Chapter 4
Lean Supply Chains: A Behavioral Perspective: Examples from Packaging Supply Chains in the FMCG Sector

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Abstract This chapter discusses the behavioral perspective of lean supply chains which consist of two elements: high-performance operational lean/JIT and high-performance relationship management that are each characterized by distinguishing concepts and features. The extent and successful implementation of operational lean/JIT is contingent upon the product variables; production volume, product standardization, and demand variability. Whereas the high-performance relationship management elements are dependent on the length of relationship, characteristics of the organization, and the policies and practices that are perceived as trustworthy and equitable by both partners. Trust is an important element in both the operations and relationships of lean supply chain management and a maturity path exists where a successful operational lean transformation is highly dependent on the existence of a strong supply relationship based on mutual trust and equity. The conclusions and implications of this study are that a "one-size-fits-all" approach is inappropriate to supply chain design. A contingency approach, that considers all the variables associated with product and organizational factors, is necessary to design an effective and sustainable lean supply chain.

1 Introduction

A unique production system emerged in Japanese manufacturing in the late 1950s that, by the late 1990s, heralded a change throughout the operations management and supply chain literature. This unique and high-performance production/supply

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system was pioneered and refined by the Toyota Motor Company (Womack et al. 1990).

In the aftermath of the first oil shock in 1973, when market conditions changed, many other Japanese manufacturing companies adopted this approach (Monden 1983), and, by 1977, interest was spreading to the West. Initially the system was known as the *Toyota Production System*. In October 1980, Andersen Consulting organized one of the first Japanese productivity seminars at the Ford Motor Company world headquarters and the term Just-in-Time (JIT) caught the imagination of the Western world (Hall 1981 cited in Harmon and Peterson 1990). The concept behind this high-performance system was a basic logic of "producing the necessary units in the necessary quantities at the necessary time" (Monden 1983, p. 4).

The term *Lean* was later coined by John Krafcik (1988) to describe the philosophy underlying the Toyota Production System (Standard and Davis 1999, p. 49) and was developed further by Womack, Jones, and Roos in their book *The Machine that Changed the World* (1990) which sought to explain the productivity differences between the Japanese and Western automakers. Lean production "encompassed a new production paradigm, a corporate strategy model and an integration model….The lean producer assumes the benefits of just-in-time, total quality, total employee involvement, etc., and builds a global strategy on that basis" (Lamming 1993, p. 18). Fundamental to the JIT and lean philosophy is that manufacturers and suppliers need to work together to provide defect-free components at the right time and in the right quantity.

The terms JIT and Lean are often used interchangeably and are not well defined. JIT is described as a philosophy, a set of techniques, and a method of planning and control (Rich 1999), although Slack et al. (1998) interpret lean as the philosophy and JIT as the management techniques and control methods. While recognizing that reliable supplies are essential to the functioning of JIT production in a lean enterprise, the subject of JIT or lean purchasing has received far less attention in the literature. Burton (1988), Naumann and Reck (1982), and Willis and Huston (1990) estimate that purchased materials and services account for 50–80% of the total cost of manufactured product and it is also estimated that suppliers account for 30 % of the quality problems and 80 % of the lead time (Waters-Fuller 1995). This provides not only considerable scope for improvement and cost reduction, but, with little or no safety stock, could determine the success, or failure, of the lean implementation (Manoochehri 1984). Ansari and Mondarress (1988) argue that JIT efficiency is primarily achieved through complete support, collaboration, and cooperation of suppliers.

According to the literature trust, communication, successful collaboration, good decision making, and business performance are positively correlated. Droge et al. (2004) state that, "Firms recognize that the performance of suppliers' products and the performance of their own products are inextricably linked. Supplier partnering moves beyond supplier development activities and treats suppliers as a strategic collaborator. Supplier partnering approach seeks to bring all the participants in the product lifecycle into the process early on so that each can provide input into the

other's processes. Thus, partnership often entails early supplier involvement in product design and/or access to superior supplier technological capabilities (see Narasimhan and Das 1999). Close integration ensures unity of effort and responsiveness.

The integrated supply chain is in many ways synonymous with the Lean Enterprise described by Womack and Jones (1994, p. 93–94; 1996) as "a group of individuals, functions, and legally separate but operationally synchronized companies. The notion of the value stream defines the lean enterprise. The group's mission is collectively to analyze and focus on the value stream so that it does everything involved in supplying a good or service (from development and production to sales and maintenance) in a way that provides maximum value to the customer".

According to Christopher (1992, p. 18) the focus of supply chain management is on cooperation and trust so that the whole can be greater than the sum of the parts. Therefore, supply chain management (SCM) is the management of *relationships* in order to provide a more profitable outcome for all parties of the network. At the heart, the supply chain is a commercial relationship that is affected and influenced by a number of factors. Cox (2003) argues that Japanese supply practices tend to be characterized by high levels of buyer dominance over supplicant suppliers. He further contends that the sourcing options and relationship management approach is contingent upon the demand and supply circumstances of the interchange; horses for courses (Cox 2003). Other authors agree with this and suggest that factors that are critical to the buyer–supplier relationship such as trust, commitment, cooperation, compliance, conflict, and conflict resolution are strongly influenced by power (Brown et al. 1995; Maloni and Benton 2000). Rich and Hines (1997) reject the argument that Japanese companies have achieved greater supply chain integration and operational benefits as a result of the power imbalance and this is supported by Ouchi (1981) who considers that the use of exertion would not achieve the necessary investments by the supplier.

Gonzalez-Benito and Spring (2000) examined purchasing in the Spanish auto components industry and describe two elements of JIT (Lean Supply) purchasing; an operational and a complementary component. Complementary practices include relationship, involvement, and quality elements. The features of the complementary practices are described elsewhere in the literature as *relationship contracting* (Sako 1992; Dore 1987), *partnership sourcing* (Carlisle and Parker 1989; Ellram 1991; Macbeth and Ferguson 1994); *co-makership* (Merli 1991); *lean supply model* (Lamming 1993), and *network sourcing* (Hines 1994, 1996). The features of these include: long-term alliances with few suppliers, single or dual sourcing for each product group and mutuality in problem solving and benefit sharing, open-book costing and transactions. The operational features include frequent deliveries of small lots controlled by the use of Kanbans, or shared inventory management, to reduce stocks and lead time this is facilitated by information that is transferred effortlessly and transparently through IT systems, such as Electronic Data Interchange (EDI), that makes information sharing accessible to all potential supply partners.

