

Supply Chain Management: Relationships, Chains and Networks

C. M. Harland

University of Bath, Centre for Research in Strategic Purchasing and Supply, School of Management,
Bath BA2 7AY, UK

The term *supply chain management* is used to represent a variety of different meanings, some related to management processes, others to structural organization of businesses. This paper identifies and discusses various definitions of supply chain management, summarizes the associated bodies of knowledge and connects them using a systems approach. Systems levels of supply chain management are identified as the internal supply chain, the dyadic relationship, the external supply chain and the inter-business network.

Empirical research on behavioural aspects of relationships, chains and networks in the European automotive aftermarket is discussed, identifying gaps in perceptions of requirements and performance held by customers and suppliers in the areas of quality, delivery, service, range and price. A combination of qualitative and quantitative analysis demonstrates substantial differences between *approaches* to supply chain management, though performance in relationships, chains and networks in the territories examined does not differ significantly.

Customer dissatisfaction in relationships is shown to increase upstream in the supply chains examined, extending the applicability of the industrial dynamics 'Forrester effect' to softer, behavioural aspects of performance. Conclusions are drawn supporting the suggestions of operations strategists that position in the supply chain is an important strategic variable which, to date, have not been comprehensively proven empirically.

Introduction

The phrase 'supply chain management' appears to have originated in the early 1980s – Oliver and Webber (1982) discussed the potential benefits of integrating the internal business functions of purchasing, manufacturing, sales and distribution. Today it is a phrase that appears in many company strategies and reports, practitioner and academic journals and texts. However, there is little consistency in the use of the term and little evidence of clarity of meaning (Harland, 1995a). Rather it appears to be a term used in several emerging bodies of knowledge which, to date, have remained largely unconnected.

This research had the following objectives:

- to provide some coordination and clarification of existing disparate work in supply chain management;
- to provide an integrating framework to help locate supply chain research;
- to build on existing behavioural work in the areas of service operations management and consumer behaviour;
- to test whether existing, proven principles of supply chains apply to soft features, as well as to hard logistics features of chains;
- to identify if network differences appear to impact on performance in relationships, chains and networks.

The initial data collection was carried out in the European automotive aftermarket within an EC ESPRIT grant no. 2277 CIM for Multi-Supplier Operations (CMSO).¹ Subsequent quantitative analysis of this data has revealed new insights into supply chain management. Before these are discussed, the differing uses of the term will be examined.

Supply chain management

There are four main uses of the term 'supply chain management':

- First, the internal supply chain that integrates business functions involved in the flow of materials and information from inbound to outbound ends of the business.
- Secondly, the management of dyadic or two party relationships with immediate suppliers.
- Thirdly, the management of a chain of businesses including a supplier, a supplier's suppliers, a customer and a customer's customer, and so on.
- Fourthly, the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers.

The first of these definitions – the internal supply chain – is adopted by Oliver and Webber (1982), Houlihan (1984), Stevens (1989), Saunders (1994), Jones and Riley (1985). It relates closely to the pre-existing concepts of materials management (Ammer, 1968; Lee and Dobler, 1965) and the value chain (Porter, 1985; Johnston and Lawrence, 1988; Kogut, 1985). However, this paper is concerned with inter-business, not intra-business integration. Therefore, the last three of these definitions will be examined here. The first body

¹ The contribution of the following partners is gratefully acknowledged – Actis (Germany), ADIST (Portugal), AFIA (Portugal), Alcatel (France), BIBA (Germany), DAF (The Netherlands), HUT (Finland), Karmann (Germany), Lucas (UK), NTUA (Greece), Saab-Valmet (Finland), TUD (The Netherlands), Vegla (Germany) and Warwick Business School (UK). In addition to the author, the Warwick Business School team comprised Lin Fitzgerald and Derek Williams, whose contributions to the original data collection are acknowledged. The subsequent analysis presented here is the responsibility of the author.

of work to be discussed, therefore, is that which defines supply chain management as the management of supply relationships.

Supply chain management as the management of supply relationships

A body of research is evolving that defines and discusses supply chain management as an intermediate type of relationship within a spectrum ranging from integrated hierarchy (vertical integration) to pure market. Christopher (1992) defined supply chain management as an alternative to vertical integration. Ellram (1991a) positioned supply chain management as shown below in Figure 1. This perspective of supply chain management has as its foundations an industrial organization and contract view of the firm as a nexus of contracts (Aoki, Gustafsson and Williamson, 1990). Marshal (1923) and Coase (1937) originally identified the existence of alternative forms of organization to either vertical integration or market. The types of alternative form were defined later by Richardson (1972) and Blois (1972).

Business trends and the management of supply relationships

Authors and practitioners from many different disciplines and functions are highlighting an increasing dependence on relationships with suppliers (see for example, Sabel *et al.*, 1987; Christopher, 1992; Slack, 1991; Schonberger, 1986). Closer, longer-term relationships are evident in some industries, reported notably in the Japanese automotive industry (Lamming, 1993; Womack *et al.*, 1990), the Japanese textile industry (Dore, 1983), craft-based Italian industries (Lorenzoni and Ornati, 1988) and various Swedish manufacturing industries (Hakansson, 1987).

Supply chain relationships are discussed here in the context of different business trends. These trends include (i) a reported increasing incidence of vertical disintegration, (ii) implementation of supplier-base reduction programmes, (iii) focusing of operations, (iv) outsourcing, (v) just-in-time and (vi) the increasing popularity of partnerships and partnership sourcing.

Vertical disintegration. A trend towards vertical disintegration has been reported in a range

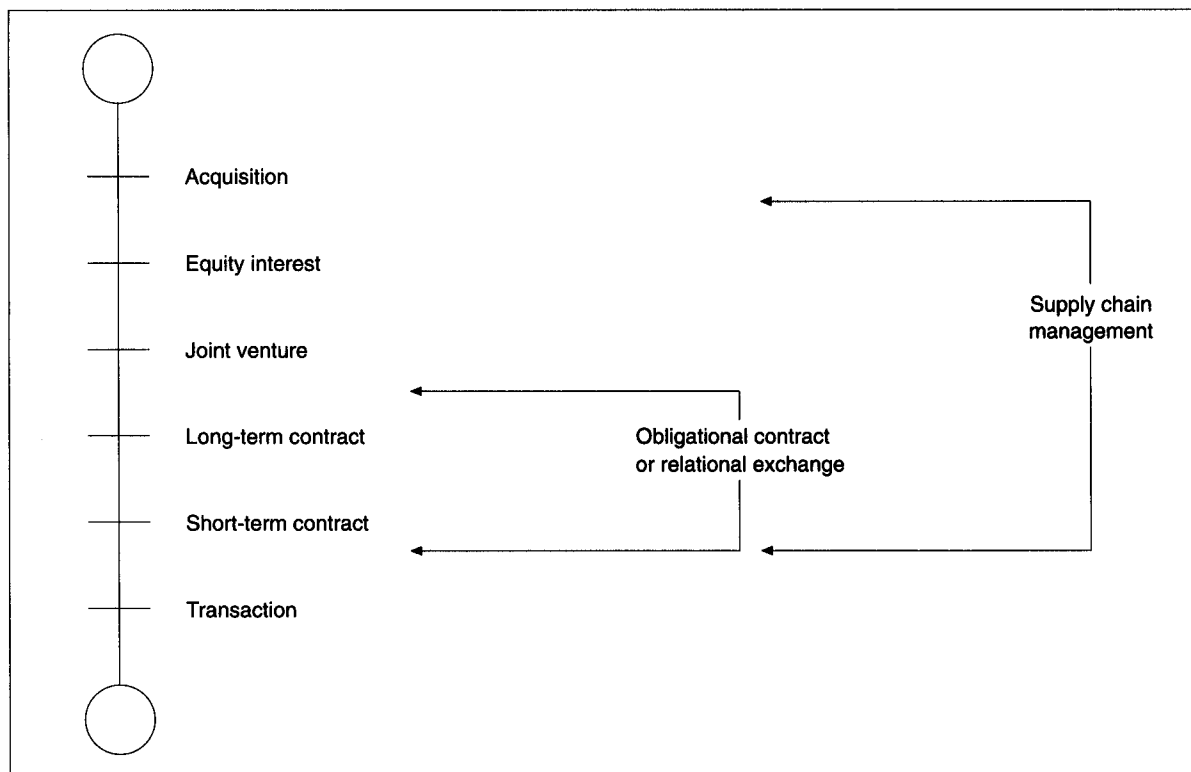


Figure 1. Supply chain management as a type of relationship

of industries (Thackray, 1986; Porter, 1987). One of the given reasons for vertical disintegration is that integrated businesses face a risk of becoming locked into inappropriate technologies (Abernathy, 1978; Harrigan, 1983; Miles and Snow, 1987). Once committed to these technologies, they may lose flexibility. However, companies that form relationships with other businesses may be able to switch to another supplier with a better technological fit to changing market conditions. Switching relationships may not be easy, but it is likely to be easier than divesting vertically-integrated parts of a business.

Supplier base reduction. A second business trend that increases the importance of supply relationships is the reported movement away from multi-sourced adversarial trading towards single or dual sourcing. For example, Rank Xerox had almost 5000 suppliers in 1981 but reduced this number to 300 by 1987 (Morgan, 1987). Lamming (1989) reported that Japanese lean producers involved fewer than 300 suppliers in new product development projects compared to

typical Western manufacturers who dealt with 1000–2500. Hakansson (1987) discussed increasing concentration in most industries studied in Sweden. As supply bases are reduced, more intense supplier development may be performed with the remaining suppliers.

Focusing of operations. Focused operations concentrate on a limited, manageable set of tasks (Skinner, 1969) that meet the order-winning criteria of customer groups (Hill, 1985; Christopher, 1992). Focus can be applied at different levels – plant level, plant-within-plant and cell. Plant-within-plant and the formation of cells may not affect inter-business relationships. However, focus at the level of the plant concentrates each plant on a different set of products/markets, processes, volumes or order-winning criteria. Harland (1995b) stretched the concept of focus beyond the boundary of the firm to consider the impact on supply chain relationships. This is clearly related to vertical disintegration; however, there is little discussion apparent in the existing literatures on focus and vertical disintegration to connect the two.

