate corporate tendencies to merge. However, there remains an ever-present operational and commercial risk that irreconcilable differences between supply chain partners may trigger dysfunctional behavioural patterns and a return to adversarial relations. Consequently, a breakdown in trust and mutual respect will necessitate that economic and social ties are either; relinquished or alternatively, contingent upon ongoing commercial commitments an acquisition may be appropriate (Granovetter, 1985).

The potential futility of engendering social relationships within a construction project environment should also be carefully measured. The transient nature of production (Akintoye et al., 2000) necessitates a nomadic construction workforce (Trajkovski and Loosemore, 2006). Therefore building personal relationships over many years of social networking may be unexpectedly dissolved due to company or individual circumstances. Investing considerable time developing social capital may create business opportunities mutually conducive to the participating parties but within the context of construction, ties remain tenuous and the terms of social contract ill-defined.

Within the construction contracting community, subcontractors and suppliers remain sceptical of main contractors' motives for developing alliances (Dainty et al., 2001b). Small and medium sized enterprises (SME's) in particular continue to question the value of strategic alliances. Often believing that strong business ties with one or a few main contractors may endanger business opportunities with other construction providers. Even industries with a history of successful supply chain management it is somewhat inevitable that during periods of economic hardship the suppliers are subjected to cost cutting measures, commonly referred to as the '*squeeze*' (Blake et al., 2003). Construction clients and main contractors are unlikely to behave any differently. Evidence from the private sector already suggest that blue chip construction clients are turning their back on framework agreements (Wright, 2010). Consequently any ambition of 'extended' relations within construction supply chain management is likely to be compromised by an enduring faith in orthodox economic thinking, driven by self-interest, competition and supply and demand.

CONCLUSION

This paper has shown that the concept of extended supply chain management (stage 5) as illustrated by Lockamy III and McCormack's (2004) supply chain maturity model remains an aspiration within the context of the UK construction industry. Exemplars of extended supply

chain management witnessed in the manufacturing sector bear little semblance to the highly institutionalized setting of a project-based, craft orientated, geographical dispersed construction industry. Construction supply chain management, like the construction industry is unique. Ingrained construction operating practices (Dainty et al., 2001a) interlaced with complex environmental agency conspire to undermine the innocent ambitions of a manufacturing supply chain management ideology.

The supply chain maturity model does offer a benchmark of adaptation and application against which construction supply chain management may be evaluated and current practice discussed. However, progress on the notion of extended construction supply chain management will require key industry stakeholders to develop innovative collaborative policies that will be progressive, organisationally supportive and commercially attractive to SME's. As with all transactional and social relationships, risk will need to be offset against the rewards. Given the structural characteristics of the construction industry and a preoccupation for competitive tendering procedures it remains fanciful that construction supply chain management will attain a stage 5 (extended supply chain management) category of supply chain maturity.

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