The commercial relationship between buyer and seller seeks to minimize the transaction costs, the added costs that are generated by performing a transaction, for example, search costs to find a supplier, costs of generating a purchase order, drafting and negotiating a contract, managing and monitoring the process flow, holding inventories, delivery and transportation, servicing and maintaining ongoing agreements, communication and establishing relationships. In fact, transaction costs encompass virtually everything besides true production costs and exist in every exchange relation (Sako 1992). The optimizing or minimizing of transaction costs is considered to be an important driver in the development of an organizational structure (Williamson 1985), Galvin and Fauske 2000 claim "transaction costs shape the organizational behavior and structure" and Leffler et al. (1991) state "contracting parties will choose the organizational and contractual forms which minimize the costs of transacting".

2 Lean Supply Chain Management

Lean thinking does not start or end with the production process. Within an organization it requires a fundamental change from discrete departments, all jealously guarding their own empires, roles, ideas, information, and direct reports to a new form of ***'collaborative'*** organization. Communication barriers have to be broken down and information made transparent and easily available. This requires a shift toward a process view of cross-functional teams dedicated to problem solving and driving out waste to enhance value and optimize the value stream. The latter concept concerns the end-to-end processes that deliver value to customers. These include all the sequences of operations as much as it concerns the optimization of supplier and logistics channels to market. The goal of the *lean* supply chain manager is to find a solution, a combination of outsourced and insourced products and services, that economizes on the sum of production, transaction, and management costs. One approach is to choose an organizational form that minimizes cost; the other is to develop cooperative trading relationships based on trust and developing a strategic network that is economically viable.

A collaborative supply chain could simply mean that two or more independent companies work jointly to plan to execute supply chain operations with greater success than when acting in isolation. (Simatupang and Sridharan 2002). Alternatively, collaboration is described as a particular degree of relationship among (supply) chain members as a means to share risks and rewards that result in higher business performance than would be achieved by the firms individually. (Lambert et al. 1999). Recently the sustainability of collaborative supply chains has been questioned (Barratt 2004; Fawcett and Magnan 2002; Sabath and Fontanella 2002). The problems range from difficulties in implementation (Sabath and Fontanella 2002), overreliance on technology (McCarthy and Golocic 2002) and lack of trust between trading partners (Ireland and Bruce 2000; Barratt 2004). Barratt (2004) considers that there is a greater need for understanding of the basic

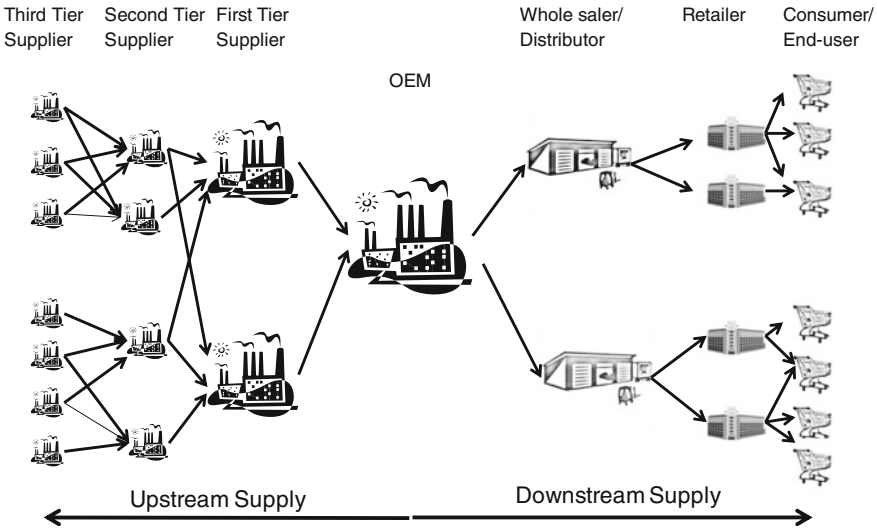

Fig. 1 The shape of "ordered" supply chains

elements of collaboration, particularly the integration of the relevant strategic, cultural, and implementation elements and argues that internal collaboration has the potential to enable internal integration and overcome functional myopia yet has proven elusive as organizations have pursued external collaboration to the detriment of internal issues. The type and level of collaboration depends on the scope of the collaboration: vertical, horizontal, or both (Simatupang and Sridharan 2002).

Upstream and downstream activities (Fig. 1) are therefore part of the lean enterprise and collaboration and communication with suppliers and customers is essential if the product is to flow seamlessly from raw materials to customer. According to Womack and Jones (1996, p. 241), "Even Toyota, the leanest organization in the world, has not yet fully succeeded in creating lean enterprises from raw materials to finished product". Although their first- and second-tier suppliers (direct and indirect levels) operate their production facilities in accordance with the Toyota Production System, their third-tier suppliers are inconsistent. The upstream raw materials suppliers have, so far, resisted Toyota's attempts to streamline their operations and are still firmly stuck in batch production. Raw material suppliers of steel, aluminum, glass, and resins account for 42 % of Toyota's manufacturing cost (Hines 1997) so the real challenge for Toyota is to convince these to change their thinking and behaviors.

Oliver and Webber are described by Svensson (2001) as the founders of the concept SCM. They conducted a study of organizations in the US, Japan, and Western Europe and concluded that traditional approaches to integrate logistics channels failed. "We needed a new perspective and, following from it, a new approach: supply-chain management" (Oliver and Webber 1982, p. 64). They

contend that SCM differs from traditional production and materials management in four respects.

1. SCM views the supply chain as a single entity rather than relegating fragmented responsibility;
2. It calls for, and in the end, depends upon, a strategic approach;
3. It provides a different perspective on inventories;
4. It takes a systems approach.

In this chapter, we argue that lean SCM encompasses all of these and involves a strong focus on behavioral operations management that includes a high-performance relationship element as well as high-performance operational element. Further, behavioral operations around trust, power, and equity are key factors in both.

