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# Supply Chain Configuration Revisited – Challenges and Strategic Roles for Western Manufacturers

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## 1. Introduction

Globalization is revolutionizing the way manufacturers operate and perceive themselves (Coe et al., 2008). A key question in the pursuit of excellence in global value chains remains: from where does the firm primarily derive its competitive advantages? Does the firm primarily rely on the marketing- and positioning-oriented aspects, which it derives from product/service development, or from its operations resources and capabilities? Arguing against current governing beliefs, this chapter claims that sustainable competitive advantage may be gained through excellence in operations capabilities, as firms purposefully work their way around traditional tradeoffs. Forward-thinking companies see their global value chain as an opportunity to innovate their operations systems, seeking lower cost, new manufacturing capabilities, improving customer responsiveness, and entering new markets, but also realizing that tapping into these opportunities requires a fundamental rethinking of their current supply chain configuration. In the pursuit of this rethinking, these companies have succeeded in developing innovative and robust operations networks, from which they build and sustain competitive advantages. This chapter takes its outset in four such companies that have been through this transition, but with different initiating conditions, different sets of choices with regards to process and content, and with different supply chain configurations as outcomes. We know of their success, but have little knowledge about why. Therefore, in this chapter, we aim to map and understand the current conditions and process for supply chain configuration and its effects on the resulting supply chain configuration.

The increased scale and scope of global operations, both with respect to markets and supply, has broadened the scope of manufacturing and supply chain management. The supply chain has undergone a radical fragmentation geographically as well as in terms of functional sub-categories and organizational boundaries, leading to an ongoing reorganization of the value chain on a global scale. This has partly rendered the division between operations management and supply chain management obsolete.

At the same time, drastic reductions in product lifecycles and delivery times have eliminated inventories and, as a consequence, have called for management of interdependencies among subsystems. This means that increased complexity has worked its way into supply chain management partly induced by the nature of activities and partly by the organization

of these activities. In addition to this increased complexity, the environment has become more dynamic. Not only do we experience more frequent changes in customers' preferences, but we also see them in products and processes. But the direction of change has become more difficult to predict. This calls for an unprecedented capability of a supply chain system to become agile, but also to make the most from the global resources the company appropriate.

In the midst of these transitions, the role of manufacturing in Western economies has been questioned, and the quest for higher-value-added activities has been strong, leading to an unprecedented wave of outsourcing and offshoring initiatives. This wave, however, builds on the basic assumption of manufacturing as a cost function, which reduces the strategic role of manufacturing to complying with global cost structures. This assumption may, though, prove to be faulty (Benedettini et al., 2009), and this chapter makes a call for reconceiving the strategic role of the manufacturing function in Western economies in the midst of global value creation.

The need to look at manufacturing and the supply chain in a new way is supported by the European Union initiative *Manufacture*. A "Vision for 2020" report (European Commission, 2004) describes, among other things, a needed transition in four main areas:

- From resource-based to knowledge-based manufacturing
- From managing a linear process to dealing with a complex operations set-up
- From individual sources of competitive advantage to systems-based competition
- From mono-disciplinarity to trans-disciplinarity

The report emphasizes the need to innovate within manufacturing and to integrate multiple perspectives and disciplines. This also applies to the supply chain, where the above-mentioned challenges to industrial firms call for a capability to quickly reconfigure the supply chain at the same time that increased emphasis should be placed on knowledge and competence development. In response to these transitions, it is argued that we need to provide a broader approach to configuration of supply chains. In this chapter, we shall, therefore, introduce four generic supply chain roles (Full scale, benchmarking, ramp-up, and prototype) and, based on case studies, discuss their implications for the configuration of supply chains.

In the next section, we shall first review the literature on operations networks and manufacturing strategy to provide a background for introducing four generic strategic roles of supply chains. This is followed by a section with four case studies, introduced by a discussion of methodology and concluding with a cross-case analysis. The last section will deal with implications for the configuration of supply chains.

## 2. The network perspective

Literature on the management of multinational enterprises (MNEs) - and in particular the Network Theory, which views the multinational organization as a web of inter- and intra-firm relationships - provides the conceptual foundations of this chapter. According to Bartlett & Ghoshal, an MNE consists of a group of geographically dispersed and goal-disparate organizations that include its head-quarters and the different national subsidiaries (Bartlett & Ghoshal, 1993). Such an entity can be conceptualized as an inter-organizational network that is embedded in an external network consisting of all other organizations such as customers, suppliers, regulators, and so on. These types of organizations exist in

increasingly rugged competitive landscapes, which they need to deal with through ongoing and often non-linear adjustments of internal operations and its supply chain links. This moves the focus away from the simple dyadic relationships between, e.g., the HQ and its subsidiary, the functional domains within the value chain, or the specific decision to invest in a foreign location, to the task of managing a network of established subsidiaries and analysis of the competitive advantages that arise from the potential scope of economics of such networks.

