

# THE IMPACT OF SUPPLIER DEVELOPMENT INITIATIVES ON KEY PERFORMANCE INDICATORS

Jonathan Gosling<sup>1</sup> Mohamed Naim<sup>2</sup> Denis Towill<sup>3</sup> and Brian Moone<sup>4</sup>

<sup>1, 2 and 3</sup> Logistics Systems Dynamics Group, Cardiff Business School, Cardiff University  
Aberconway Building, Colum Drive, Cardiff, CF10 3EU, UK

<sup>4</sup> Mace Group, 155 Moorgate, London, EC2M 6XB, UK

It is frequently posited that supplier development and long term partnerships are an effective way of gaining a competitive edge. However, due to the lack of regularity in demand patterns in project based industries, some researchers have questioned the effectiveness of such initiatives. Exploiting a unique and interesting longitudinal dataset gathered from a global construction company's archival records, the aim of this paper is to analyse the impact of supplier development initiatives on Key Performance Indicators (KPIs). Supplier KPIs, recorded on a database, are analysed for a range of suppliers from the 1990s to 2013. Suppliers are organised into relational categories for the analysis, including 'long term strategic partners', 'some partnerships arrangements' and 'little partnership arrangements'. The highest performing group was the long term strategic partners, in both average performance scores and the consistency of those scores. We also conclude that suppliers with limited partnering arrangements perform less well on the project 'close out' KPI.

Keywords: supplier development, performance measure, relationship, supply chain management.

## INTRODUCTION

Japanese approaches have had a large impact on how many firms consider the role of suppliers. This includes the rationalisation of the supply base to focus on a number of closer partnerships ([Lamming, 1993](#); [Liker and Wu, 2000](#)), a movement away from price-based criteria to other performance criteria ([van Weele, 2010](#)), and a focus on active development of suppliers ([Krause et al., 2007](#); [Modi and Mabert, 2007](#)). Much has also been written on the design and implementation of performance measurement systems to support such shifts ([Neely et al., 1995](#); [Simpson et al., 2002](#)). The extent to which all these approaches are capable of being directly transferred to construction organisations is an on-going source of debate ([Briscoe and Dainty, 2005](#); [Fernie and Tennant, 2013](#); [Kagioglou et al., 2001](#); [O'Brian et al., 2009](#)).

Technological and societal trends have also led to an increasing awareness of the potential for governments and organizations to collect, analyse and act on large datasets. Boyd and Crawford ([2012](#)) note that the era of 'Big Data' is underway. They further note that while such an era offers unprecedented opportunities, there are a number of assumptions and potential biases that must be considered in a critical way. We must take a more considered approach before taking the 'leap of faith' in big data.

---

<sup>1</sup> goslingj@cardiff.ac.uk

Retailers such as Tesco, Walmart and Amazon are often cited as pioneers of 'analytics', whereby they collect and analyse masses of data from customers and suppliers in order to learn more about their markets and manage their operations more effectively ([Davenport and Harris, 2013](#)). Examples from the construction sector are much less forthcoming.

Integrating the threads of supplier development, supplier performance measurement and 'big data' together, this paper exploits a unique and interesting longitudinal performance dataset gathered from a global construction company's archival records. The aim is to analyse the impact of supplier development initiatives on Key Performance Indicators (KPIs). In doing so, we provide some critical discussion of the challenges involved in collecting, analysing, interpreting and using such data.

## LITERATURE REVIEW

### Supplier Development and Portfolio Models

A range of studies have bemoaned the lack of progress with respect to supply chain management in the construction industry ([Akintoye et al., 2000](#); [Barker and Naim, 2008](#); [Briscoe and Dainty, 2005](#)), and a recent article suggests that the diffusion can at best be described as 'non adoption' ([Fernie and Tennant, 2013](#)). It is likely that a range of structural and cultural problems make the direct application of such approaches difficult ([Dubois and Gadde, 2002](#)). Numerous studies have reported the use of preferred supplier arrangements, framework agreements and approved lists ([Gosling et al., 2010](#); [Tennant and Fernie, 2012](#); [Thorpe et al., 2003](#)). Such models have much in common with the portfolio management models proposed in purchasing literature. The premise of portfolio models is that organisations should and can manage an array of supplier relationships, each serving different needs ([Kraljic, 1983](#); [Wagner and Johnson, 2004](#)). An underlying assumption is that partnership activity has the potential to minimize the destructive potential of conflict, and leverage the respective strengths of the partners ([Spekman, 1988](#)).