3 Behavioral Operations Perspective in High Performing Supply Chains

Traditional purchasing and supply management practices have been described as adversarial and *arms-length* where buyers and suppliers have negotiated on price. Within these purchasing environments there have been little need, or desire, to develop close relationships. The unit of currency was the purchase order that resulted from a single transaction. Traditional supply relationships and supply chain partnerships are compared in Table 1 that shows that short-term contracts are replaced by long-term alliances with few suppliers. In these environments relationships take on a strategic importance where trust, commitment, and power influence the strength and quality of the trading arrangement.

Two forms of contractual relationships are described by Sako (1992, pp. 9–29) as Arms-length Contractual Relation (ACR) and Obligational Contractual Relation (OCR) which represent the two ends of a multi-dimensional spectrum. ACR is typified by discrete economic transactions where the account is settled at the conclusion of the transaction. Neither party is obliged to continue the relationship nor are they controlled by the other. All dealings are conducted at arm's length and if unforeseen problems arise they are settled by legal or other rules. In contrast

Table 1 Adapted from Stuart 1993

Traditional supply relationships	Lean supply chain partnerships
Focus on cost for supplier selection	Multiple criteria for supplier selection
Short-term *contracts* for suppliers	Long-term *alliances* with suppliers
Large supplier base	Few suppliers
Proprietary information	Shared information
Suppliers are perceived as part of the *problem*	Suppliers are involved in finding *solutions* to problems

OCR involves a contract that is embedded in mutual trust and is characterized by a high level of interdependence.

The ACR-OCR framework illustrated in Sako 1992, p. 16 takes a system view of the factors influencing the inter-firm relationships to describe buyer–supplier transactions. The framework takes the view that no economic transactions take place in a vacuum but are influenced by a complex socio-economic environment. This section discusses some of the relationship theories and concepts that influence the inter-company and inter-personal relationships within an integrated supply network.

3.1 Power

The literature suggests that factors that are critical to the buyer–supplier relationship such as trust, commitment, cooperation, compliance, conflict, and conflict resolution are strongly influenced by power (Brown et al. 1995; Maloni and Benton 2000). Lukes (1994) defines power as "the ability of actor A to make actor B act in a manner it might not have done". Depending on how the dominant party chooses to use the power-dependency relationship, purchasing strategies can be described as competitive, cooperative, and command.

Cox has been at the forefront of the debate about the role of power in supply chain relationships. He examines the buyer–supplier power relationships within the supply chain and questions the assertions of the lean community of the *win–win* and trusting long-term relationships of ***lean supply*** (Lamming 1993; Lamming et al. 2001); ***network sourcing*** (Hines 1994); and ***partnering*** (Macbeth and Ferguson 1994). According to Cox (1997, 2002, 2004) Japanese supply practices tend to be characterized by high levels of buyer dominance over supplicant suppliers (Cox 2004, p. 348) and Toyota's structural dominance approach (Cox 1999, p. 172). He argues that, although the ***agile*** school agrees in principle with long-term collaborative relationships, they point out that "the high volume and highly standardized demand and the supply circumstances in the car industry are not replicated in all other types of industries. In many industries—fashion goods, construction, publishing, for example—demand and supply vary significantly making *lean* approaches to sourcing very difficult" (Cox 2004, p. 348). He argues that the sourcing options and relationship management approach is contingent upon the demand and supply circumstances of the interchange; horses for courses (Cox 2003).

According to Cox (2003) the effect of buyer–supplier power is one of both facilitation and constraint. The desired outcome of the dominant party will be facilitated while those of the dependent party will be constrained. Maloni and Benton (2000) showed empirically, the importance of power within the supply chain. Their findings are summarized below:

- Power plays a significant role in the supply chain, and the different sources of power have contrasting effects on inter-firm relationships in the chain. Thus, both the power source and the power target must be able to recognize the presence of power, and then reconcile supply chain strategy for power influences.
- Exploitation of the supply chain by the power partner may lead to dissension and under performance, thus hurting the power holder. Likewise, a judicious use of power may serve to benefit the power holder.
- Influences of power on the buyer–supplier relationship and subsequent effects of this relationship upon supply chain performance expose the potential of power as a tool to promote integration of the chain and empower higher levels of performance. This performance benefit incites the power holders to take a second look at their positioning of power within supply chain strategy and urges a more conscious, considerate use of power.

Rich and Hines (1997) reject the argument that Japanese companies have achieved greater supply chain integration and operational benefits as a result of the power imbalance and propose a three pillar methodology as a general framework. They claim that policy deployment, cross-functional management, and supplier integration is generally applicable to most organizations and cite examples from distribution (RS Components) to FMCG (Proctor and Gamble).

However, according to Benton and Maloni (2005) "it may be argued that a firm with significant power might not find it necessary to establish the win–win alliance since it can achieve its own profitability and effectiveness through control of its suppliers (dependents). In other words, firms with the bargaining power have little if any reason to yield control or to withhold exercise of such power. In seeking their own profitability and success, the dominant firms may be better off pursuing their own individual supply chain agendas, submitting to a joint planning partnership only as much as the balance of power dictates".

3.2 Trust

Transaction costs are considered to be reduced in a relationship with high levels of trust (Williamson 1985). Jarillo (1993) focuses on the reduction of transaction costs in a network where entrepreneurs invest in building mutual trust. Trust has a role in reducing uncertainty and risk in an economic transaction thereby reducing transaction costs (Sako 1992, p. 37). In her book, *Prices, Quality, and Trust* Mari Sako (1992, p. 38–39) defines three categories of trust:

1. *Contractual trust*. The moral duty of both partners to execute their obligations. Suppliers are trusted to produce the required quantity of goods at the specified time and buyers are trusted to pay for these within the time agreed. The contract may be written as in a purchase order, or contract, but may also be verbal.

Contractual trust relies on the keeping of promises and covers explicit and implicit agreements.
2. *Competence trust*. The expectation that the trading partner is technically competent to perform the exchange. On behalf of the supplier this is to supply the product or service to the required specification and for the buyer to competently specify and make the transaction and payment.
3. *Goodwill trust*. The trust that is expressed as a willingness to do more than expected.

Both ACR and OCR relationships rely on *contractual trust* and *competence trust* but *goodwill trust* exists only in OCR relationships. According to Sako "What distinguishes 'goodwill trust' from 'contractual trust' is the expectation in the former case that trading partners are committed to take initiatives (or exercise discretion) to exploit new opportunities over and above what was explicitly promised" (p. 39).