In industrial systems, companies are engaged in R&D, purchasing, production, distribution, and the use of goods and services. We describe such systems as networks of relationships among firms with different levels of task-based interdependencies. There is a division of work in a network, which means that the individual entities develop interdependencies with each other. This also means that coordination is not achieved through a central plan or an organizational hierarchy, nor does it take place through the open-market price mechanism. Rather, coordination is often found to take place through interaction and mutual adjustment among firms in the network, in which cost is just one influencing condition alongside market-serving and knowledge-seeking potentials. The operational environment of the production company is often treated as an exogenous entity and is reified as a source of undefined uncertainties as opposed to being seen as an organizational field consisting of specific interacting organizations. This remains a key problem of our understanding of the operations network, as the discussion remains too abstract to form a basis for concrete decisions.

Shi & Gregory discuss manufacturing networks as integrated rather than aggregated from its parts (Shi & Gregory, 2005). This introduces a systems dimension, which remains poorly understood. The systems perspective calls attention to issues beyond isolated location and capacity choices, and emphasizes the coordinated aspects of operations networks. In the operations literature, this coordination has typically been addressed in discussions of plant roles. Ferdows (1989) defines the operations system as a network of factories, where each site plays a different role, although this framework is biased towards the role of the single plant rather than considering the faculties of the integrated or coordinated network (Ferdows, 1989). While the level of analysis within the discussion of plant roles remains that of the plant, the network perspective points to a need to look at the interaction between plants to understand the dynamic configuration of plants. Today's operational reality points not only to the network of autonomous plants or to the dominating corporate center, but rather raises the need to deal with agglomerates of internal and external partners with changing dispositions and roles.

Conceptually manufacturing networks theory originated in the operations management field, whereas the logistics management perspective dominates supply chain theory (Rudberg & Olhager, 2003). The historical trajectory of the configuration, i.e. whether the starting point is the internal or the external network, influences how the network is operating as well as what capabilities can be mobilized within it (Shi & Gregory, 1998). Research on manufacturing networks has its roots in the manufacturing management of a single factory, resulting in an inclination of scholars to study the network as a wholly owned and internal network where all facilities are under full control. Conversely, research on supply chains from a logistics perspective tends to analyze the network as an external network with facilities owned by different organizations. Logistics research has traditionally focused on the links between the nodes, whereas manufacturing network research tends to focus on the nodes themselves and their internal efficacy.

Rudberg & Olhager introduce the term Value Network as a means to integrating the manufacturing and the logistics-based perspectives, cf. figure 1 (Rudberg & Olhager, 2003). They describe the value network as a network of facilities, possibly owned by different organizations, where time, place, or shape utility is added to a good in various stages such that the value for the ultimate customer is increased. Various purposes may be associated with this network and thereby influence its capabilities, such as the following:

- The market-seeking network; this type of subsidiary is formed around the objective of initiating their operations in emerging economies to capture the local market with an existing range of products, possibly with local adaptations.
- Parallel operation network; within this type, the subsidiary is expected to reproduce, possibly at a smaller scale, the operations at the MNE's original base.
- Efficiency-seeking network; seeks to establish rationalized product subsidiaries specializing in the production of a smaller part of an MNE group's existing product range, aiming to supply this in a cost-effective manner to a wider market.
- Knowledge-seeking network, which at the subsidiary level builds on the incorporation of a customized and higher-value-added functional scope. These subsidiaries are likely to be more securely embedded within the distinctive local economic capabilities.

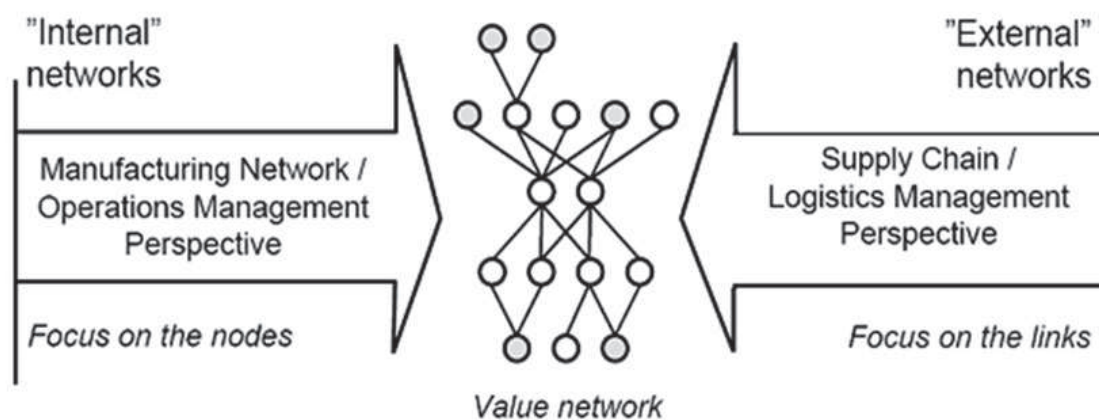


Fig. 1. Value network (source: Rudberg & Olhager, 2003)