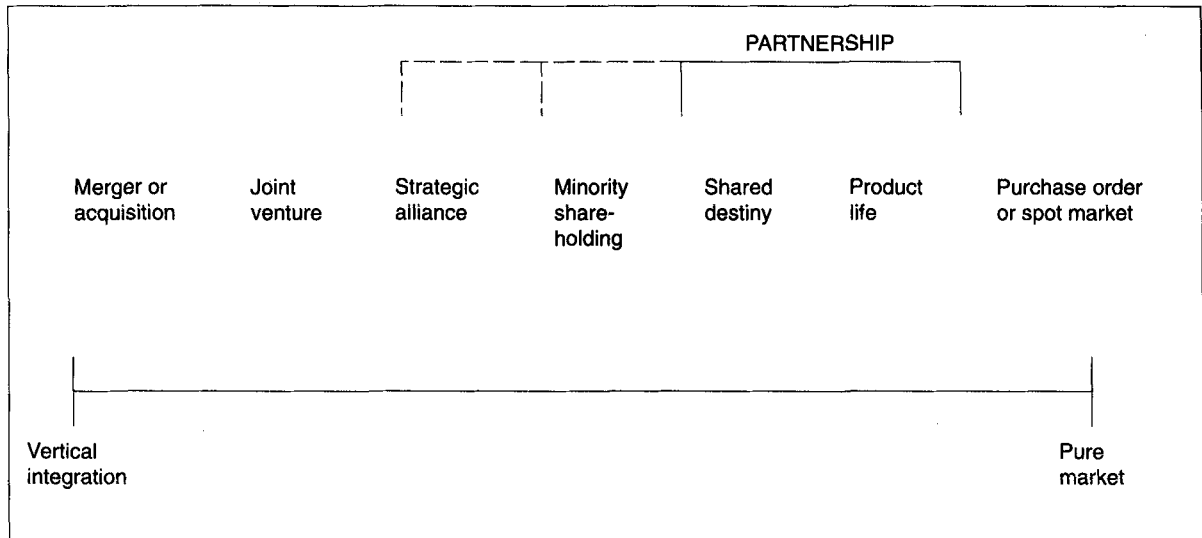


Figure 2. Partnership as type of relationship

Outsourcing. Outsourcing is a term that has been used to describe the 'putting out' of non-core internal processes such as catering, site security, estate management, legal services, recruitment, logistics and information systems. One issue of concern is what is considered to be core and non-core (Fitzgerald, 1995). Conceptually there are common features of outsourcing and focus. Both rationalize the business to concentrate on a core set of manageable tasks and both are likely to result in greater dependence on relationships. Focus tends to have been limited to consideration of production operations and outsourcing to service operations.

Just-in-time. Just-in-time (JIT) requires elimination of waste – JIT supply requires delivery of perfect parts and services at exactly the time they are required. Frazier *et al.* (1988) and Lascelles and Dale (1989) identified that traditional adversarial relationships were not conducive to generating good quality. A movement towards JIT therefore necessarily involves supplier development, usually with a reduced supplier base.

Partnership and partnership sourcing. Macbeth and Ferguson (1994) use the phrase 'partnership' to refer to the intermediate types of relationship shown in Figure 2 above.

The phrase appears to be used to describe non-equity cooperative relationships. Recently there

has been increasing attention paid to partnerships – phrases such as 'win-win' are enticing businesses to favour partnerships over other types of relationship. However, not all relationships should be partnerships – rather it is more a case of 'horses for courses' with an appropriate type of relationship being selected for a particular set of circumstances (Cox, 1995).

All the above business trends provide the context for increasing interest in the management of supply relationships or, as some of this set of researchers may term it (Ellram, 1991a; Macbeth and Ferguson, 1994) 'supply chain management'. However, the relationship work concentrates at the level of the dyad, i.e. a two party relationship. Whilst relationships are the building blocks of chains and networks, two links don't make a chain. The next level of system to be considered here is the inter-business chain.

Supply chain management as the management of inter-business chains

In the operations strategy area Hayes and Wheelwright (1984) described a commercial chain with the elements shown below in Figure 3. Other authors have described the supply chain as a pipeline (see for example, Farmer and Ploos von Amstel, 1991).

Hayes and Wheelwright discussed the direction, extent and balance of vertical integration

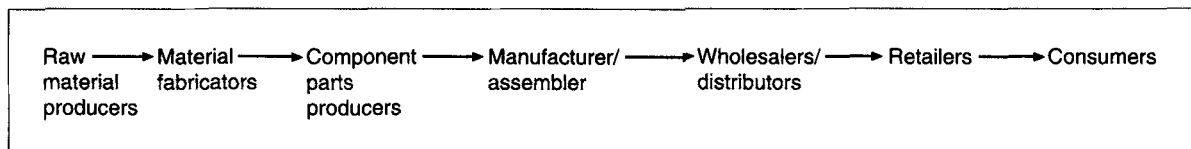


Figure 3. An inter-business supply chain

in the chain. They also identified that a firm's physical position in the chain would affect demand volatility, asset intensity, profitability, technological change and scale and balance.

To date there is little evidence of empirical work supporting these effects other than in the industrial dynamics literature (Forrester, 1961; Burbidge, 1961; Towill, 1991). Studies of industrial dynamics in supply chains have supported the conclusion that upstream businesses suffer greater volatility and 'noise' than do downstream businesses. This Forrester effect has to date been shown to impact on logistical information such as orders, forecasts, volumes and timing. However, there is little evidence of investigation into softer aspects of chains.

The fourth systems level is the level of the inter-business network.

Supply chain management as strategic management of inter-business networks

A network has been defined as a specific type of relation linking a defined set of persons, objects or events. The set of persons, objects or events of which the network is comprised can be called *actors* or *nodes* (Mitchell, 1969).

Christopher (1992) defined supply chain management as the management of:

'... the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer. Thus, for example, a shirt manufacturer is a part of a supply chain that extends upstream through the weavers of fabrics to the manufacturers of fibres, and downstream through distributors and retailers to the final consumer.'

Different aspects of networks have been considered in the literature to date. These include (i) competitive position in networks, (ii) definitions of components of networks, (iii) network structures and (iv) network performance. Network

performance is considered later but a brief summary of research in the first three areas is provided here.

Competitive position in networks

Competitive advantage may be gained by harnessing the resource potential of the network in a more effective manner than competing firms (Cunningham, 1990). Taking a network perspective can influence competitive behaviour and identifies the following issues as important:

- selection of collaborative partners in the network;
- establishing a competitive position in the network;
- monitoring your own and your competitors' positions in the network;
- how the network relationships are handled.

Quoted examples of firms that appear to have strategically managed their networks to improve competitive position include Toyota (Womack *et al.*, 1990), Benetton (Christopher, 1992) and Nissan (Nishiguchi, 1994). However, there is a group of academics in the Swedish networks school who believe that industrial networks cannot be managed and that actors within them merely cope (Hakansson and Snehota, 1995). This school has been instrumental in the development of a language to describe business networks and their components.

Definitions of components of networks

The components of networks of actors, resources and activities are dependent on each other. Actors are defined by the activities they perform and the resources they control; they are connected to other actors via resources and activities. Each actor's unique combination of resources and activities constitutes its identity. Actors develop and organize their activities partly in response to how their customers and suppliers perform and

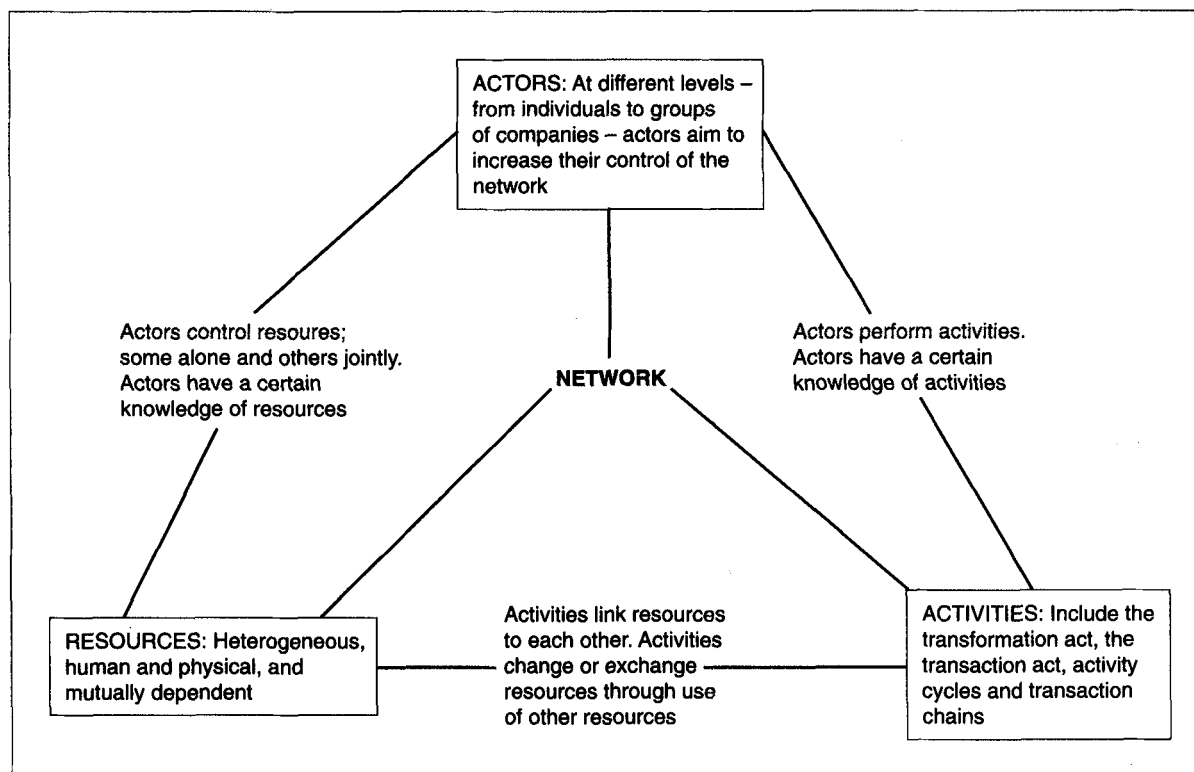


Figure 4. Network model
Source: Hakansson, 1987.

organize theirs (Dubois, 1994). Actors undertake transformation activities, such as production. Activities undertaken between actors are called exchange or transaction activities.