Contractual trust and *competence trust* can be gained by screening and audits but *goodwill trust* is contextual and only gained within a relationship and develops over time and through shared experiences. Therefore, the investment costs are very high and a long-term perspective is required to recoup the investment. Fawcett et al. (2004, p. 20) think that trust is still not clearly understood by managers in the west but argue that a lack of trust is "the greatest obstacle to advanced supply chain collaboration". They further describe four dimensions of supply chain trust:

1. The performance dimension—trust depends on consistently doing what you say you will do.
2. The information sharing dimension—trust requires open and clear information and vice versa open and clear information requires trust.
3. The behavioral dimension—sharing of risks and rewards and the willingness to invest in supply chain partners capabilities.
4. The personal dimension—trust is personal and developed through one-on-one meetings and customer and supplier visits made by cross-functional teams.

According to Fawcett et al. (2004, p. 24) Honda's Teruyuki Marou said "Suppliers do not trust purchasing because purchasing means cost, but they must trust you. Suppliers must develop confidence in you." These views are supported by other writers. Bowersox et al. (2000) state "effective information sharing is heavily dependent on trust beginning within the firm and ultimately extending to supply chain partners". Ellram and Cooper (1993) and Gardner and Cooper (1993) consider that if information is shared openly then opportunistic behaviors are reduced. Beccerra and Gupta (1999, p. 197) agree and state "in low-trust relationships, people protect themselves by sharing less information and taking more conservative actions". They also consider the personal dimensions and acknowledge that "business occurs among people who have biases, cultures, attitudes, experiences, and interact with each other through time. A certain level of trust will grow with each relationship" (Beccerra and Gupta 1999, p. 198). The use, or rather misuse, of coercive power on the other hand diminishes trust.

Trust can be both the antecedent and consequence of asset specificity (Ik-Whan and Suh 2004) but the relationships are very complex. Asset specificity affects trust and transaction costs. Where asset specificity is high the risk of opportunistic behavior is greater and trust is lower resulting in higher transactions costs. However, the converse is also true; where trust is high the willingness to invest in specific assets is also higher; but as these assets increase, the dependency on the supply chain partner also increases. The possibility of opportunistic behavior is much more damaging when one party has assets highly specific to the relationship (Beccerra and Gupta 1999. Ik-Whan and Suh (2004) propose that trust leads to commitment while Fynes et al. (2005) present empirical evidence that communication has a positive effect on trust that, in turn influences commitment and adaptation (transaction specific investments) that positively correlate with quality and cost.

3.3 Equity

The supply chain network consists of links and nodes that are individual firms. The network chain, or web, is only as strong as its weakest link. Satisfaction has a key role in strengthening the relationship. "Thus, a manufacturer cannot be responsive without ***satisfied*** suppliers, and the benefits of such a relationship cannot be transferred to the end customer unless the distributors align with this manufacturer's strategy as well. At the same time, a manufacturer cannot produce quality products without pushing quality responsibility upstream to its suppliers. SCM involves the strategic process of coordination of firms within the supply chain to competitively deliver a product or service to the ultimate customer" *(*Benton and Maloni 2005, p. 2). They define supplier satisfaction in the supply chain as "a feeling of ***equity*** with the supply chain relationship no matter what power imbalances exists between the buyer–seller dyad."

The notion of "equity" is associated with justice and fairness. The individual fundamentally believes that they are being treated fairly in comparison to what they see others receiving. Adams (1963) advanced the proposition that we each, on acting to satisfy our needs, assess the equity or fairness of the outcome we perceive. Adams equity theory can be applied to the manufacturer—supplier dyads to motivate partners to work for the optimization of the whole chain.

Torrington et al. (2002) describing Adams' Equity Theory state that "we are concerned that rewards or outputs equate to our inputs and that these are fair when compared to the rewards being given to others." They argue that low trust relationships exist where people feel they are not being treated fairly. This would suggest that where powerful business customers exert their power unfairly the suppliers perceived equitable rewards are reduced and trust is compromised.

The concepts of power and trust do much to create a model of relationship management but these concepts are not very informative unless motivations are investigated and therefore the concept of supplier equity in the relationship is seen as the final aspect upon which to ground this study. Having outlined the background theory underpinning supply chain management, this chapter will return to the features of modern lean businesses, the use of power, trust, and equity in the design of supply chains that support high performing businesses.

4 Evolution of the Lean Supply Model

4.1 Supply Chain Management in the West

Purchasing practices at Ford's Highland Park plant consisted of dual sourcing and competitive tendering with prices held for six to twelve months (Lamming 1993 citing Sorenson 1956). Henry Ford distrusted his suppliers and proceeded to vertically integrate. This became an obsession until he owned everything. The Model T was built with Ford-owned glass and steel made from Ford-owned ore, coal, and timber but huge capital investment bought inflexibility and high fixed costs. The complex was so inflexible that even small changes came at huge costs (Lamming 1993 citing Chandler 1964). However, the component supply model for the first decades of mass manufacturing was classic vertical integration. Although General Motors followed this approach they were accidentally introduced to subcontracting and in 1921 under Sloan decided not to operate in the component market but rely more on outside firms.

The European component suppliers originated in the highly skilled craft industry and although, US style mass manufacturing ideas were popular in which many small specialized firms remained. However, some large assemblers approached high levels of vertical integration. Following the Second World War, the political climate in Europe resulted in a number of companies coming under public ownership and financed wholly, or partly, from government sources. This gave rise to strong national identity characteristics and company-specific issues dominated (Lamming, op. cit. p 14).

A major transformation occurred in the post-war years in the customer base for automobiles; they wanted variety, and also at this time tariffs were removed allowing the Europeans to develop a steady market for their small cars in the US. This gave them the opportunities to gain economies of scale and to be able to compete with the US giants. With competition came the demand for sophisticated and innovative components that were more successfully produced from independent component suppliers; although vertical integration with fiercely adversarial out-sourcing remained the norm for US and European automotive suppliers for many years to come (Lamming op. cit. p 16).