According to Wiendahl et al., there are four basic network types (Wiendahl et al., 1998):

- The first type is the Strategic Network; this network is strategically operated through a focal company, mainly a finished product supplier, contractually close to the focal company.
- The second is the Virtual Enterprise, which consists of independent companies working together on the basis of a joint business understanding and aiming to take advantage of an available business opportunity through common operation. The co-operation is confined to a point in time or a relatively short period (like a project).
- The third form is the Regional Network; this is based on a special conglomeration of highly specialized small and medium-sized enterprises within a geographical area.
- The fourth is the Operational Network: The goal of working together is that the company, supported by a comprehensive company information system, is able to capitalize on the performance of partners in the short term, especially in free production and logistic capacity.

In light of these network types, it is necessary to make the case that the ownership ties that exist within the vertically integrated MNE do not necessarily impede the scope of behaviors that are possible among interacting organizations that are not so connected. Control may be limited within multinationals not only because some of the subsidiaries happen to be very distant and resource-rich, but, more so, because they control critical linkages with key external actors. Fiat is present in the MNE, but it may not be the most dominant mechanism of control, and it coexists with local autonomy, which makes inter-organizational theories applicable as a means for discussing operations networks.

The strategic role of distributed facilities is determined by the interplay between several factors, such as the following:

- Geographical proximity to customers (server capabilities, landed cost, responsiveness)
- Operations capabilities and plant dispositions (abilities to deliver on key performance criteria)
- Process stage (vertical network structure and position in the value flow)
- Production volume (different management and technology requirements)
- Product line (compatibility of process technologies and management systems, degree of interdependencies with other facilities)

With an outset in these characteristics of the operations network, there are a number of strategic positions that may be taken by plants, but what is the scope of these strategic positions and what are their key features? This question will be dealt with in the following section and will be summarized into a set of supply chain roles in section 5.

### 3. Manufacturing strategy

Two articles by Skinner put manufacturing on the agenda of general managers by introducing such concepts as manufacturing strategy, manufacturing tasks, and focused factory (Skinner, 1969, 1974). It was a serious attempt to argue that manufacturing has a contribution to make in the competitiveness of an industrial enterprise. The manufacturing task captures the specific requirements and demands on manufacturing and provides a basis for prioritizing goals. Different tasks lead to different focused factories.

The role of manufacturing indicates the strategic contribution of manufacturing to the competitive strength of a company. Based on empirical findings, Hayes & Wheelwright (1984) identified four different roles of manufacturing: internally neutral, externally neutral, internally supportive, and externally supportive, which they saw as a maturity model of strategic manufacturing, proposing that manufacturing companies make a choice as to how they compete (Child, 1972).

Coming from a different perspective, Senge supports this maturity model, as he identifies three learning waves within the quality movement (Senge, 1996). He argues that companies are highly concerned with improving tangible work processes, which he qualifies as the first wave. The second wave deals with improving how work is conducted, which opens up for an appreciation of the inherent systems dynamics. The third wave gradually emerges from the previous two with learning as a natural part of life in an organization. Applying maturity thinking to the distribution of manufacturing directs attention to the questions of strategic progression and learning within a manufacturing system, and firmly places the view and role of manufacturing in a corporate setting on the strategic agenda.

Positioning manufacturing in its wider environment has become a question of fit and focus. An important contribution was made by the identification of the concepts “Order-Winners”

and “Order Qualifiers” (Hill, 1985), which is concerned with matching competitive conditions to appropriate organizational structures. Within the perspective of fit and focus, the strategic role of manufacturing can also be described by its location and contribution to the value chain of a company (Porter, 1985).

Voss introduces three paradigms of manufacturing strategy, which have proved to be quite robust to the test of time: competing through manufacturing; strategic choices in manufacturing, and best practice (Voss, 1995). In the first paradigm, he includes Skinner, Hayes & Wheelwright, and Hill in the second paradigm. In his 2006 revisit to the paradigms, he stresses the need to look beyond the underlying stages/maturity assumption that characterizes each of the paradigms, but rather to see manufacturing development as an iterative process in which each of the three paradigms is revisited regularly (Voss 2006). With the increased distributed manufacturing and increased complexity, there is a need for adding more dimensions to strategic roles of manufacturing.