Table 1 offers an overview of a range of categorisation for partnership types. Most describe a scale of relationships spanning from loose, 'arms-length' relationships to close partnerships. This links with notions of discrete and relational exchanges in relational contracting theory, whereby one time spot interactions are treated very differently to ongoing interactions ([Cox, 1996](#); [Wagner and Boutellier, 2002](#)). Presenting relationships as a spectrum or continuum promotes the view that a healthy 'balance' across partnerships categories is effective ([Gosling et al., 2010](#)). The movement to develop and maintain strategic partnerships is not without critique though, and it has been noted that many companies mishandle them, and do not have the strategic thinking and management capabilities do make them work ([van Weele, 2010](#); [Wagner and Boutellier, 2002](#)). van Weele (2010) refers to 'the myth of partnership' and argues that successful partnerships are quite rare and are often the result of "muddling through, disappointments and perseverance" (p222).

Within the construction management literature, a range of barriers have been discussed in relation to the attainment of close partnership arrangements. Such barriers include the scepticism over the motives behind supply chain management practices by SMEs ([Dainty et al., 2001](#)), fragmentation and structural issues within the construction industry ([Dubois and Gadde, 2002](#)), power relationships and regimes ([Fernie and Tennant, 2013](#)), as well as the nature and regularity of demand patterns ([Gosling and Naim, 2009](#); [Ireland, 2004](#)). Effective partnerships, it appears, are far

from assured. Despite the aforementioned critique, recognition that suppliers play a crucial part in the production systems, and that they can be actively managed and improved, has a long history (Leenders, 1966). Efforts in this area are often termed 'supplier development', which has been defined as any effort by an industrial buying firm to improve the performance or capability of its suppliers (Krause, 1999). In subsequent work (Krause *et al.*, 2007; Krause *et al.*, 2000), which has been developed by Modi and Mabert (2007), four supplier development strategies have been shown to be effective:

- Competitive Pressure. The use of market forces and benchmarking (e.g. multiple sourcing)
- Evaluation and Certification Systems. Management of the current and expected performance through evaluation and feedback (e.g. supplier scorecards).
- Incentives. Motivating desired performance through incentive schemes (e.g. awards).
- Direct Involvement. Proactive approaches through direct means (e.g. financial or human investment) (Adapted from Modi and Mabert, 2007)

Table 1: Comparison of Partnership Types from different sources

Cox (1996)	Lysons and Farrington (adapted from Johnson 1997)	Gosling <i>et al.</i> 2010	Wagner and Boutellier 2002
Adversarial	Competitive Leverage	Approved	Arm's length
Preferred	Preferred Suppliers	Preferred	
Single Sourcing	Performance Partnerships		Partnership
Network Sourcing			
Strategic Alliances	Strategic Alliances	Strategic Partnerships	Strategic Partnership
Internal, mergers, acquisitions	Co-business Integration		

### Measuring supplier performance

As outlined in the foregoing section, the growing emphasis on the development of strategic partners has led researchers to consider the role of supplier evaluation and performance measurement. Tan *et al.* (1999) indicate that regular assessment of suppliers is positively related to a range of competitive dimensions. Despite this, Simpson *et al.* (2002) found that a surprising 45% of firms, across a range of industries, had no formal method in place for evaluating suppliers. Carter (1995) outlines the seven C's as a guide to supplier evaluation, which are competency, capacity, commitment, control systems, cash resources, cost and consistency. Popular purchasing textbooks give further general guidance in this area (Lysons and Farrington, 2012; van Weele, 2010), but there appears to be no agreed standard protocol as to what to measure, and the ideal frequency of measurement.

Construction companies have, typically, focused on measuring client objectives on cost, time and quality for individual projects (Dainty *et al.*, 2003; Ward *et al.*, 1991). A number of authors have noted that such traditional measures of the construction

project are insufficient, and have argued that the scope should be extended to different areas (Dainty *et al.*, 2003; Kagioglou *et al.*, 2001). Wegelius-Lehtonen (2001) argued that the focus of measurement for construction companies could be at three levels. The first relates to the general environment and their own performance at company level, the second level relates to individual project performance, and the third is concerned with subcontractors and suppliers. This paper is primarily concerned with the latter category.