4.2 Supply Chain Management in Japan

By contrast to Western style supply chain management, the Japanese had evolved from a very different financial model. The first era of Japanese industrialization saw family-owned holding companies, ***zaibatsu***, controlling industrial empires that consisted of a large company in each major sector steel, shipbuilding, construction, insurance, finance (Womack et al. 1990, p. 193). Banks were included in the holding company and finance for investment came directly from the bank. These *zaibatsu* were disbanded, along with their assets, by the Americans during the occupation of Japan following World War II.

Nishigushi (1987, 1994) describes the emergence of *strategic dualism* in 1920s as the foundation for Japanese subcontracting. Dualism, a strategy through which an assembler tries to outsource certain items while maintaining the manufacture of key components, was the strategy that Chrysler traditionally followed until the late 1980s. Relationships between assembler and supplier are extensively *arm's length* (Nishigushi 1987, p. 2). Subcontracting developed rapidly from 1930s onwards in response to sudden surges in demand. During the period 1931–1939 Toyota developed its supply base by buying parts directly from the US companies, disassembling them and seeking local firms to copy the parts (Cusumano 1985, p. 64). There were no long-term relationships with suppliers at this time and innovation and quality were poor (Cusumano 1985, p. 66). As subcontracting became more widespread purchasing became more important. Both Toyota and Nissan developed their purchasing departments during this time. In 1939 around 66 % of the manufacturing costs, excluding raw materials, of a Toyota motor vehicle was attributable to purchased parts. Purchased components were divided into three types (Nishigushi 1994, p. 37):

- General purchasing
- Special purchasing
- Specialty factory purchasing

General purchasing is for items that require no specialized manufacture and can be bought from many suppliers, who can easily be switched. Special purchasing and specialty purchasing are with suppliers that have expertise and require close ties both, financial and/or capital; signaling a move toward asset specific resources. This arrangement was strategic in intent and set in Toyota's internal rules.

Supplier associations (***kyoryokukai***) were a product of the government's wartime program of organizing the subcontractors into channeled groups (***keiretsui)*** (Nishigushi 1994, p. 39). In contrast to the financial holding of a *zaibatsui, keiretsui* members are held together by cross-locking equity structures and the system was glued together by a sense of reciprocal obligation (Womack et al. 1990, p. 194–195). Toyota's *kyoryokuka* was formed in 1943 between Toyota and twenty key subcontractors. Strategic dualism remained the basis of *keiretsui* supplier relationships until the 1960s with prime contractors beating down prices until the government intervened to prevent unfair practices. During this time the automotive

sector were pioneering more harmonious and goodwill relationships but these were not apparent in the post-war Japanese electronics industries that were neither benevolent nor trusting.

Considerable changes emerged in the 1960s that lay the foundations for Japanese models of ***relationship contracting*** (Sako 1992; Dore 1987), ***partnership*** (Carlisle and Parker 1989; Ellram 1991; Macbeth and Ferguson 1994); ***Co-makership*** (Merli 1991); ***lean supply model*** (Lamming 1993); and ***network sourcing*** (Hines 1994, 1996). Network sourcing is described as "a model derived from the observation of best practice buyer–supplier relationships from around the world, but particularly from Japan" (Hines 1996, p. 19). Hines (1994, 1996, p. 8) identified ten characteristics that defined the Japanese Network Sourcing model:

1. A tiered supply structure with heavy reliance on small firms;
2. A small number of direct suppliers with individual part numbers sourced from one supplier, but within a competitive dual sourcing environment;
3. High degrees of asset specificity among suppliers and risk sharing between customer and supplier alike;
4. A maximum 'buy' strategy by each company within the semi-permanent supplier network, but a maximum 'make' strategy within these trusted network;,
5. A high degree of bilateral design employing the skills and knowledge of both customers and suppliers alike;
6. A high degree of supplier innovation in both new products and processes;
7. Close, long-term relations between network members involving a high level of trust, openness, and profit sharing;
8. The use of rigorous supplier grading systems increasingly giving way to supplier self-certification;
9. A high level of supplier coordination by the customer company at each level of the tiered supply structure;
10. A significant effort made by customers at each level individually to develop their supplier.

The network sourcing model recognizes the reorganizing of subcontracting into tiers that moved the supply structure from semi-arm's length to a systematic ***clustered control*** (Nishiguchi 1994, p. 122) based on a pyramid structure. The firms at the apex of the pyramid buy complete assemblies and system components from a concentrated, clustered base of first-tier subcontractors, who buy specialized parts from second-tier suppliers, who buy discrete parts or labor from third-tier subcontractors, etc. Nishigushi (1987) recognizing that the *keiretsu* is not a closed system reorganized the pyramids into an interlocking form that he called the Alps structure.

The shift from discrete purchasing to complex asset-specific industrial contracts required different means of pricing and value analysis (VA) techniques developed by General Electric's purchasing department were adopted and became widely used in Japan from 1960s. Detailed cost breakdowns of value-added components paved the way to rational price determination rather than negotiating price downstream. Suppliers and subcontractors investigated ways of reducing costs by joint improvements, sharing the benefits and buyer–supplier profit sharing rules

were developed and traditional unilateral price determination shifted to bilateral price agreements (Nishigushi 1996, p. 125). Along with this shift in price negotiations was the move toward participation in new production development and innovation. Nishigushi (1996, p. 125) describes it as "the logic of contractual relations moved from exploitation to collaborative manufacturing".

Ansari and Modarress (1988) argue that lean supply chain efficiency is primarily achieved through complete support and cooperation of suppliers. They list the following activities as major components of lean supply purchasing.

1. Small purchase lot sizes, delivered in exact quantities.
2. Few suppliers, ideally one per component or family of parts
3. Supplier selection and evaluation based on quality and delivery performance as well as price, rather than solely a price decision
4. No incoming quality inspection
5. Looser design specifications giving the supplier more freedom in meeting specifications
6. No annual rebidding compared to traditional annual tendering
7. Standard containers
8. Reduced and less formal paperwork.

Other authors (Manoochehri 1984; Freeland, 1991; Schonberger and Gilbert 1983) have, in addition to these, included other practices.