Another way of characterizing the strategic role of manufacturing was proposed by Johansen & Riis based on the thesis that an industrial company can occupy a number of different positions in the supply chain (Johansen & Riis, 2005). These positions influence the way in which a company develops products and seeks out knowledge, as well as the roles of its production function and the relationships with other companies in its networks. Three archetypal companies were proposed:

- The Focused Firm, which specializes in a particular sphere of knowledge and capability development.
- The Networking Firm, which puts other companies together and coordinates and develops their mutual activity.
- The Integrating Firm, which assembles other companies’ components into products or solutions.

In view of the close interaction between the various functions of an industrial company, it is difficult to identify a strategic role that manufacturing plays alone. For example, manufacturing may make a significant contribution by supporting sales in fast ramp-ups of customized products, and product development through its ability to prototype.

The discussion so far has seen manufacturing as one unit of operation, either as one single plant or the overall contribution of the company’s plants. However, when a company has several plants spread throughout a region, individual plants may play different roles. Ferdows characterized plants according to their primary location driver and the level of competence in terms of various functional resources and management responsibilities (Ferdows, 1989, 1997). For example, a low-competence site established mainly for reasons related to low-cost production was defined as an *offshore site*. Such a site is established to produce specific items to be exported for further operations or sale. It would not be expected to be innovative, and its managers follow the instructions and plans handed down to them. At the other extreme, a *lead factory* spans a wide range of functional competencies and managerial responsibilities, and creates new processes, products, and technologies for the entire company, drawing on access to skills and knowledge. Other types of factories are *source factories*, *server factories*, *contributors*, and *outposts*.

Most of the contributions to manufacturing strategy take their outset in the focus and fit perspective with its emphasis on offering customers what they want. But manufacturing competencies and their development may also create competitive advantage for the company (Hayes et al., 2005). In view of increased difficulties in predicting market developments and distributed production facilities, the dynamic capabilities dimension of

strategic development will be an important issue in the future (Teece et al., 1997). This may change our paradigm of manufacturing based on resources of manufacturing based on knowledge, which explicates the need to look beyond fit, focus, and trade-offs, as they may not be sufficient for competitive success.

Another paradigm shift may take place from managing settled dyadic relationships to managing unsettled networks (Karlsson, 2003). He identifies the new manufacturing challenge as one of managing the extraprise, due to the increased reliance on activities outside the formal boundary of the company. Still, we know too little about managing activities outside the formal reign of control, especially when it comes to handling the dynamic effects of the relationship (Mayer & Argyes 2004) or analyzing the overall network structure and the company's position in it, so as to be able to engage effectively in the reconfiguration of the network (Gnyawali & Madhavan 2001).

In conclusion, the review of part of the literature on manufacturing strategy has presented a variety of different ways of positioning manufacturing as a means for identifying and defining the strategic roles of manufacturing in an industrial company.

The first group of contributions (represented by the work of Skinner, Hayes & Wheelwright, and Hill) relates directly to the extent and selected objectives of the contribution of manufacturing to competitive advantage. The second group positions a company in a value chain or a supply chain (represented by the work of Porter, and Johansen & Riis). The third way of classifying strategic roles focuses on the mutual interplay between functions, leading to a primary role and four supporting roles (represented by the work of Johansen & Riis). The fourth classification identifies different roles that a plant can play in a network of manufacturing plants of a company (represented by the work of Ferdows).

To a large extent, the perspectives are mutually exclusive, which suggests that an industrial company may find it appropriate to use several classifications to find a configuration of strategic manufacturing roles that is in line with the environmental challenges and internal strength.

#### 4. Strategic roles of supply chains

In the following, we shall adopt the broader view of manufacturing presented above as the fourth perspective, seeing manufacturing as an integral part of supply chains or orchestrated manufacturing networks. We are focusing on manufacturing to determine whether it takes place in a plant owned by an industrial company or if it is carried out by a supplier. This allows us to study some of the key issues of supply chain management, for example accessibility of capabilities, reliability of delivery, competence development, and organizational learning in the context of the ongoing network-based reconfigurations. Furthermore, we shall make use of the third classification presented above to support this extended manufacturing process perspective.