Relationships between actors represent valuable bridges as they give one actor access to the resources of another. The network model shown in Figure 4 is based on resource dependency theory; through relationships it is possible for individual actors to mobilize resources.

The network model indicates some of the complexity of the study of networks. Some researchers may use the term to describe a network of actors, others to discuss a network of processes or activities. Networking activities such as guest engineering relate to sharing of resources in networks. Therefore, care should be taken when describing a firm's network; it should be made clear which of these networks are being considered.

Network structures

Nishiguchi (1994) reported how Toyota and other Japanese companies organized their suppliers into hierarchies; first-tier or primary suppliers

provided systems rather than components. This had the effect of significantly reducing the number of suppliers dealt with on a direct-supply basis, though not necessarily reducing the number of supply sources in the network in total. It did impose more levels in the network. It also made the buying company more dependent on each supplier, whereas the traditional broader network attempted to reduce dependency to suppress prices and maintain competition.

Therefore, it can be seen that the study of networks may be related to networks of actors (firms or individuals), activities (or processes) and resources. Examination of all these types of network is valid; what is important is that the appropriate network is chosen for the type of study. Network performance will be considered in the next section.

Supply chain management and performance

Different researchers have attempted to assess performance in different ways, depending on

Table 1. Relative merits of broad versus narrow networks

Advantages of broad networks	Advantages of narrow networks
Adaptable to change	Collaborative innovation
More switching opportunities	Rigid and strong
Wider access to knowledge	Dense flows of information
Hedge against uncertainty	Higher confidentiality
Cost competitive	Shared destiny

whether they were researching at the level of the network, the external chain or the relationship.

Network performance

Easton and Quayle (1990) investigated performance differences between single-sourcing and multiple-sourcing networks. They proposed that single-sourcing networks would be more rigid and stronger as there would be dense flows of exchanges within them. It would also be easier to retain confidentiality in single sourcing. However, the advantages of multi-source or broad networks included an ability to adapt to changes in the environment through switching and a larger base to generate innovation from. Puto *et al.* (1985) advocated multiple sourcing as an important strategy for firms who needed to reduce uncertainty in purchasing.

Therefore, it can be seen that, whilst there is general agreement on the reduction of multi-sourcing in networks, there is a range of views on the relative merits of single and multi-sourcing. Some of these views of the relative merits are summarized in Table 1 above.

Most of the work to date that is evident on inter-business network performance has tended to concentrate on varying performance given different structures. The aspects of performance that have been considered are more oriented towards economic performance than to other aspects of performance such as customer satisfaction.

Chain performance

Most of the existing work on chain performance has been contributed by the industrial dynamics and logistics literatures. Industrial dynamics research (see Forrester, 1961; Towill 1991; Burbidge, 1961) has identified that demand

information about timing and volume of requirements becomes increasingly distorted further upstream in supply chains. This distortion is caused by time delays in ordering, batching of information and of requirements, safety stock provision, problems in communication and inaccurate forecasting. The resulting Forrester effect, shown below in Figure 5, is an increasing amplitude of perceived demand which causes lumpy and irregular schedules in upstream businesses.

Logistics research into chain performance has focused primarily on improving speed and cost performance (see Stalk and Hout, 1990; Bowersox *et al.*, 1992; Christopher, 1992). Improvements in speed and cost may relate to the physical supply chain, through which materials are converted and goods flow to end customers, or to the process chain of orders and demand transmission. The logistics literature considers the physical distribution and information distribution connections between nodes in the chain, as shown below in Figure 6.

The work on chain performance has considered customer satisfaction but related to delivery reliability, cost/price and time to market aspects of performance. Other aspects of customer satisfaction have not been considered in as much depth.

Relationship performance

As far back as 1963, industrial purchasing authors have written about performance dimensions to evaluate suppliers. At the time the term 'relationship' was not used to describe dealings with suppliers as the Western commercial climate of the time was one of price competition and adversarial transactions. However, assessment of relationship performance was evident at that time. The National Association for Purchasing Agents (NAPA) in the USA published the results of a research study by Smith *et al.* (1963), identifying the value of assessing supplier performance in terms of quality, delivery and price. Post-purchase performance evaluation of suppliers along these dimensions was supported by Lee and Dobler (1965) as providing the buyer with:

'objective information to use in subsequent negotiations and in making future sourcing decisions.'

A growing body of work in the study of relationships emphasizes that there are opportunities

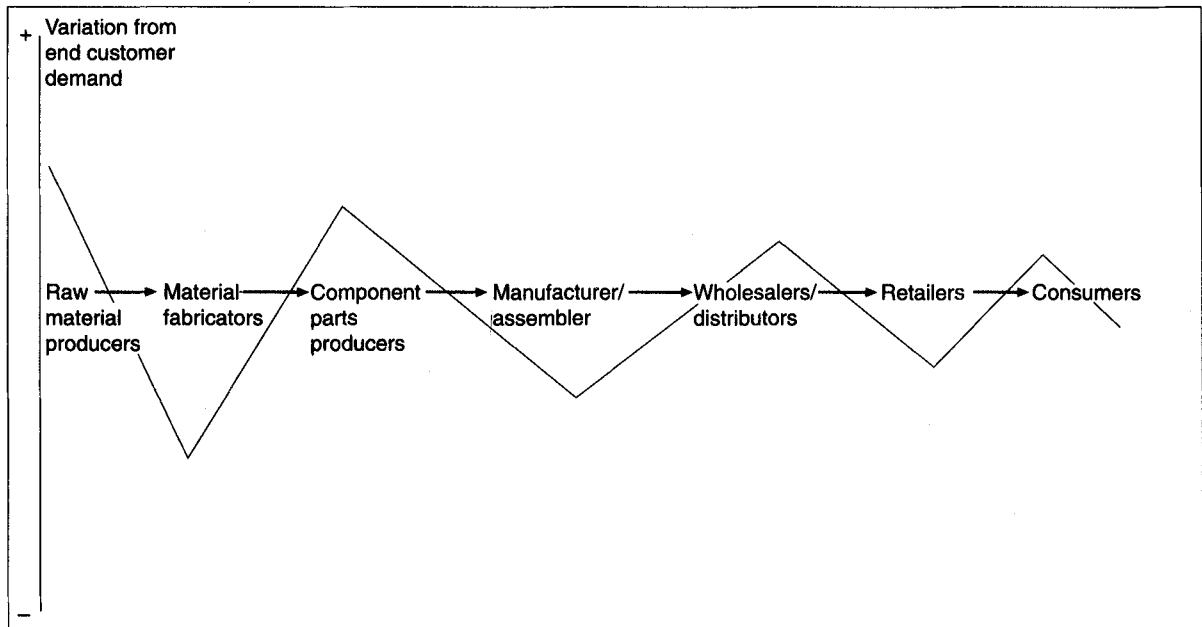


Figure 5. Forrester effect on supply chain performance

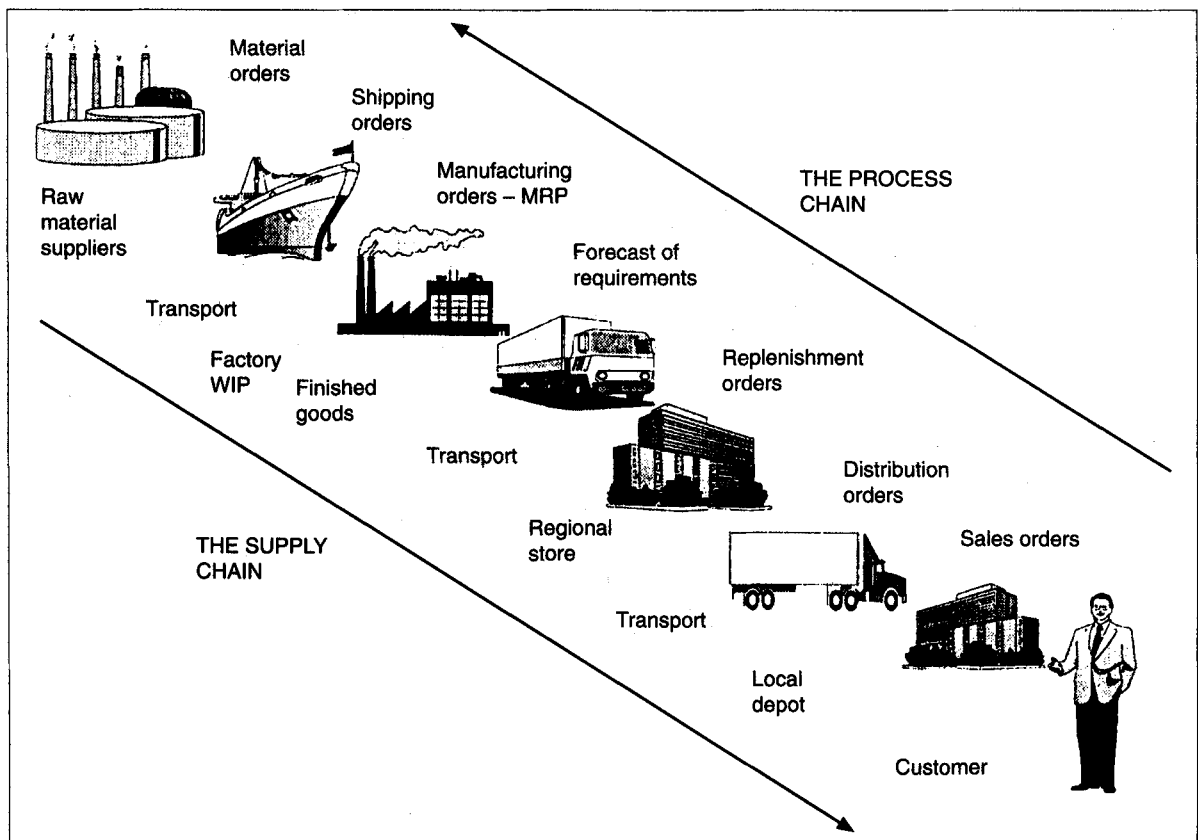


Figure 6. Logistics chains
Source: Derived from Braithwaite, 1992.

for mutual advantage if information is shared between the parties (Christopher, 1992; Ellram, 1990, 1991b; Macbeth and Ferguson, 1994; Hines, 1994). Recent purchasing literature emphasizes the increasing importance of measuring and monitoring performance within relationships because of the increased dependency between the parties (Ellram and Carr, 1994).