## **THE PERFORMANCE DATASET AND CASE CONTEXT**

This paper interrogates a comprehensive data set gathered from a global construction company's archival records and reports the analysis of historical performance data of the case company's supply base. The archive includes supplier performance data from 1990 to the present. The company was formed in 1990, and has maintained growth, even during the recession, and has won a range of awards relating to its supply chain practices. The company operates in a range of sectors, but has been particularly successful in managing the construction of iconic and headquarter commercial offices. The data relates specifically to this sector. Before the dataset is described and analysed, it is important to outline how performance of suppliers is undertaken at the case company. Project teams assign measurement scores across a number of different KPIs when a supplier has completed their contribution to a particular project, which is written up as a report allowing space for qualitative commentary. Performance may be graded 0, 1, 2 or 3 where the latter represents the highest score. The different KPIs are as follows:

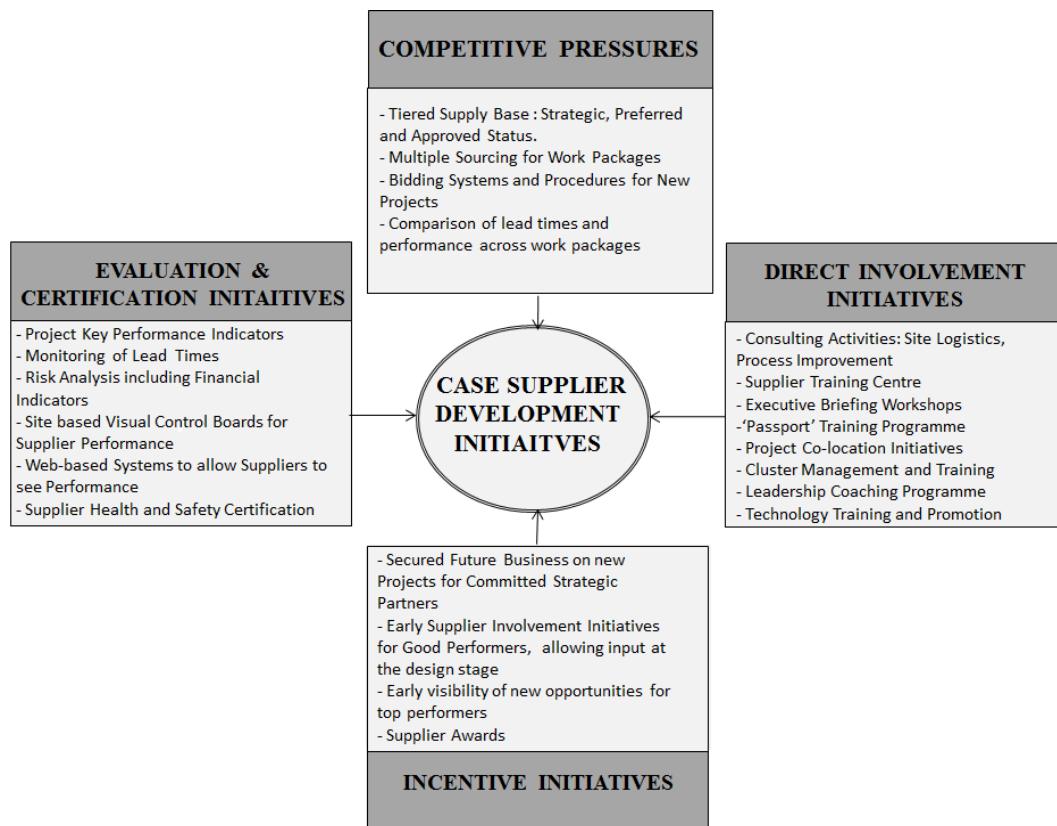
- Health and Safety - Based on adherence to documentation and work place standards, communication standards and accident records
- Programme - Based on reliability and presentation of programmes, as well as achieving programme goals.
- Financial - Based on attitude towards change instructions, presentation of accounts and timeliness for settling accounts
- Quality - Based on workmanship, defects and snagging records
- Design - Based on completeness in relation to programme, buildability, interface management and change management.
- Management - Based on organisation/supervision on site, communication and exchange of information, proactive motivation and attitude, as well as progress reports.
- Close out - Timely completion of work, management of final accounts, management of issues raised at completion.