In previous work, five different roles were identified (Johansen & Riis, 2005). *Full-scale production* is carried out exclusively by manufacturing, whereas the following four roles support one or more functions, such as *ramp-up* (which builds on the key relations to sales and product development), *prototype production* (with key relations to product and process development, sales and sourcing), *benchmarking* (with key reference to sourcing), and *laboratory production* (with key relations to product and technology development). We take the ongoing reorganization of the global value chain discussed in section 3 as a basis for stating that it is possible to use these roles to identify four strategic roles related to the



increasingly fragmented and distributed supply chains. By including “laboratory production” into “prototype production,” we obtain four generic roles, which respond to current global supply chain reorganizations by reintroducing operations into considerations of corporate competitiveness and, as a result, raise new demands on operations capabilities:

*Full-scale manufacturing and sourcing:* This role deals with the daily operation to secure precise and swift delivery to market demand. As mentioned above, this has become a complex task with globally distributed production plants and global sourcing and demanding customers. In addition, market fluctuations call for agility to be able to escalate volume and to down-size.

*Benchmarking:* This is an important task for an industrial firm to continuously examine, and one consideration a company undertakes constantly is if other suppliers can deliver better, e.g. in terms of reliability, quality, and cost. This should also include the firm’s own plants and may result in recommendations for improvement or shift in suppliers. These capabilities are too important today to be embedded within one single functional domain (sourcing), but depend on ongoing collaboration between partners and function across the value chain. In contrast to the Full-scale role where establishment of mutual trust in a supply chain or network is a key concern, the Benchmarking role implies a capability to smoothly shift partners in a network and, thus, introduces process-based robustness and raises demands on the capability to specify.

*Ramp-up:* As an industrial firm introduces a new product line or opens a new market, a new supply chain needs to be established. This calls for a capability to quickly configure a supply chain, taking into account the specific nature of the product, markets, and suppliers. A design framework based on modular business processes has been a solution for some companies.

*Prototype:* When an industrial company wants to introduce new business models, new technologies, and new materials, strong cooperation between all functions is needed. The supply chain has the task of engaging potential suppliers in new product and process development.

#### **Four roles – four working modes**

The four roles respond to different types of supply chain configurations, with the full-scale and the prototype roles positioned at either end of a continuum from a tight to a loose supply chain structure. But at the same time, they also represent different types of demands that the supply chain configuration has to cater for. Therefore, in a specific company situation, the four strategic roles of the supply chain may not have equal weight. Yet, any role cannot be neglected, as it presents the company with important supply chain dilemmas, the reconciliation of which may turn into competitive capabilities. As they may already have become apparent, the strategic roles ask for different organizational working modes and put different capabilities to the fore of attention. For example, the Full scale operation requires a well-oiled business system, often based on many pre-programmed decisions, whereas the Prototype role relies on personal contacts and tacit knowledge shared by several individuals and/or companies.

### **5. Methodology: A framework for network configuration**

As pointed out above, we need to view supply chain issues in a larger context, for example to address the inter-linkages between manufacturing and procurement in a global context,

and to include the interdependencies between manufacturing, supply chain, sales/marketing, product development, and purchasing. Furthermore, configuration should be seen as an evolutionary process and not as a once-and-for-all design effort. This has led us to develop a framework for configuration of supply chains and global operations systems, cf. figure 2.

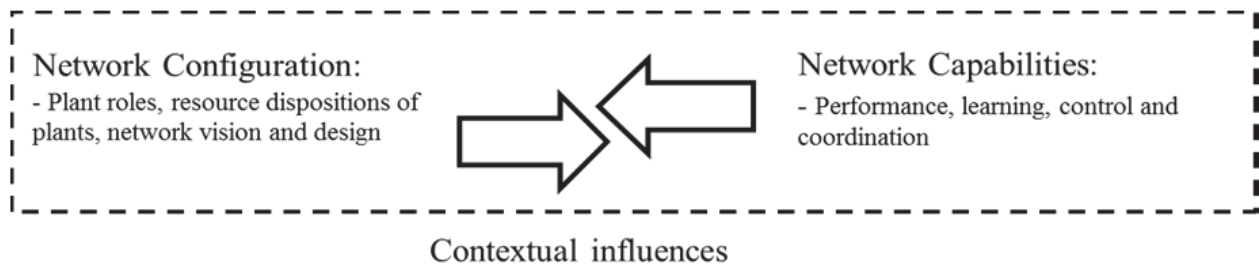


Fig. 2. An analysis framework for network configuration

This model will in the following serve to structure the discussion of our case studies. Four case studies, representing four different industrial situations (context influences), will be presented. The strategic choice and preferences will be dealt with by discussing the strategic roles of supply chains introduced above, and the emerging operations network will describe the operations structure (network configuration). Organizational issues to be discussed will touch on operations infra-structure, and the case studies will include the development over time of the elements of the framework (Network Capabilities).