A performance measurement system implemented by the purchasing party can enhance the buy-sell relationship (Monczka and Trench, 1988). However, most performance measurement systems in use fail to do this for three main reasons. First, they incorporate mostly hard, objective measures which may not be appropriate for measuring softer features of capability and performance (Ellram, 1990; Macbeth and Ferguson, 1994). Secondly, the measurement systems are usually designed by the purchasing organization for the purchasing organization, rather than for the relationship as a quasi-organization (Lamming, 1993). Thirdly, the measurement system is imposed on suppliers using power leverage (Gregory, 1986). These three failings are in direct conflict with the shared destiny principles of partnership and long-term relationships.

Therefore, if newer, more appropriate forms of performance measurement are required to support longer-term relationships, this requires identification of what these newer performance measurements should be. Marketing and service-management based views particularly emphasize that the customer's perception is critical in a relationship (Zeithaml *et al.*, 1990; Christopher, 1992). The connection between expectations, perceptions of performance and satisfaction/dissatisfaction are well proven; Berry and Parasuraman (1991), Brogowicz *et al.* (1990), Gronroos (1990), Davidow and Uttal (1989) and Haywood-Farmer and Nollet (1991) all claim that customer satisfaction arises as a result of the customer comparing their expectations to their perception of performance. These service-based issues are of far greater importance in measuring long-term relationship performance than in measuring short-term transactions between parties, with no long-term commitment.

However, parties to a relationship may misperceive each other's actions (Borys and Jemison, 1989). This misperception may result in the customer perceiving its requirements as being A while the supplier perceives them as being B.

Similarly, the customer may perceive the supplier's performance as being C whereas the supplier perceives it as D.

Therefore, it seems reasonable to hypothesize that if parties wish to develop closer relationships, they should identify and close these perception gaps at the outset, then jointly work on an agreed and understood programme to improve performance within the relationship.

Derivation of research questions

Level of analysis

Taking a systems approach, it appears that research and conceptual development of the subject of supply chain management has occurred at the different systems levels of relationships, chains and networks, as shown below in Figure 7. Research to date has tended to be performed in one of those levels of analysis rather than across the systems levels. Therefore, one of the stated objectives of this research was to examine inter-relationship between these levels.

Content of research

It has been highlighted above that the content of most research to date on supply chain management that considers issues beyond the dyadic relationship has tended to be hard and structural in its nature. In contrast, the research in dyadic relationships has evolved more recently into considering softer, more behavioural aspects of relationships and, in the service management and consumer behaviour areas, to considering perceptions of performance. However, this research has not yet been applied to the other systems levels of the chain and the network.

Therefore, another stated objective of this research was to provide insight into chain and network effects on softer, behavioural aspects of performance. Therefore the following two research questions were posed:

Research questions

Question one

'Is there evidence that features of the network significantly affect behaviour and performance in relationships and chains?'

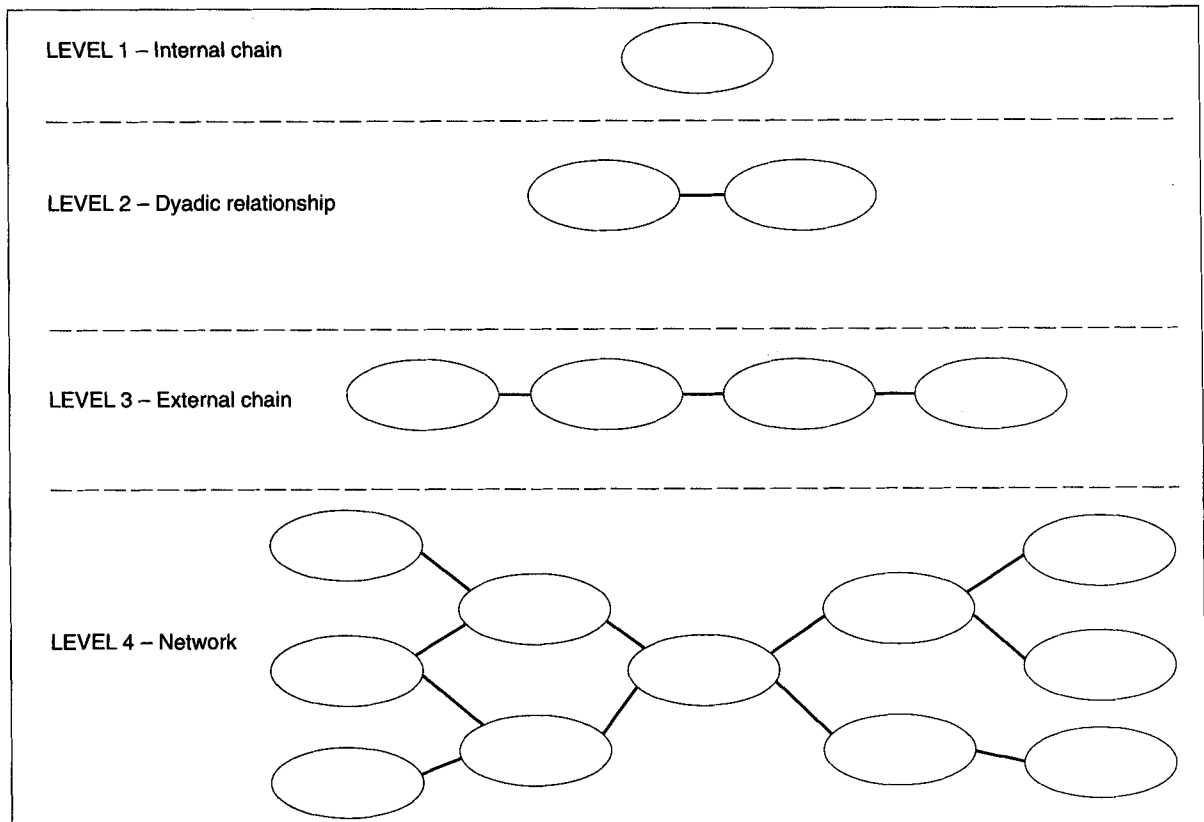


Figure 7. Levels of research in supply chain management

Question two

'Is there evidence that features of the chain significantly affect behaviour and performance in relationships.'

The next section describes the empirical research undertaken to answer the above two research questions.

Empirical research

Research methodology

The methodology applied in this research involved the three levels of analysis shown in Figure 8 below; the levels of analysis are based on the supply chain methodology designed by Harland, Williams and Fitzgerald (1993). The analysis performed at each of these three levels was iterative. For example, analysing chains gave more insight into the network. Analysis of dyads allowed comparison between relationships at different positions in the supply chain, providing insight into chain behaviour. Aggregation of the information gathered at the level of the dyadic relationship gave insight into the network.

Building on the service management and consumer behaviour literature cited earlier, it was intended to identify how much misperception existed in exchange relationships and whether it appeared to be linked to the level of dissatisfaction between the parties. Existing analytical models such as the Parasuraman *et al.* gap model (1985) were considered for this investigation. However, this model included analysis of gaps that were not directly relevant to this research. Therefore, a simple analysis tool was designed to identify gaps in perceptions of parties in relationships – a mismatch tool.