9. Deliveries synchronized to buyer's production schedule
10. Geographically close suppliers
11. Improved data exchange

Other studies of lean supply (JIT) and purchasing in the Spanish auto-components industry (Gonzalez-Benito et al. 2000; Gonzalez-Benito and Spring 2000; Gonzalez-Benito and Suarez-Gonzalez 2001 and Gonzalez-Benito 2002) found three factors that need to be taken into account when designing a high-performance supply chain: product variables (the characteristics of the exchanged product or service); the buyer and seller organizational variables and variables associated with the marketing environment.

In a study of Mexican manufacturing plants, Lawrence and Lewis (1996) reported that quality, customer service, and productivity were higher where JIT logistics and supplier involvement practices were noted. This supported by Fawcett and Birou (1993) who argued that there is a direct relationship between JIT purchasing and reported financial benefits: reduced administrative, inspection and inventory costs, as well as other benefits such as: quality, productivity, and improved scheduling.

The literature highlighted many common implemented, or technical, features which support high performance—the lean supply features. These design issues have been used to compile the model. Table 2

Relationship theories are applied to a study of the supply chain for premium printed packaging to two FMCG companies where the packaging is an integral part of the product, used for protection, information and differentiation of the product

Table 2 The concepts of high-performance relationship management identified in the literature

	Concept	Features	Author(s)
High-performance relationship management	Trust	Involvement, commitment, information sharing, and transparency	Sako(1992), Dore (1987), Hines(1994), Nishiguchi (1994), Lamming (1993), Ellram and Hendrick (1995), Fawcett (2004), Chu and Fang (2006), Johnston et al. (2004)
	Cost transparency	Better cost control; open-book costing; selfinvoicing	Merli (1991), Lamming (1993), Lamming et al.(2000)
	Dependency	Dedicated assets; shared destiny; colocation	Ansari and Modarress (1988), Schonberger and Gilbert (1983), Merli (1991),Lamming (1993), Hines (1994), Gonzalez-Benito and Spring (2000)
High-performance operational JIT/Lean Purchasing	Kanbans with suppliers VMI	Reduced inventories; improved material availability; frequent deliveries; small lots; standardized containers	Ansari and Modarress (1988), Chen et al. (2005), Chyr et al. (1990), DeToni and Zamolo (2005), Disney and Towill (2003), Dong and Xu (2002)
	Time compression (Reduced lead-time)	Reduced batch sizes; reduced set up and changeover times	Fine (1998), Ansari and Modarress (1988), Schonberger and Gilbert (1983), Rich (2002), Gonzalez-Benito (2002)
	EDI	Integrated IT systems; production schedules; and stock visibility	Ansari and Modarress (1988), Schonberger and Gilbert (1983), Merli (1991), Ellram and Hendrick (1995), Waller(1991), Gonzalez-Benito and Spring (2000)

from the competition where, because of the uniqueness of the packaging, asset specificity is high and trust is a key element in the supply relationship that influences both the relational and the operational elements of lean supply.

The supply of printed packaging to FMCG receives scant attention in the lean/JIT literature, restricted mainly to flexibility of in-line label printers, yet the reliable provision of high-quality printed packaging, whether this is in the form of folding cartons, decorated tins, boxes, bottles or tubes is essential to maintain the flow of FMCG manufacturing in the consumer-packaged goods sector. This chapter, which builds partly on the work of Gonzalez-Benito and Spring (2000), seeks to address this and presents the findings of a study that investigated the relationships and supply chains of two major FMCG companies with their printed packaging suppliers.

5 Research Approach

This chapter reports the findings from a case study of packaging supply chains in the FMCG sector. The two cases selected represented users of high quality printed packaging designed for use in the high-end FMCG market. Clearly observations from only a few organizations are not likely to be representative of the entire industry. However, Hartley (1994) counters this argument by observing that statistical generalizations might be out of date by the time they are interpreted, whereas a description of the processes might be valuable.

The unit of analysis was the packaging purchasing process carried out within each organization. This avoids the problem of ambiguity by analyzing the process, and the managers perceptions of the process, rather than the overall performance of the purchasing functions within the organizations. Eight purchasing managers from the two case firms were surveyed and account managers, production managers and packaging technologists from six packaging companies in three sectors participated in semi-structured interviews and site visits.

6 Case Studies

Fusion (a coded name) was established in Europe over two hundred years ago to produce a range of paper products in the FMCG market. The product has changed little over the years but the lifestyle marketing of the product and the target consumer market has changed. At the height of production there were five factories throughout Europe, with two in the UK. Subsequent market decline has closed most of these, leaving one in the UK and other one in mainland Europe.

The production involves preparing the paper products and packing them in various formats and styles for end-user consumption through retailers. Fusion is sold by a range of retail customers range from large multi-national supermarkets to small independent shops. Fusion is the brand leader for these products and they

operate in a cost-conscious, price sensitive market where on-shelf availability and quality reliability are key competitive drivers.

Phobos (a coded name) was established in the UK in 1900 and has served the UK market continuously since this time. They have successfully established markets in Europe and the Far East over the past two decades. Phobos produces high-end, luxury consumer products in a competitive environment. The packaging serves to protect the product for consumption and to differentiate it from the competition. The products are packed in a variety of formats including gift packs and comprise folded cartons, decorated tins, and printed laminates and films.

Both organizations have a long and varied history in supplying FMCG to the European market and both have, at some time in their past, been separately vertically integrated, owning their own in-house printers and controlling their own packaging supply chains. Both now purchase their packaging from UK and European printers and converters. Packaging materials represent over 20 % of the final product cost and is a significant element of the product. The criticality of the product is such that any component of the packaging that is sub-standard, or not available, means that the product cannot be shipped and, in most cases, cannot complete manufacture.

The research compared the results found in the case studies with the published literature on the characteristics of lean supply chains (Manoochehri, 1984; Ansari and Modarress 1988; Freeland 1991; Schonberger and Gilbert 1983). However, the packaging supply chain, in contrast to other studies, is characterized by highly developed suppliers, often more technologically advanced than the customers. In addition, the suppliers produce for a variety of FMCG customers and are exposed to a number of advanced practices and ideas, often ahead of more traditional organizations, so some of the concepts, such as supplier development and training, applies more to supply chains where the advanced organization is the downstream producer.

7 Research Findings and Reflections

The findings support the conclusions of Gonzalez-Benito (2002) that there are two components of lean supply; an operational component and a relational component (Fig. 2). In this study, the packaging supply chain was found to be relatively well developed in the relational components that are influenced by organizational characteristics but poorly developed in the operational elements that are influenced by the product characteristics such as volume, variety, specificity, and economic value.