As already mentioned, the five generic manufacturing roles that we have transferred to supply chains were identified as part of a series of workshops with industrial managers and researchers in an effort to support an industry-driven development process. In other research projects, we have undertaken a number of case studies, some of which are action research-oriented covering different industries and spanning a spectrum of different situations. As illustrated in figure 3, we have selected two dimensions to capture the influencers from the industrial context: the rate of change and the need for coordination of the operations network. We have selected four case studies, one in each of the four cells.

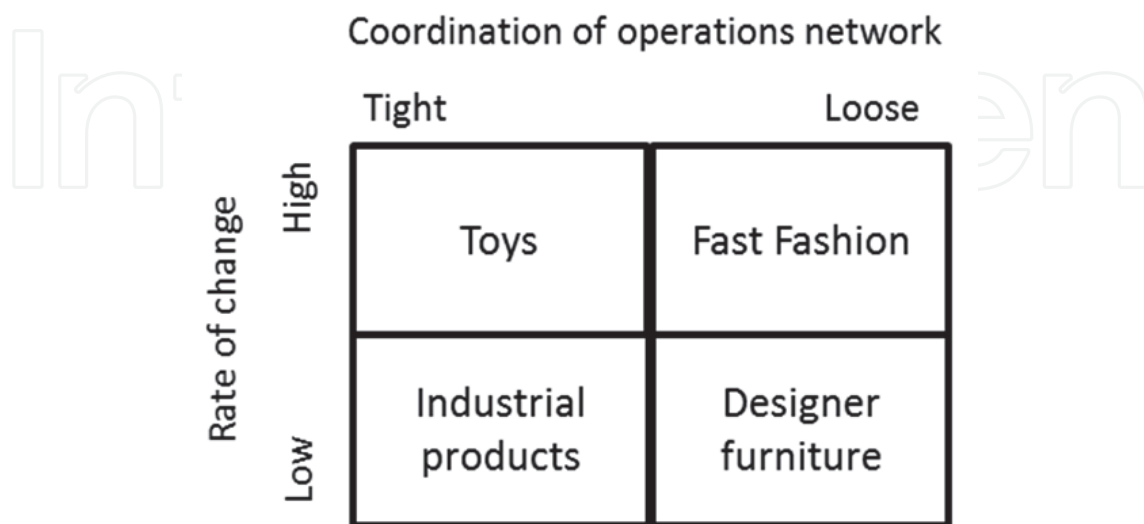


Fig. 3. Four different industrial contexts

### Case-study company 1 - Toys

The company is a producer of products characterized by high seasonality, volatile demand, and exposure to fashion trend fluctuations, creating an eminent challenge of balancing its capacity for demands, while constantly updating its product line. The company had traditionally been committed to its fully owned operations in its domestic base in Denmark. In spite of its global sales, very few production facilities of the company had been established abroad. However, with dropping sales accompanied by negative financial results, a new management group, which entered the company in 2004, urgently started rolling out plans for a design and implementation of the transfer to external suppliers in low-cost countries. A preparation stage included a comprehensive cross-functional analysis, which focused on the development function, sourcing, production, and distribution, leading to a number of initiatives. On the development side, the main focus was on reducing the complexity of products, which over the years had grown considerably with a growth in the number of suppliers, product variety, and component variety. The reduction in complexity was not only meant to drive costs out of the supply chain, but also to prepare the company for quick response delivery.

While the reduction of complexity coming out of product development started right after the end of the analytical stage, it was decided to run a pilot study on offshore outsourcing. The major pilot project included moving a product line to an external supplier in Hungary. The supplier was selected after a careful multi-staged process involving initial screening of shortlisted companies, a number of rounds of negotiations, and on-site assessments. The case-study company's previous experience with offshore outsourcing was limited to low-volume complex specialty tasks and components for which the company had no internal resources. Now, the company was outsourcing the entire product line, something it had never done before. The economic benefits of the transfer were obvious. In addition, an important aspect of this pilot line was a learning experience, as it was the first outsourcing initiative of this caliber for the company. When the pilot project was half-completed and proved to be successful, the company started negotiations for outsourcing the rest of the supply chain with this manufacturing services provider, assigning it the role of a strategic finished goods supplier. However, the relative success of the test case proved to be more difficult to replicate than expected. The specific nature of the pilot line provided limited insight into the effects of interdependencies in a distributed production network. The test case was based on a single-site production set-up with its own internal component base while the other product lines were formed from components produced in multiple locations. The transition from the single- to multi-site set-up also revealed that documentation of products, processes, and technology was not sufficiently developed to make a clean shift. The documentation had been adequate for in-house and long-term domestic relationships. However, it appeared to be insufficient for the effective use by the new strategic partner. This meant that major tasks became documentation, process mapping, and data structuring. In addition to capturing tacit knowledge and creating a transferable repository of knowledge, there were many more challenges ahead of the transition team. A big challenge lied in coordinating the interfaces between the company and its strategic partner. With a very high employee turnover at partners' sites, getting stable reference points became an apparent difficulty. When the Danish company was ready to start transferring knowledge and to learn how to develop the strategic supplier relationship, all of a sudden a key person at the partner's side was leaving. Hence, a more coordinated approach to the transfer was lacking.