Mismatch tool. The mismatch tool was designed to identify and measure the size of gaps in perceptions between a purchasing organization (the customer) and a supplier. Four mismatches were investigated:

- Mismatch one – this represents the gap between what the customer in the relationship claims to require and what the supplier in the

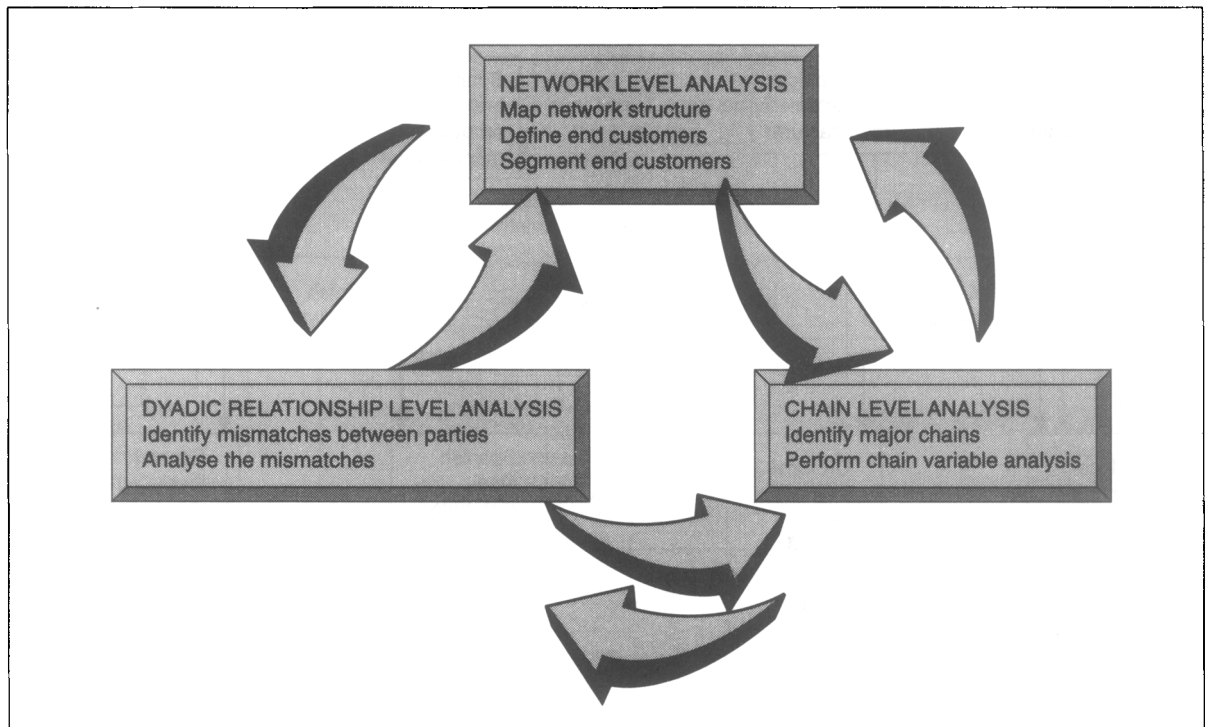


Figure 8. Levels of analysis

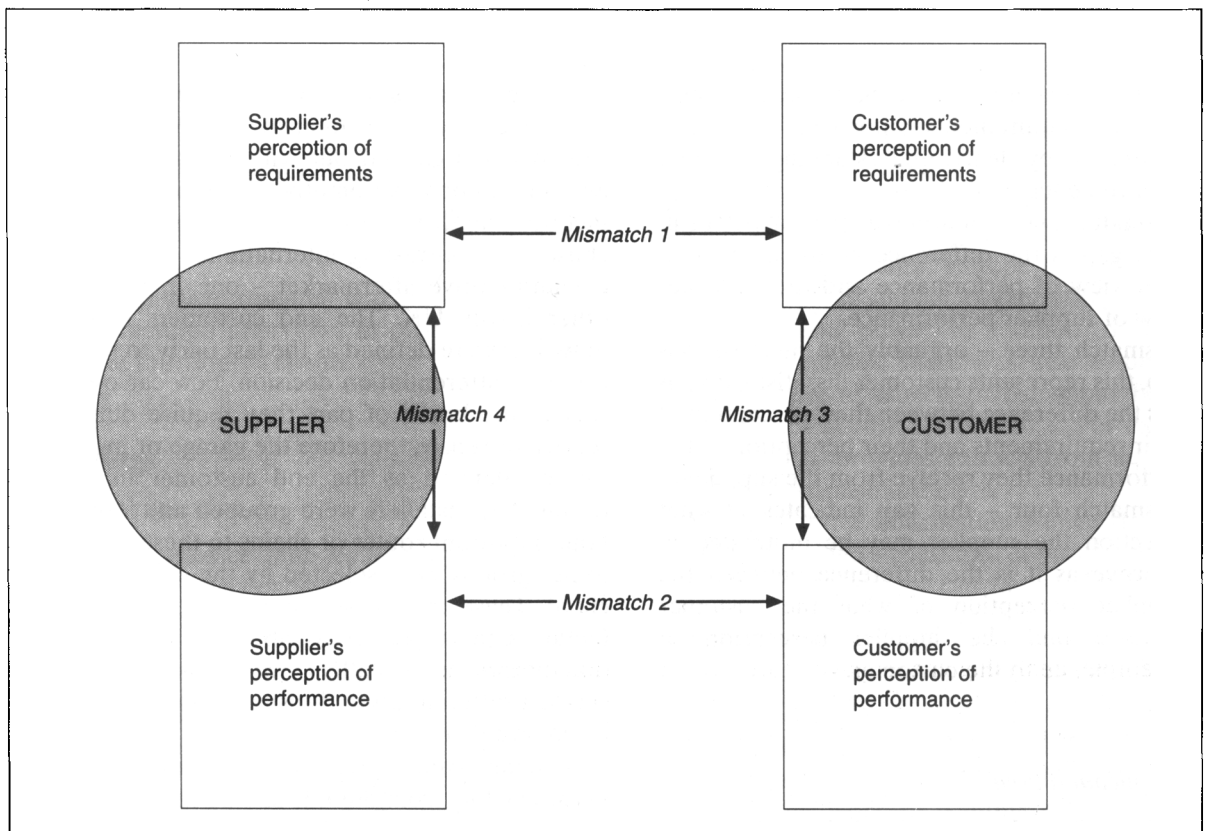


Figure 9. Mismatch tool

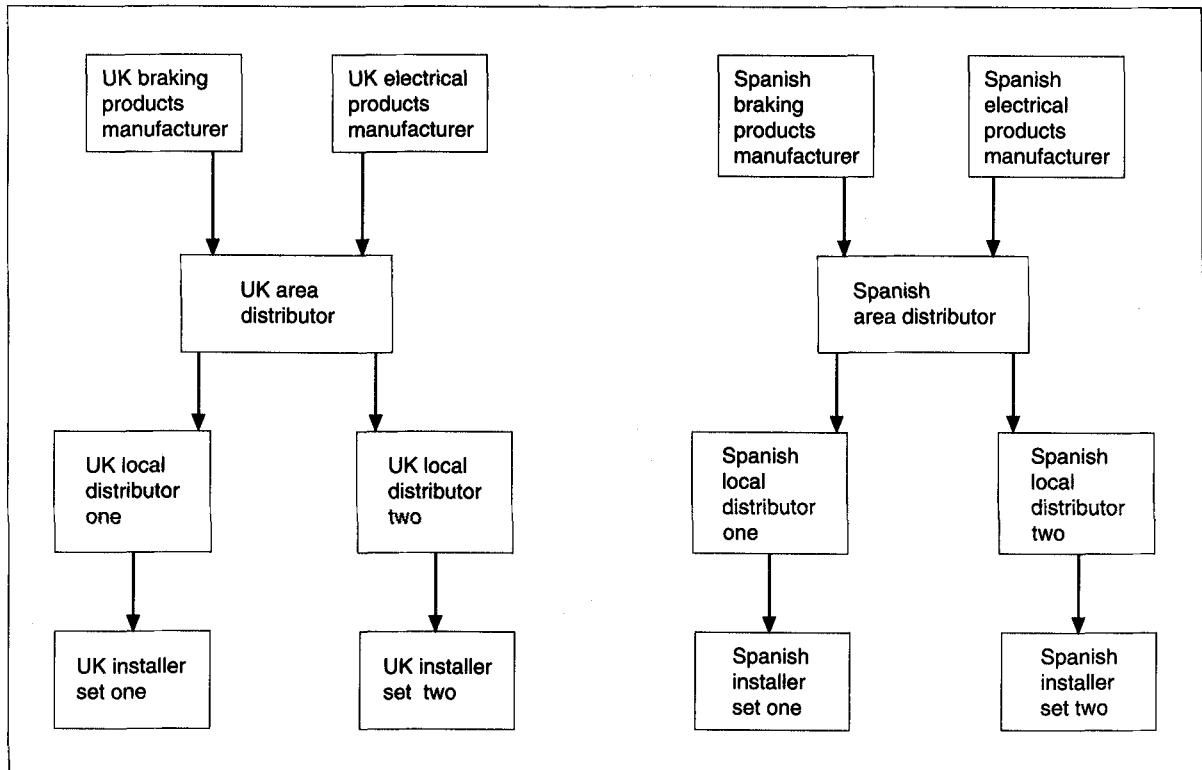


Figure 10. Supply chains analysed

relationship perceives the purchaser as requiring. This requirements gap is what marketing try to close by clearly understanding customer requirements.

- Mismatch two – this perception of performance gap is the difference between the supplier view of performance and the customer view of supplier performance.
- Mismatch three – arguably the most serious gap, this represents customer dissatisfaction as it is the difference between their perception of their requirements and their perception of the performance they receive from the supplier.
- Mismatch four – this gap indicates in what direction the supplier may be motivated to improve as it is the difference between the supplier perception of what the customer requires and the supplier perception of performance to the customer.

The application area

The mismatch tool was used to help analyse gaps in perceptions in relationships within supply

chains in the automotive aftermarket, or vehicle spares industry, using empirical field research. The research was carried out with the assistance of an international automotive component manufacturer and distributor. This collaborating client chose two contrasting international networks in the automotive aftermarket – one in Spain the other in the UK. The end customers in these networks were defined as the last party to make a product differentiation decision. Few car owners specify the brand of part they require during a service or repair, therefore the garage or installer can be defined as the end customer in these chains. The installers were grouped and labelled. Four important routes or chains to these end customer groups were selected by the collaborating client. These chains ran from component manufacturers, through area distributors, through local distributors to installers who made the last product differentiation decision; these are shown above in Figure 10.