Once reports are received by the project team, they are uploaded to a bespoke system and expressed as a percentage score. Suppliers are then able to log on to the system and observe performance figures and trends for all projects that they have contributed to. It should be noted that this is only one part of the company's performance management system, and we will return to critique the process of measurement in the discussion section, as this is important for appreciating the limitations of the study. In total, there are 98 suppliers included in the database and, since 1990, these suppliers have made 1334 contributions to various projects.

## ANALYSIS OF SUPPLIER DEVELOPMENT INITIATIVES AND PARTNERSHIP TYPES

The initiatives are pertinent to the dataset depending on the partnership category employed. Direct involvement initiatives are more likely to be undertaken with close or strategic partnerships, incentive and evaluation initiatives are more focused on intermediate partnership types (e.g. preferred suppliers) and competitive pressures are aimed at more transactional relationships (e.g. approved suppliers). Hence, strategic partners receive training of various types, benefit from consulting expertise and may be offered co-location opportunities. Approved suppliers are much more likely to experience pressures of competitive bidding and rigorous benchmarking and comparison.

Figure 1: Supplier Development Initiatives at the Case Company



In order to explore the impact of supplier development initiatives, suppliers were categorised into three groups. The first type would have been vetted in terms of health and safety, as well as with references and financial checks. No direct investment is made with this category. The second type is classed as 'some partnership arrangements'. This group acknowledges that the realities of partnering are very often complicated, especially in a longitudinal setting where suppliers can float in and out of different relationship categories at different points, and can result in 'relationship strength–performance spirals' (Autry and Golicic, 2010). To qualify as part of this category, suppliers must have been listed as a strategic supplier at some point within the history of the dataset. The third type is classed as long term strategic partners. These suppliers are listed as strategic partners for at least 5 years. Table 2 shows that the number of suppliers for the different types are 52, 33 and 13 respectively. Long term partners have completed many more projects, on average, than other groups at just over 26, while suppliers with little partnerships arrangements average just under 8

projects. Table 3 shows the general sectors of suppliers within the database, and also gives a breakdown of the partnership types within these general sectors.

*Table 2: Summary of data for different partnership types*

Partnership Type	Average Number of Projects Completed per Supplier	No of Suppliers
1 - Little Partnership Arrangements	26.54	52
2 – Some Partnership Arrangement	17.55	33
3 – Long Term Strategic Partner	7.88	13

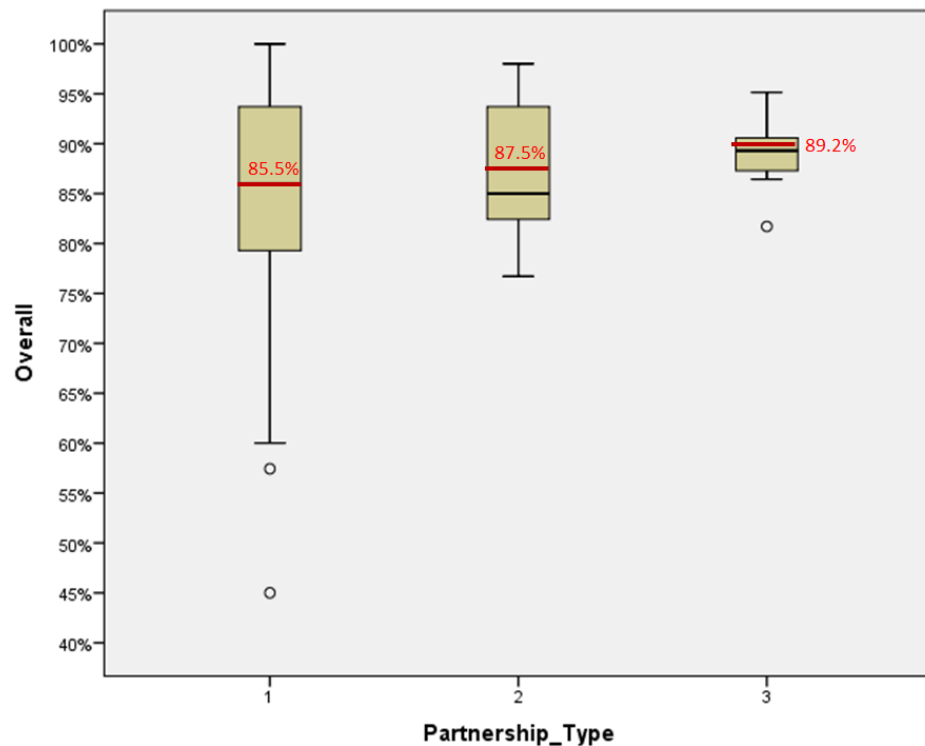
*Table 3: Overview of sectors in the database with breakdown of partnership types*