The very high speed and wide scope of the transfer constituted another challenge. The case-study company tried to deal with the situation by increasing the number of its own employees at the partner's sites as part of daily operations and making sure everything was done according to specifications; for example, senior quality engineers were based in the partner's sites in Mexico and Hungary. This approach incurred a hidden/unexpected cost, but according to the company's estimates these costs did not exceed 10% of cost savings generated by the outsourcing initiative. However, the challenge of absorbing the amount of knowledge transferred from Denmark represented only part of the problem. Another was in the lack of motivation to learn from the suppliers' side. Over time, it emerged that the supplier was reluctant and struggled to learn. On the one hand, the fragmented approach that the supplier had to organize its sites all over the world might have hampered the company's ability to learn and absorb effectively the inflow of new competencies. On the other hand, this could not be solely blamed on the supplier, as from the inception of the relationship the Danish case-study company, in its representative's opinion, focused more on its own goals rather than investigating what the suppliers' goals and motivations were.

Another area where the relationship was facing difficulties was in securing smooth operations when faced with a volatile market situation. The Danish company was used to tackling enormous market dynamics, seasonal fluctuations, and unpredictable demand; in addition, approximately 60-70% of the company's annual turnover is generated through continuous launching of new products. Such dynamics were completely in contrast to the much more stable operations the supplier was used to and prepared for. Besides creating another challenge for the transfer, this situation also caused a gap between flexible and market-responsive solutions the Danish company was looking for and what its partner could deliver. Eventually, the fact that neither dispatching nor receiving companies could reap all the benefits expected by both parties contributed to management's considerations of bringing the sites back in-house. The relationship was remarkably resilient against the individual challenges it faced. However, their concerted effect eventually led to the break-up of the relationship. At the beginning of 2008, the company announced its plan to 'backsource' or bring back in-house one plant run by its partners, followed by announcements in July, 2008 of further 'backsourcing' of two more plants.

It is obvious that the high rate of introductions of new products and the seasonal variation call for tight coordination, explaining the location of the company in the upper left corner of figure 3. The case illustrates, among other things, that outsourcing brought into the open the interdependencies between operations and the other functions primarily based on tacit knowledge. If the company had analyzed the strategic roles of supply chains, the course of actions and configuration decisions would most likely have been different. The network structure is likely to be changed in the future, as a new balance needs to be developed between specialized production processes and the need to be close to the markets. For example, an effort will be made to develop new technology for plastic molding, and regional assembly units will be established for low-volume products and parts with high unpredictability.

#### **Case-study company 2 – Industrial solutions market**

The company is a Danish equipment manufacturer holding a market-leader position. With production in twelve countries and a global sales presence, it is working from a strong international base. Every year since 2000, the company has acquired two to three companies, and has furthermore been signalling a change in mindset from the earlier ideology of

making everything in-house to joint ventures and acquisitions. Some of the newly acquired firms still control their own R&D agenda, while others are fully integrated. The pace of acquisition has quickened recently on par with the restructuring of their main product's market characterized by increased concentration, and firms moving from component to system suppliers, adding more competencies. When referring to product development, an executive talks about a "Centrally driven, global approach - with a local presence." Denmark has the strategic vision and remains in firm control through corporate functions, but business units have their own budget and latitude to select projects and allocate resources.