A complicated process of facilitation took place, starting from the UK and Spanish area distributor. The area distributors facilitated access upstream to the component manufacturers and

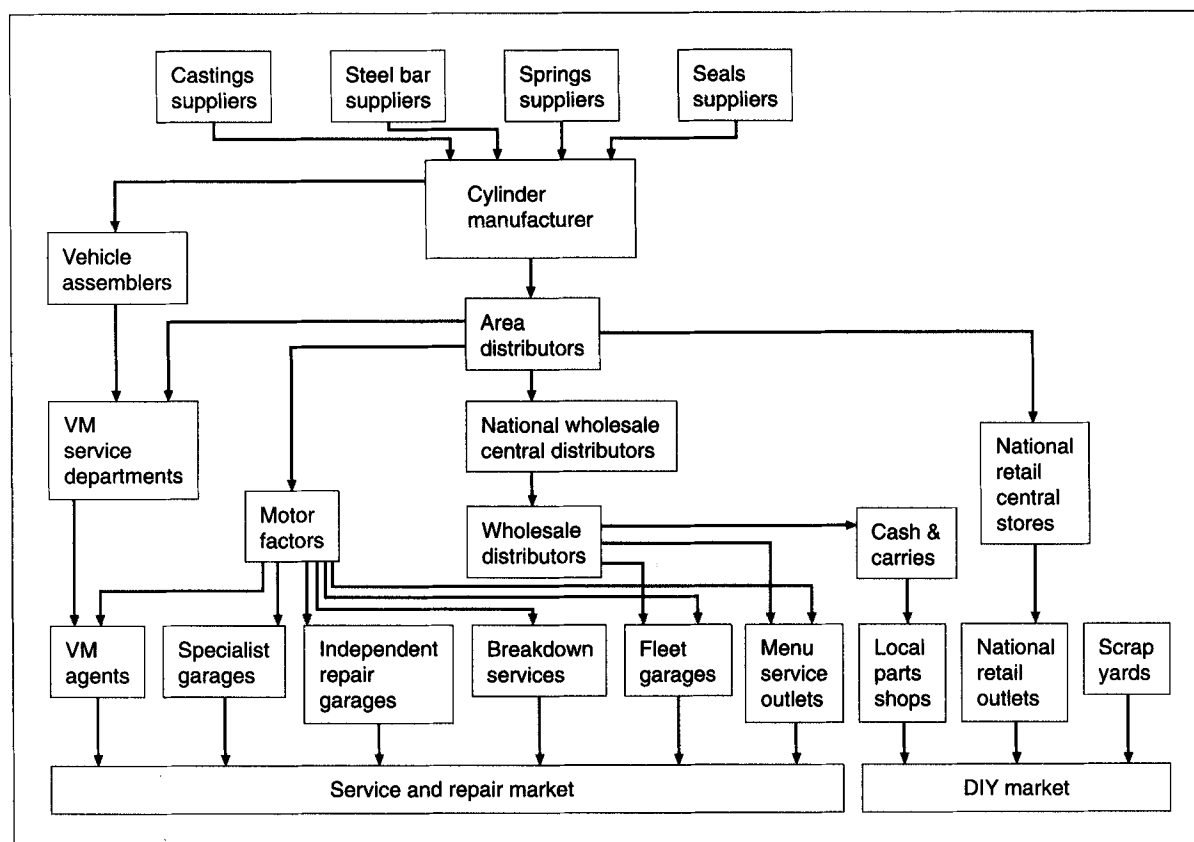


Figure 11. UK automotive aftermarket industry network map

downstream to the local distributors. The local distributors in each of the four supply chains facilitated access to a set of ten installers that they served.

The empirical research was carried out in 107 semi-structured interviews in over 50 companies in these four supply chains.

Findings

Research question 1

'Is there evidence that features of the network significantly affect behaviour and performance in relationships and chains?'

Half of the relationships and chains were in the Spanish automotive aftermarket and half were in the UK. The industry network maps for these two networks are provided in Figures 11 and 12.

It can be seen that the UK aftermarket was a more sophisticated market in terms of the number of variations of outlet which consumers could choose between; for example, in Spain there was

no equivalent to a menu service operator. An interesting feature of the Spanish network was the presence of buying groups. These are more common in continental Europe than in the UK and are clubs of smaller organizations securing bulk purchasing power. In addition to different network structures, there was also evidence of different cultural aspects of behaviour between the UK and Spanish relationships. For example, Table 2 below provides extracts from interviews of UK and Spanish installers.

The qualitative information gained during interviews provided a backcloth of business practice in both territories. As can be seen in Table 2, the expectations of customers in relationships in the UK differed substantially from those in Spain. The UK customers gave an impression of wanting to keep a distance between themselves and their suppliers. They wanted the basic business processes to be carried out efficiently but did not show evidence of wanting a deeper, more trusting relationship. In fact, to the contrary, some of the UK customers viewed inter-personal

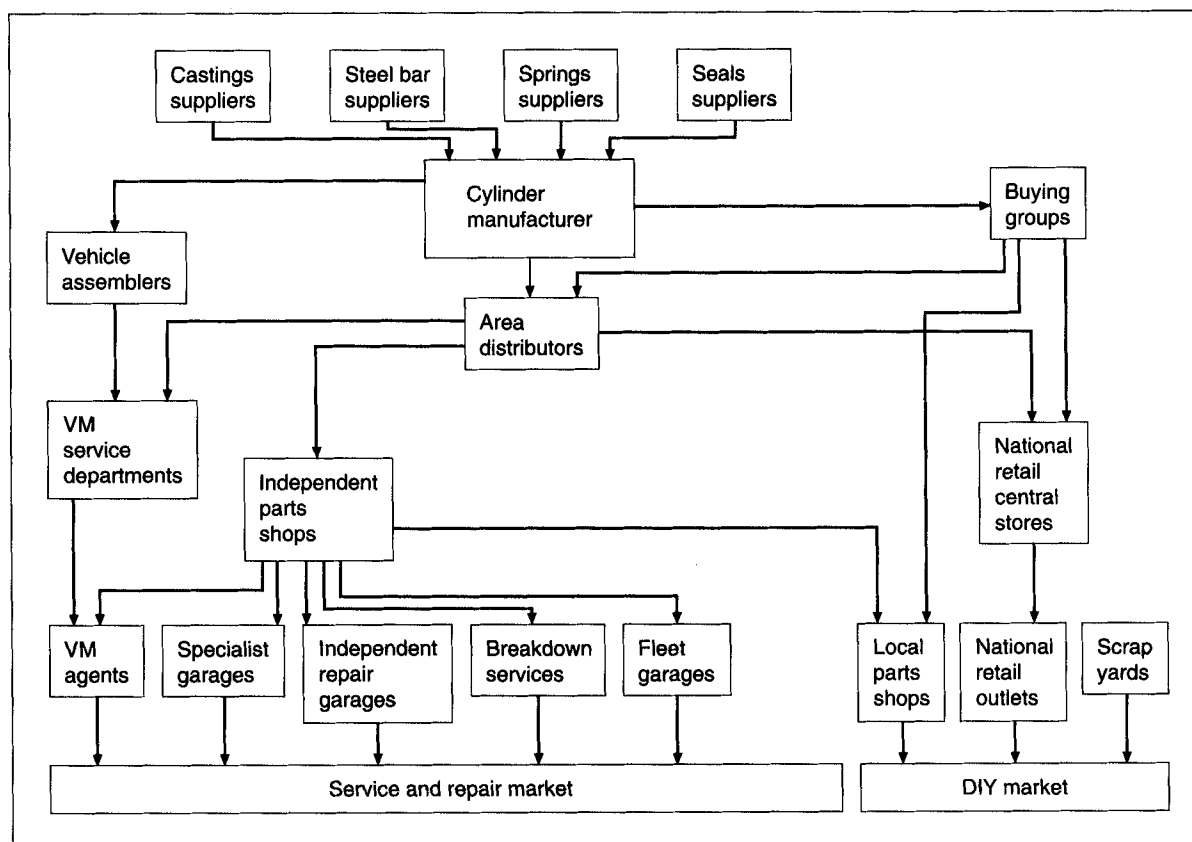


Figure 12. Spanish automotive aftermarket industry network map

relationships with suppliers negatively. There was little evidence of socializing between parties outside work. There was also little evidence of trust to allow suppliers to help locate parts for them from other suppliers; if a supplier did not have a part in stock, the customer would typically try other sources until the part was located. Nor did the UK customers interviewed allow their suppliers to restock their warehouses unattended or rely on suppliers for technical information and advice.

The Spanish customers provided a strong picture of a business culture that relied on trust and friendship relationships; socializing was a frequent occurrence between the parties. Many customers interviewed allowed their supplier representative access to their site to top up inventory as required. The suppliers in the relationships were seen as providers of support and technical advice. If a supplier did not have a part in stock, the customer trusted them to source the part from other suppliers.

The qualitative analysis therefore showed that the network context differed in its structure and

its behaviour. However, this research also sought to identify if there appeared to be a significant impact of network differences on performance. To test this, statistical Tukey tests were performed on the quantitative data gained through the gap analysis.

Despite the substantial differences in behaviour observed in the qualitative analysis, Figure 13 shows little difference between the patterns and levels of mismatches for the UK and Spanish relationships. The amount of customer dissatisfaction – mismatch 3 – was higher in the UK than in Spain but Tukey tests showed this difference not to be statistically significant. When the data was separated into two UK and two Spanish chains, again there was no statistical difference between the two territories.

Therefore, whilst there appeared to be a different *approach* to business in the two territories, giving rise to different expectations of customers, the resulting performance in terms of customer satisfaction and misperceptions between suppliers and customers was not significantly different.

Table 2. Extracts from interviews of installers responding to questions on their service requirements

UK service requirements	Spanish service requirements
Wants immediate availability of information. Likes to know people at the supplier so he can 'growl' at them	Wants a supplier to look for a part if it's not in stock. Needs to be able to place orders by phone for urgent parts and for distributors to come and restock parts for them for repeat parts (and on their own if the storemen aren't there) – trust and confidence in the rep. is required because of this. Wants friendship; wants an intimate relationship with suppliers. Where more than one supplier stocks a part, he'll choose on the basis of the relationships
No services are required from the local distributor; the installer gets technical information from elsewhere	Wants to be well looked after. Wants a very correct relationship. Wants faulty parts to be swapped
No service expectations	Values a good relationship with the rep.
Not really interested in service aspects	Does not want a woman in charge at the local distributor – believes it will mean poor service. Wants friendship from the relationship
Wants promptness in answering the telephone	Friendly relations are essential for the survival of the business. The local distributor will have to provide more technical support and advice in the future
Wants accuracy and efficiency in invoicing	Wants suppliers to have experience and knowledge. Wants them to trouble themselves to locate parts. Wants friendly relations with sales people; it is important that sales people have good technical knowledge and experience so they can advise the workshops on appropriate parts
Wants accuracy in interpreting the order	Wants technical information and training

Research question 2

'Is there evidence that features of the chain significantly affect behaviour and performance in relationships?'