These findings are consistent with the findings of Gonzalez-Benito et al. (2000) that operational and complementary practices can be implemented separately. The operational practices are inherent in a lean environment but the complementary practices that depend on trust and cooperation between supply partners are appropriate to all manufacturing environments. They further prove that operational

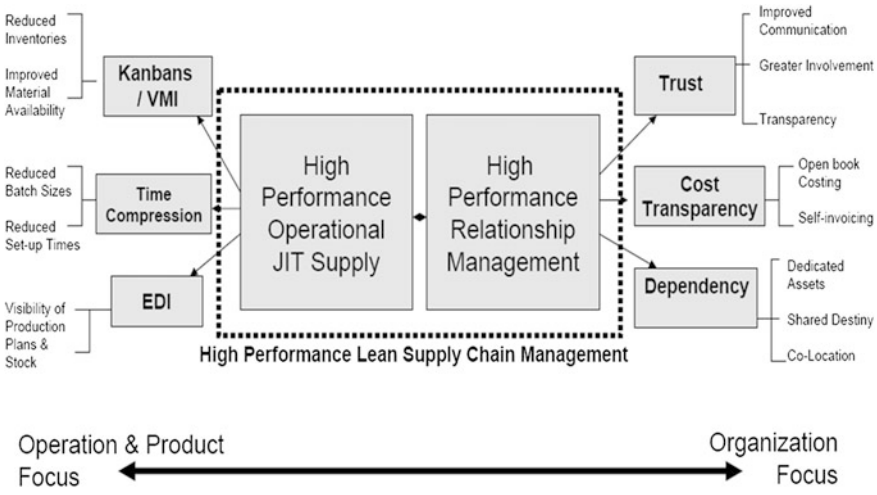

Fig. 2 Model of high-performance lean supply chain management

practices cannot be fully implemented without the presence of the complementary practices, suggesting a maturity pathway.

The concepts of high-performance relationship management accepted from the literature review are:

- Trust
- Cost transparency
- Dependency

7.1 Trust

The features of a trusting relationship are:

- Improved communication and information sharing
- Transparency and openness of information
- Involvement in new products and processes

Trust reduces transaction costs due to absence of opportunistic behaviors. Power and equity affect trust but power comes in several forms:

Coercive power	based on the ability to punish
Reward power	based on the ability to reward
Legitimate power	comes with the formal position or title
Referent power	-based respect or charisma
Expert power	that comes from having expertise in a particular area

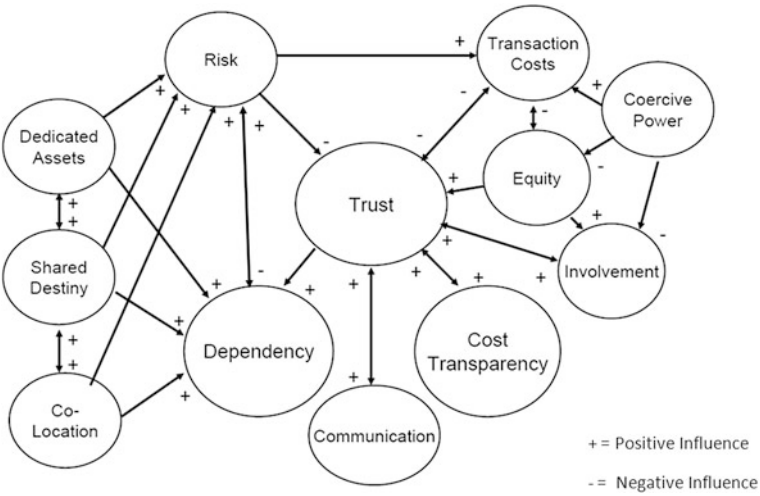

Fig. 3 Interactions of variables in high-performance relationship elements

The use, or abuse, of coercive or reward power will achieve compliance but will erode trust and encourage suppliers to behave opportunistically if they feel a perceived loss of equity. The interactions are shown in Fig. 3.

7.2 Cost Transparency

Cost transparency facilitates open book costing and negotiations based on costs rather than price. In an environment of cost transparency self-invoicing is encouraged. Cost transparency depends on trust and cannot exist without trust.

7.3 Dependency

The features of dependency are:

- Dedicated assets
- Shared destiny
- Co-location
- Dedicated assets can be:
  - Physical assets—machines, tools or site
  - Human assets—skills, capabilities or labor resources

Dependency increases risk; so dependency affects trust and is affected by trust.

The case companies shared a high level of trust, cost transparency, and mutual dependence with their critical packaging suppliers. Trust and dependency was influenced by the nature and duration of the contractual relationship and by the asset specificity where only 25 % of the purchasing managers had more than two suppliers for any given category of product and all of the purchasing managers single-sourced each product line at any given time. This may be for the duration of the product life or the supply contract. The average length of the supply relationship was greater than 10 years for the majority of the purchasing managers, with only 25 % dealing with suppliers where the relationship is less than 5 years. The average length of supply contract is 1 year but two managers had contracts with suppliers for 3–5 years.

As packaging is usually unique to a product, the supplier owns the "tools" or "plates" that are specific to that product. The customer only "owns" the design engraved, or etched, on the plate, or cylinder. In all of the cases studied the supplier holds dedicated machinery or tooling that is product, or brand-specific. In 75 % of cases, the cost of moving to another supplier influenced the decision of the purchasing manager to stay with the supplier for the life of the product. So asset specificity is a dominant factor in printed packaging and is highly influential in supplier selection and choice as supplier switching is unlikely.

This model indicates where the relationship variables of trust, power, and equity positively or negatively impact on each other and/or act to increase or decrease the adoption of the elements of a supply relationship model. For example dedicated assets, shared destiny, and colocation increases risk and dependency yet, while high risk can negatively impact on trust, dependency is strengthened in a trusting relationship. Similarly transaction costs are increased in a high risk environment where trust is low and coercive power is high. This model was used by the purchasing managers and supplier account managers to rank their perceptions during the cross case comparisons and cross data displays.