Sector	Total	Type 1	Type 2	Type 3
Building Completion / Finalisation	35	21	12	2
Mechanical / Electrical / Installation Activities	28	9	14	5
Structural Works	20	12	5	3
Demolition / Site Preparation / Groundworks	9	7	1	1
Support / Specialist Service	6	3	1	2
Total	98	52	33	13

## ANALYSIS OF PERFORMANCE MEASURES

The link between performance and partnerships has been analysed in a number of papers ([Krause et al., 2007](#); [Modi and Mabert, 2007](#); [Tan et al., 1999](#)), and based on these studies we would expect a higher average, and more consistent performance as the tighter the partnership becomes. The analysis begins with an overview of the total mean performance, giving a single figure for each supplier across all projects and metrics. A box plot for this is shown in Figure 2, where the mean score for each partnership types is indicated via the red line. The box plot shows that group 3, long term strategic partners, are more consistent in terms of the range of performance measures. Partnership type 1 suppliers have a much greater range of performance. Strategic partners median and mean are slightly higher than the other groups. The top performing supplier is a fit out and finishing subcontractor specialising in decorative and protective coatings services including general decoration, spray applied finishes, protective and hygienic coatings and special paint effects. The supplier averages 95.14% across the range of KPIs, and has contributed to 37 different projects. The supplier has also undertaken continuous training initiatives with the case company, and joint investment has been made in new paint systems and technologies.

Figure 2: Box plot comparison for the three different partnerships types

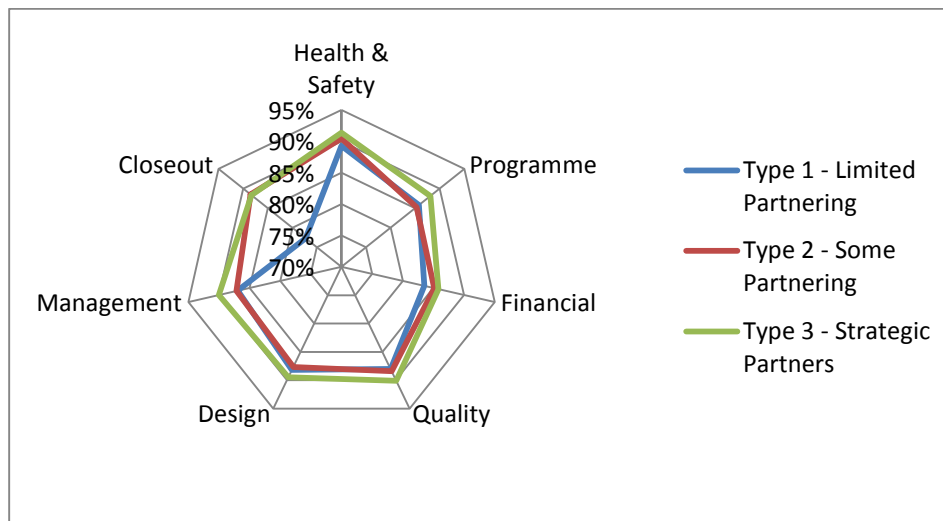


While Figure 2 gives a broad overview of performance for the three partnership types, it does not give insight into individual measures. Figure 3 presents a radar plot for mean scores of the different partnership types across each of the different individual KPIs. It shows that type 3, long term strategic partners outperform on all individual KPIs apart from close out, where they are equal with type 2 suppliers. Type 3 suppliers perform slightly worse than type 2 on financial and much worse on close out. The poor performance of type 1 suppliers on the close out measure presents an interesting discussion point. This could be the result of a lack of understanding of processes and standards creating a build-up of snags and outstanding issues creating difficulties during the final stages. Furthermore, if there is no loyalty or certainty of future work between parties, there may be less incentive and leverage to ensure issues are 'closed out' effectively.