It was identified in the literature review that position in the supply chain was thought to affect profitability, demand volatility, asset intensity, technological change and scale and balance. Of these possible effects, the literature provided empirical evidence to support the effect of position in the chain on demand volatility, i.e. the Forrester effect. This research tested for a Forrester effect on softer, behavioural aspects of supply chains.

Each of the four supply chains examined was sub-divided into *dyadic levels* where these were all the installer/local distributor relationships considered together, all the local distributor/area distributor relationships and the area distributor/manufacturer relationships. Comparisons across these dyadic levels would show if sizes of gaps changed significantly upstream or downstream.

It can be seen in Figure 14 below that the level of mismatches rises with dyadic level. This is not consistent across all the types of mismatch, however. Mismatch 1 – the gap between the customer's and the supplier's perception of requirements – does not increase consistently upstream, nor does mismatch 4 – the gap between the supplier's perception of what is required and what they provide. However, both mismatch 2 – the gap between the customer's and the supplier's perception of what is provided – and mismatch 3 – the gap between the customer's perception of what they require and what they receive (i.e. customer dissatisfaction) both increase upstream. Tukey tests showed these increases upstream to be statistically significant.

Therefore it was shown that misperceptions about performance between parties in relationships worsened in upstream relationships. Also customer dissatisfaction increased upstream. These two findings were further explored in correlation tests. Using Pearson's correlation coefficient it was shown that customer dissatisfaction was significantly correlated to misperception of performance with a correlation coefficient of 0.3325, significant at the 1 per cent level. The data were standardized to remove any extraneous effects and the correlation test repeated – customer dissatisfaction was still significantly correlated to misperception in performance.

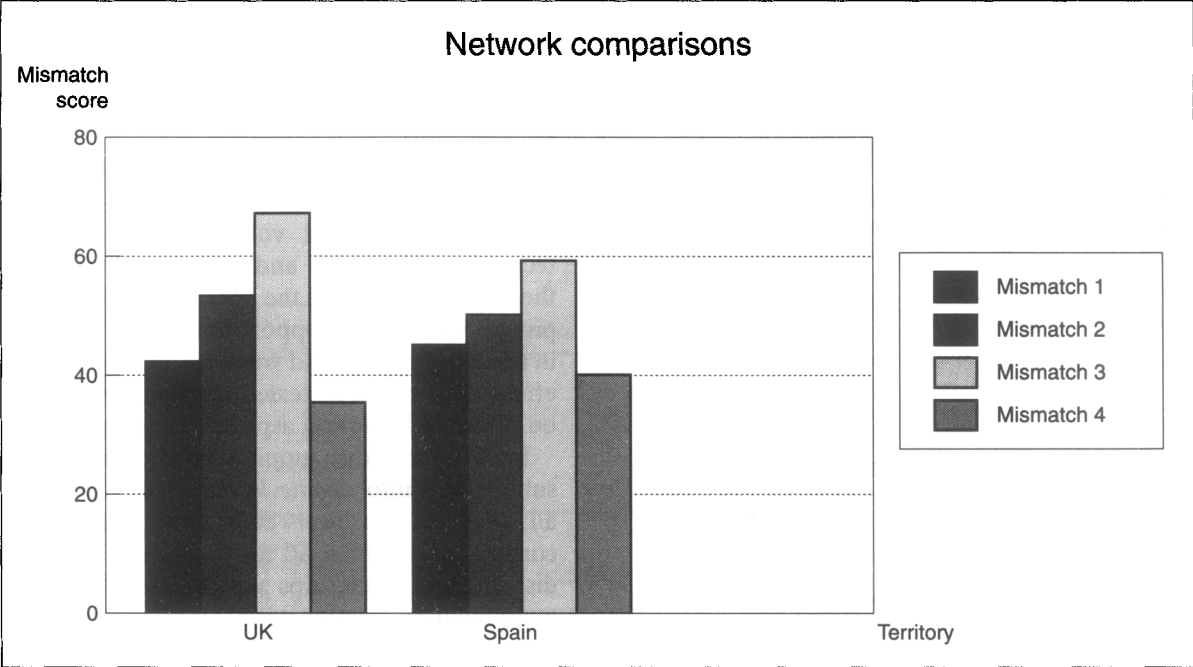


Figure 13. Quantitative comparisons of gaps in UK and Spanish relationships

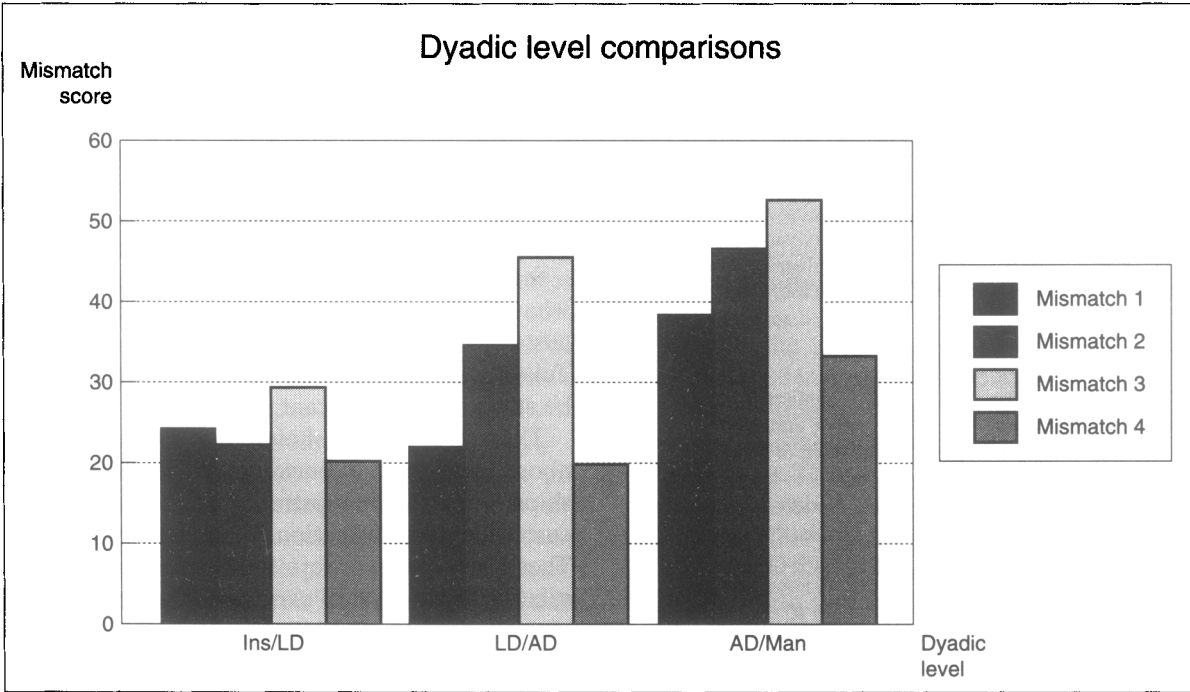


Figure 14. Dyadic level mismatches

Discussion and conclusions

The observations on differences between the UK and Spanish networks were surprising. The differences in business approach were so apparent during the interviews that the research team observed that territory differences were substantial. However, the quantitative analysis performed subsequently by the author showed similar patterns of misperceptions and customer dissatisfaction between the territories. Therefore, the trust-oriented and supportive Spanish relationships did not perform any better in the eyes of the customers. This requires further replication across other territories in subsequent research.

The findings relating to position in the supply chain are useful; they extend an existing body of knowledge in industrial dynamics to show that a Forrester-like effect can relate to softer aspects of performance as well as hard logistical features of supply chains. They also integrate the knowledge in service management and consumer behaviour literatures with supply chain research, which is novel.

The main contribution of the work is to integrate across supply chain levels. The existing partnership/relationship work does not make visible any possible explanation that may be attributable to position in the chain. Similarly, this body of research does not adequately recognize the significance of the network context.

There has been little research performed to date that involves chains of non-integrated businesses, probably because of the size of the task and the difficulty of facilitating access to connected companies. Also examination at the level of the network, the external chain and the relationship involves searching across disparate literatures and conceptualizing holistically. However, as the trend towards network relationships rather than vertical integration appears to be increasing, the need for research in chains and networks will also increase. This research requires replication in and across different sectors and territories to identify if network, chain and relationship effects vary in different industrial contexts. Further extension of the work is required to consider other network, chain and relationship variables and their effect on other systems levels.