However, trust is also a very important variable in the successful implementation of the operational features of a lean supply chain. This supports the work of Gonzalez et al. (2000) who consider that operational JIT purchasing cannot be implemented before the complementary practices. Figure 4 illustrates the interactions between the operational variables.

The characteristics of the product such as volume, standardization and demand variability determine the feasibility of operational JIT supply implementation. While none of the packaging suppliers mentioned that they developed Kanbans with any customers, several said that they had produced JIT for large customers where the products were standard and the demand stable. All of the suppliers reported that they managed stocks for some of their customers; this is either vendor managed inventory (VMI) against agreed minimum stock levels, or comanaged (CMI). For some FMCG manufacturers with high volume turnaround or volatile demand, the packaging is held at the customer as consignment stocks and invoiced on crossing the line into production. All of the suppliers in this study reported that they had some customers who self-invoiced, either once the materials had been consumed from stock or on receipt into their own stock system. Many of the suppliers have EDI arrangements

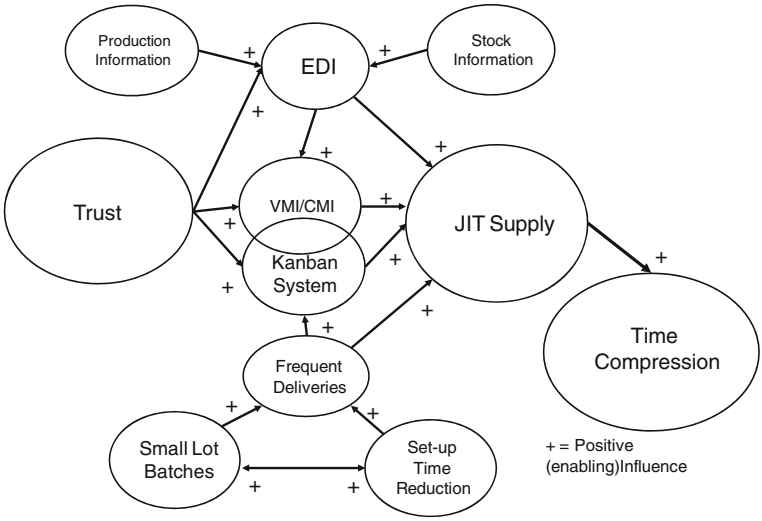

Fig. 4 Interactions between variables of high-performance operational lean supply chains

with some of their customers and generally requirements are transmitted electronically. Some customers give the suppliers visibility of their production schedules but most work from sales forecasts. While not fully adopting lean manufacturing, the main packaging suppliers are actively involved in continuous improvement and various Lean/Six Sigma programs with their customers. Trust appeared to be as significant an element in operational as in relational supply management.

To develop a lean supply model based on reducing inventories and compressing lead-time advocates of lean suggest that a flow, or pull system, is implemented. Central to this would be reducing batch sizes and establishing JIT deliveries synchronized to real customer demand. Inventory models such as VMI or CMI may be part of this solution, as would kanbans or other forms of demand signaling. All of these require a high degree of trust. The manufacturer would need to trust that the supplier could meet the tight delivery schedules with good quality parts or materials. The supplier would need to trust that the customer would provide them with high quality data to manage their own production and to meet the payment terms. Without trust a lean supply could not be established and could not function. In a true high-performance lean supply chain sharing of electronic data or production schedules is possible, but again this can only happen in a relationship of mutual trust.

8 Conclusions

The main research findings are that lean SCM consists of two elements, operational JIT/lean purchasing and high-performance relationship management. The extent and successful implementation in the packaging industry is contingent upon

the product variables; production volume, product standardization; and demand variability. Other variables such as economic value, fragility, and specificity have impact in other industries (Gonzalez-Benito 2002). In this example of printed packaging to both companies, all products are considered specific as the products are generally single-sourced for each product design. Packaging is not considered to be high-value items in economic terms. However, it is considered of high strategic value as the products cannot complete manufacture, and cannot be shipped, if the packaging is not available. The packaging components are not fragile in that they are easily broken, but they can be damaged and, hence unsuitable for manufacture, if poorly stored and handled; a risk that is increased if inventories are high.

The success of implementing relationship management depends on length of relationship, characteristics of the organization, and the policies and practices that are perceived as trustworthy and equitable. In order to build on these variables the supply base needs to be small and success is higher where the actors are mutually dependent and where there is a perception of common destiny. It is also enhanced when there is a sense of shared history and mutual responsibility.

The implementation of high-performance relationship management is independent of the industry and can be applied irrespective of the production environment. Conversely, the JIT/lean operational practices depend on the supply relationships that support them and they can only be fully implemented in a JIT/lean operating environment (Fig. 5). This suggests that there is a maturity path toward the Lean Enterprise which starts by developing high-performance relational management that is a necessary precursor to lean production and operational JIT/lean. Trust appears to be a significant element to both relational and operational lean supply chain management.

Undoubtedly a strong customer has power over a smaller, or dependent, supplier, and can force the supplier to comply with customer requirements. However, coercive power does not elicit long-term commitment and affects the level of trust and equity in the relationship. The risk of the suppliers in a coercive power relationship behaving opportunistically is high and the relationship may not survive long term.

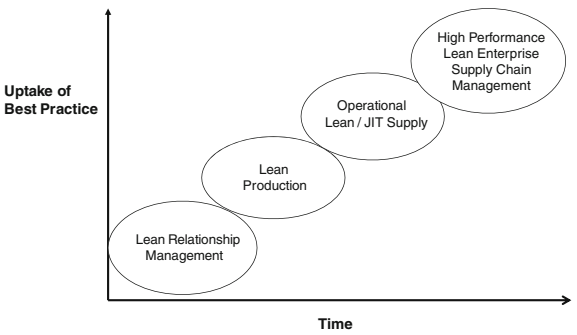

Fig. 5 Maturity path from lean supply relationship management to the lean enterprise

In summary a lean supply chain can be described as a system, whose design is contingent on the product variables, the socio-technical organizational characteristics of all partners and the organizational structures that support them. Behavioral operations of SCM are of crucial importance to developing high-performance lean supply chains.

Finally, to appreciate the benefits, and to proactively seek to improve and implement best practice, requires that the organization understands best practice and has the capacity to learn; this may be contingent on the organization, its structure and its exposure, and openness to new ideas.

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