## DISCUSSION

Before the findings are discussed in more depth, it is important to critique some of the characteristics of the dataset analysed. Firstly, the timing and frequency of measurement where Simpson *et al.* (2002) report a wide range of practice in this respect. They note that some buying organisations measure suppliers regularly while others only do so on an annual basis. In our construction case, suppliers are evaluated after their input on a particular project. It should be noted that this approach has been criticised as being a 'lagging' measure (Kagioglou *et al.*, 2001), which has limited ability to feed-forward into project improvements. The case company does operate monthly KPI figures with Type 1 suppliers in order to complement project measures, which is an area for investigation in the future.

Figure 3: Spider plot to show performance across different categories and specific KPIs



A further area for discussion is the relative importance of different KPIs. In the analysis presented the measures are considered as equally important. The case company has considered at length the possibility that individual KPIs may have different significance to the overall performance of a project. They concluded that projects present many different scenarios, potentially requiring different weightings for the range of KPIs. This brings to the fore the difficulties of a one size fits all model for constructions projects. Simpson *et al.* (2002) found that the majority of buying companies considered quality to be the most important of the measures. Another important issue that has been highlighted in the literature is the level of inclusion of different parties within the supplier measurement process. It is possible that the buying organisation may undertake evaluations alone, the supplier may undertake the evaluation alone, or that it may be done jointly. Simpson *et al.* (2002) reported that only 19% of companies in the sample included both parties (buyer and supplier) in the measurement process. In this case, rankings were assigned by project teams without supplier involvement, although feedback meetings are intended to be collaborative, and suppliers have access to the performance data through a web system. This also raises the issue of consistency between project teams when performing ratings.

## CONCLUSION

The findings suggest that groups of suppliers in close partnership types have higher average performance scores, and the spread or range of performance scores decreases, giving more consistency from project to project. We also conclude that suppliers with limited partnering arrangements perform less well on the 'close out' KPI. Through the analysis and exploration of a longitudinal dataset, the paper supports literature linking supplier development initiatives with improved performance, and offers some encouragement for other construction organizations embarking on their own supplier development programmes. In doing so, we also present critique of a performance measurement system for suppliers, giving insight into some of the challenges of collecting and managing such a system. These findings add to the debate in relation to the use of collaborative partnerships in the construction industry. Hopefully, the findings also encourage other researchers to seek insight through the analysis of big data collected from an empirical setting. There are a number of limitations. It is unclear if supplier development initiatives are effective beyond the boundaries of the case and sector in question (i.e. commercial buildings). Furthermore, the significance



of the performance differences between different partnership types needs further analysis.

## REFERENCES

- Akintoye, A., McIntosh, G., Fitzgerald, E., 2000. A survey of supply chain collaboration and management in the UK construction industry. *“European Journal of Purchasing and Supply Management”* **6**, 159-168.
- Autry, C.W., Golicic, S.L., 2010. Evaluating buyer–supplier relationship–performance spirals: A longitudinal study. *“Journal of Operations Management”* **28**, 87-100.
- Barker, R., Naim, M.M., 2008. Is supply chain thinking permeating the UK housebuilding industry? Findings from a survey of UK housebuilders. *“International Journal of Logistics: Research and Applications”* **11**, 67 - 80.
- Boyd, D., Crawford, K., 2012. Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. *“Information, Communication and Society”* **15**, 662-679.
- Briscoe, G., Dainty, A., 2005. Construction supply chain integration: an elusive goal? *“Supply Chain Management”* **10**, 319-326.
- Carter, R., 1995. The seven Cs of effective supplier evaluation. *“Purchasing and Supply Management”*, 44-44.
- Cox, A., 1996. Relational competence and strategic procurement management: towards an entrepreneurial and contractual theory of the firm. *“European Journal of Purchasing and Supply Management”* **2**, 57-70.
- Dainty, A.R., Cheng, M.-I., Moore, D.R., 2003. Redefining performance measures for construction project managers: an empirical evaluation. *“Construction Management and Economics”* **21**, 209-218.
- Dainty, A.R.J., Briscoe, G.H., Millett, S.J., 2001. New perspectives on construction supply chain integration. *“Supply Chain Management”* **6**, 163-173.
- Davenport, T.H., Harris, J.G., 2013. *“Competing on analytics: the new science of winning”*. Harvard Business Press.
- Dubois, A., Gadde, L.-E., 2002. The construction industry as a loosely coupled system: implications for productivity and innovation. *“Construction Management and Economics”* **20**, 621-631.
- Fernie, S., Tennant, S., 2013. The non-adoption of supply chain management. *“Construction Management and Economics”* **31**, 1038-1058.
- Gosling, J., Naim, M.M., 2009. Engineer-to-order supply chain management: A literature review and research agenda. *“International Journal of Production Economics”* **122**, 741-754.
- Gosling, J., Purvis, L., Naim, M.M., 2010. Supply chain flexibility as a determinant of supplier selection. *“International Journal of Production Economics”* **128**, 11-21.
- Ireland, P., 2004. Managing appropriately in construction power regimes: understanding the impact of regularity in the project environment. *“Supply Chain Management”* **9**, 372-382.
- Kagioglou, M., Cooper, R., Aouad, G., 2001. Performance management in construction: a conceptual framework. *“Construction Management and Economics”* **19**, 85-95.
- Kraljic, P., 1983. Purchasing must become supply management. *“Harvard Business Review”* **61**, 109-117.