References

- Abernathy, W. (1978). *The Productivity Dilemma*. Johns Hopkins University Press, Baltimore, USA.
- Ammer, D. S. (1968). *Materials Management*. Irwin, Homewood, IL, USA.
- Aoki, M., B. Gustafsson and O. E. Williamson (1990). *The Firm as a Nexus of Treaties*. Sage, London, UK.
- Berry, L. L. and A. Parasuraman (1991). *Marketing Services: Competing Through Quality*. Free Press, New York, USA.
- Blois, K. (1972). 'Vertical Quasi-Integration', *Journal of Industrial Economics*, **20**(3), pp. 33–41.
- Boroy, B. and D. B. Jemison (1989). 'Hybrid Organisations as Strategic Alliances: Theoretical Issues in Organisational Combinations', *Academy of Management Review*, **14**(2), pp. 234–249.
- Bowersox, D. J., P. J. Daugherty, C. L. Droge, R. N. Germain and D. S. Rogers (1992). *Logistical Excellence: It's Not Just Business as Usual*. Digital Press, Burlington, MA, USA.
- Braithwaite, A. (1992). 'A Pragmatic Route to Effective Benchmarking', *Proceedings of BPICS 27th Annual Conference*, Birmingham, pp. 197–209.
- Brogowicz, A. A., L. M. Delene and D. M. Lyth (1990). 'A Synthesised Service Model with Managerial Implications', *International Journal of Service Industry Management*, **1**(1), pp. 27–46.
- Burbidge, J. L. (1961). 'The New Approach to Production', *Production Engineer*, December, **40**(12), pp. 769–784.
- Christopher, M. G. (1992). *Logistics and Supply Chain Management*. Pitman Publishing, London, UK.
- Coase, R. H. (1937), 'The Nature of the Firm', *Economica*, Vol. **V**.
- Cox, A. (1995). 'Pro-Activity, Value Engineering and Strategic Procurement Management: An Entrepreneurial Contractual Model for the Firm', *Proceedings of First Worldwide Research Symposium on Purchasing and Supply Chain Management*, pp. 72–89.
- Cunningham, M. T. (1990). 'Survival and Growth Strategies in New Technology Markets', *Proceedings of the 6th IMP Conference*, Milan, pp. 346–372.
- Davidow, W. H. and B. Uttal (1989), 'Service Companies: Focus or Falter', *Harvard Business Review*, July/August.
- Dore, R. (1983). 'Goodwill and the Spirit of Market Capitalism', *British Journal of Sociology*, **34**(4), December, pp. 459–482.
- Dubois, A. (1994). *Organising Industrial Activities: An Analytical Framework*. Department of Industrial Marketing, Chalmers University of Technology, Sweden.
- Easton, G. and M. Quayle (1990). 'Single and Multiple Network Sourcing – Network Implications', *Proceedings of 6th IMP Conference*, pp. 474–488, Milan.
- Ellram, L. M. (1990). 'The Supplier Selection Decision in Strategic Partnerships', *Journal of Purchasing and Materials and Management*, Fall, pp. 8–14.
- Ellram, L. M. (1991a). 'Supply Chain Management: The Industrial Organisation Perspective', *International Journal of Physical Distribution and Logistics Management*, **21**(1), pp. 13–22.
- Ellram, L. M. (1991b). 'A Managerial Guideline for the Development and Implementation of Purchasing Partnerships', *International Journal of Purchasing and Materials Management*, Summer, pp. 2–8.
- Ellram, L. M. and A. Carr (1994). 'Strategic Purchasing: A History and Review of the Literature', *International Journal of Purchasing and Materials Management*, Spring, pp. 10–18.
- Farmer, D. H. and R. Ploos von Amstel (1991). *Effective Pipeline Management*. Gower, UK.

- Fitzgerald, G. (1995). The Outsourcing of Information Technology: Revenge of the Business Manager or Legitimate Strategic Option?, Unpublished paper, Birkbeck College, University of London, UK.
- Forrester, J. W. (1961). *Industrial Dynamics*. MIT Press, Boston, MA, USA.
- Frazier, G. L., R. E. Spekman and C. R. O'Neal (1988). 'Just-in-Time Exchange Relationships in Industrial Markets', *Journal of Marketing*, **52** (October), pp. 52–67.
- Gregory, R. E. (1986). 'Source Selection: A Matrix Approach', *Journal of Purchasing and Materials Management*, Summer.
- Gronroos, C. (1990). *Service Management and Marketing*. Lexington Books, MA, USA.
- Hakansson, H. (ed.) (1987). *Industrial Technological Development: A Network Approach*. Croom Helm, London, UK.
- Hakansson, H. and I. Snehota (1995). *Developing Relationships in Business Networks*. Routledge, London, UK.
- Harland, C. M. (1995a). 'The Dynamics of Customer Dissatisfaction in Supply Chains', *Production Planning and Control, Special Issue on Supply Chain Management*, **6**(3), May–June, pp. 209–217.
- Harland, C. M. (1995b). 'Focus in Supply Chains', *Proceedings of 2nd International Symposium on Logistics*, Nottingham, July.
- Harland, C. M., D. Williams and L. Fitzgerald (1993). 'Supply Chain Methodology', *Human Systems Management*, **12**(1), pp. 17–25.
- Harrigan, K. R. (1983). *Strategies for Vertical Integration*. Lexington, MA, USA.
- Hayes, R. and S. C. Wheelwright (1984). *Restoring our Competitive Edge: Competing Through Manufacturing*. John Wiley, New York, USA.
- Haywood-Farmer, J. and J. Nolle (1991). *Services Plus: Effective Service Management*. Morin, Boucherville, Quebec, Canada.
- Hill, T. (1985). *Manufacturing Strategy*. Macmillan, London, UK.
- Hines, P. (1994). *Creating World Class Suppliers: Unlocking Mutual and Competitive Advantage*. Pitman, London, UK.
- Houlihan, J. (1984). 'Supply Chain Management', *Proceedings of 19th International Technical Conference*, BPICS, pp. 101–110.
- Johnston, R., and P. R. Lawrence (1988). 'Beyond Vertical Integration: the Rise of Value Adding Partnerships', *Harvard Business Review*, July–August, pp. 94–101.
- Jones, T. C. and D. W. Riley (1985). 'Using Inventory for Competitive Advantage Through Supply Chain Management', *International Journal of Physical Distribution and Materials Management*, **15**(5), pp. 16–26.
- Kogut, B. (1985). 'Designing Global Strategies: Comparative and Competitive Value Added Chains', *Sloan Management Review*, Summer, pp. 15–28.
- Lamming, R. (1989). The Causes and Effects of Structural Change in the European Automotive Components Industry, Working paper of the International Motor Vehicle Program. MIT, Cambridge, MA, USA.
- Lamming, R. (1993). *Beyond Partnership: Strategies for Innovation and Lean Supply*. Prentice-Hall, Hemel Hempstead, UK.
- Lascelles, D. M. and B. G. Dale (1989). 'The Buyer–Supplier Relationship in Total Quality Management', *Journal of Purchasing and Materials Management*, Summer, pp. 10–19.
- Lee, L. and D. Dobler (1965). *Purchasing and Materials Management*. McGraw-Hill, New York, USA.
- Lorenzoni, G. and O. Ornati (1988). 'Constellations of Firms and New Ventures', *Journal of Business Venturing*, **3**, pp. 41–57.
- Macbeth, D. K. and N. Ferguson (1994). *Partnership Sourcing: an Integrated Supply Chain Approach*. Pitman, London.
- Marshall, A. (1923). *Industry and Trade*. Macmillan, London.
- Miles, R. and C. Snow (1987). 'Network Organisations: New Concepts for New Forms', *California Management Review*, **28**(3), pp. 62–73.
- Mitchell, J. C. (1969). 'The Concept and Use of Social Networks'. In: J. C. Mitchell (ed.), *Social Networks in Urban Situations*, pp. 1–50. Manchester University Press, Manchester.
- Monczka, R. M. and S. J. Trencha (1988). 'Cost Based Supplier Performance Evaluation', *Journal of Purchasing and Materials Management*, Spring.
- Morgan, I. (1987). 'The Purchasing Revolution', *McKinsey Quarterly*, Spring, pp. 49–55.
- Nishiguchi, T. (1994). *Strategic Industrial Sourcing*, Oxford University Press, Oxford.
- Oliver, R. K. and M. D. Webber (1982). 'Supply Chain Management: Logistics Catches Up With Strategy'. In: M. Christopher (1992), *Logistics: The Strategic Issues*, pp. 63–75. Chapman and Hall, London, UK.
- Parasuraman, A., V. A. Zeithaml and L. L. Berry (1985). 'A Conceptual Model of Service Quality and its Implications for Future Research', *Journal of Marketing*, **49** (Fall), pp. 41–50.
- Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. Free Press, New York, USA.
- Porter, M. E. (1987). 'Managing Value – From Competitive Advantage to Corporate Strategy', *Harvard Business Review*, May–June.
- Puto, C., W. Patton and R. King (1985). 'Risk Handling Strategies in Industrial Vendor Selection Decisions', *Journal of Marketing*, **49**, Winter, pp. 89–98.
- Richardson, G. B. (1972). 'The Organisation of Industry', *Economic Journal*, No. 82.
- Sabel, C., G. Herrigel, R. Kazis and R. Deeg (1987). 'How to Keep Mature Industries Innovative', *Technology Review*, **90**(3), pp. 26–35.
- Saunders, M. (1994). *Strategic Purchasing and Supply Chain Management*. Pitman, London, UK.
- Schonberger, R. J. (1986). *World Class Manufacturing: The Lessons of Simplicity Applied*. Free Press, New York, USA.
- Skinner, W. (1969). 'Manufacturing – Missing Link in Corporate Strategy', *Harvard Business Review*, May–June, pp. 136–145.
- Slack, N. (1991). *The Manufacturing Advantage*. Mercury Business Books, London.
- Smith, D. V., B. G. Lowe, D. H. Lyons and W. H. Old (1963). *The Development Project Committee on Standards for Vendor Evaluation*, National Association of Purchasing Agents, New York, USA.
- Stalk, G. H. and T. M. Hout (1990). *Competing Against Time: How Time Based Competition is Reshaping Global Markets*. Free Press, New York, USA.
- Stevens, G. C. (1989). 'Integrating the Supply Chain', *International Journal of Physical Distribution and Materials Management*, **19**(8), pp. 3–8.
- Thackray, J. (1986). 'America's Vertical Cutback', *Management Today*, June.
- Towill, D. (1991). 'Supply Chain Dynamics', *Computer Integrated Manufacturing*, **4**(4), pp. 197–208.
- Womack, J. P., D. T. Jones and D. Roos (1990). *The Machine that Changed the World*. Macmillan International, New York, USA.
- Zeithaml, V. A., A. Parasuraman and L. L. Berry (1990). *Delivering Quality Service: Balancing Customer Perceptions and Expectations*. Free Press, New York, USA.