- Krause, D.R., 1999. The antecedents of buying firms' efforts to improve suppliers. *“Journal of operations management”* **17**, 205-224.
- Krause, D.R., Handfield, R.B., Tyler, B.B., 2007. The relationships between supplier development, commitment, social capital accumulation and performance improvement. *“Journal of Operations Management”* **25**, 528-545.
- Krause, D.R., Scannell, T.V., Calantone, R.J., 2000. A structural analysis of the effectiveness of buying firms' strategies to improve supplier performance. *“Decision Sciences”* **31**, 33-55.
- Lamming, R., 1993. *“Beyond partnership: strategies for innovation and lean supply”*. Prentice Hall London.
- Leenders, M.R., 1966. Supplier Development. *“Journal of Purchasing”* **24**, 47-62.
- Liker, J., Wu, Y.-C., 2000. Japanese Automakers, US Suppliers and Supply Chain Superiority. *“Sloan Management Review”* **42**, 81-93.
- Lysons, K., Farrington, B., 2012. *“Purchasing and supply chain management”*. Pearson Education.
- Modi, S.B., Mabert, V.A., 2007. Supplier development: improving supplier performance through knowledge transfer. *“Journal of Operations Management”* **25**, 42-64.
- Neely, A., Gregory, M., Platts, K., 1995. Performance measurement system design: a literature review and research agenda. *“International Journal of Operations and Production management”* **15**, 80-116.
- O'Brian, W.J., Formosa, C.T., Vrijhoef, R., London, K.A., 2009. *“Construction Supply Chain Management Handbook”*. CRC Press.
- Simpson, P.M., Sigauw, J.A., White, S.C., 2002. Measuring the performance of suppliers: an analysis of evaluation processes. *“Journal of Supply Chain Management”* **38**, 29-41.
- Spekman, R.E., 1988. Strategic supplier selection: understanding long-term buyer relationships. *“Bus. Horiz”*. **31**, 75-81.
- Tan, K.-C., Kannan, V.R., Handfield, R.B., Ghosh, S., 1999. Supply chain management: an empirical study of its impact on performance. *“International Journal of Operations and Production Management”* **19**, 1034-1052.
- Tennant, S., Fernie, S., 2012. The commercial currency of construction framework agreements. *“Building Research and Information”* **40**, 209-220.
- Thorpe, A., Dainty, A., Hatfield, H., 2003. The realities of being preferred: Specialist subcontractor perspectives on restricted tender list membership. *“Journal of Construction Procurement”* **9**, 47-55.
- van Weele, A.J., 2010. *“Purchasing and supply chain management: Analysis, strategy, planning and practice”*. Cengage Learning EMEA.
- Wagner, S.M., Boutellier, R., 2002. Capabilities for managing a portfolio of supplier relationships. *“Bus. Horiz”*. **45**, 79-88.
- Wagner, S.M., Johnson, J.L., 2004. Configuring and managing strategic supplier portfolios. *“Industrial Marketing Management”* **33**, 717-730.
- Ward, S., Curtis, B., Chapman, C., 1991. Objectives and performance in construction projects. *“Construction Management and Economics”* **9**, 343-353.
- Wegelius-Lehtonen, T., 2001. Performance measurement in construction logistics. *“International Journal of Production Economics”* **69**, 107-116.