The company has developed proprietary product and process technology built on the understanding and the nurturing of the interaction between production, product development (PD), and its technology center (TC). Being responsible for technology development and establishment of production lines, the technology center needs to coordinate its activities with its two customers, namely Production and Product Development (PD). Production has already been offshored, and with PD moving out of Denmark, it makes sense that TCs follow customers in their global expansion. Consequently, local TCs have already opened in Hungary and China, and a new site is planned in Mexico/USA. Cooperation between foreign units is limited to brief collaboration on assignments and sharing of patents. However, there is a shared agenda at a higher level in relation to operations in different market segments. Although R&D manpower in China is growing fast, they have not launched any product range of their own yet, and are solely supporting central development activities. It is expected, however, that future responsibilities of developing specific products will be taken over by the Chinese. A focus on the Americas is also needed, as the group is relatively weak here, where the company introduced some product ranges over 50 years ago, but can only claim less than a 10% share of the market. In time, each "Triangle" (TC/Production/PD) will grow increasingly independent and specialized, replicating best practices, but developing its own particularities, compatible with local cultures and markets. TC Denmark, which designs production equipment for all factories, including testers and tools, is to remain the lead factory for the next few decades. Electrical parts of testers, for instance, are manufactured in the Netherlands, mechanical parts are purchased in Denmark, and assembly takes place in Denmark. TC Hungary provides more capacity and cost reduction in the tester area, supplying spare parts, IT support, or any competencies needed around the tester area. Similarly, TC China focuses on tools with 7-8 people building documentation on the tool and automation equipment areas. The operations started with a small base, but are expected to grow rapidly. The global organization is nurtured through a positive iterative process by gradually increasing the level of complexity of tasks. For example, both China and Hungary have cast-iron mechanical construction units that are routinely assigned tasks by the project manager in Denmark. These parallel activities in Denmark and abroad will continue until it makes sense to move key competencies abroad.

As part of the overall globalization strategy, a production line was transferred from Denmark to a green field site in the Americas where a future triangle was intended to be. In spite of ample previous experience and a corporate focus on developing an organizational transfer capability, this project was challenging in a number of ways. First of all, the production line consisted of proprietary technologies, which had been amended in Denmark over a long period of time with very little documentation. In Denmark, semi- and unskilled people were operating the line with a wide delegation of autonomy for solving problems, while support staff, including skilled set-up fitters along with an engineering team, was

supporting the line at disturbances, for maintenance, and for malfunctions, in addition to a more elaborate division of labor that was planned for the receiving unit. Secondly, this was seen as a test where the company was navigating in unknown territory with regard to location, to the approach, and to the scale of initial operations.

Preparation for the transfer was intense and focused on establishing a robust working template of the manufacturing process. The existing level of documentation was limited and did not reflect the historical modifications of the manufacturing process; for this reason, the work to capture and standardize the process was comprehensive and lasted for more than half a year. The company was able to maintain high motivation among employees in the dispatching unit during the preparation. The receiving context was assessed in an intensive investigation of its capacity to absorb the line, but was not involved in the transfer. The transfer itself was planned as a Big Bang exercise, where everything was packed and air-lifted to its destination in order to ensure minimum down-time. The line was delivered as a turn-key solution, and onsite initial training was structured and supported by the sending organization. This support team included very experienced operators and set-up fitters. The team was pulled back after four weeks of intensive training. They witnessed a capacity of the new organization for operating the line and an eagerness to prove itself. Later, project management found that they had underestimated the difficulties of transferring tacit knowledge about disturbances, malfunctions, and non-normal operation. This called for much more education and training than expected. Incorporating corporate DNA was seen as a key to success at the new site, which was planned to be secured through the internal training program with senior management attending as well as through a strong pull from an internal customer. It soon became clear that this was difficult to install in the immature organizational unit. Having spent a year with ramp-up at the new site, it was realized that drastic means had to be undertaken, and local management was replaced by experienced internal people with a strong focus on establishing flow-oriented capabilities, after which performance slowly started to pick up.

The acquisition of new production sites and fast growth of new markets have required the tight coordination of production and supply chain activities. At the same time, the rate of introducing new products has been moderate. This explains the location of the company in the lower left cell in figure 3.

The establishment of new production facilities in the Americas has revealed the close interrelationship between production sites, the central production technology center, and the predominant tacit nature of the production knowledge.

Awareness of the “Triangle” (TC/Production/PD) that mirrors some of the strategic roles of supply chains has been useful for planning a globalization trajectory. It appears to take place in waves, with operations first, followed by establishing a local production engineering capability, and a present effort to bring about phases of product development at regional centers.

Similarly, the structure of operations and supply chains has evolved from a star configuration, with the Danish headquarters in the center, to a complex network with regional nodes holding competence centers in various areas.

### **Case-study company 3 - Fast fashion**

The fast fashion company is a leading player in its field. Just a decade ago, it could be described as a traditional production company; however, the competitive environment has made it necessary to change the profile of the company. The changes involved a transition

from production to sourcing, which has had a number of implications for the operations capabilities of the company. The operations governance has changed from the tight control of the production process with total control over materials to trimming the products to a set-up based on arms-length contractual relationships. As the company started this journey, it lost control of the piece goods, reducing the activities to trimming, which is associated with buttons, zippers, and interlining. With the closure of the last production facilities in 2005, the company's role was reduced to design and quality control. The finished items are today sourced from suppliers based in China/Hong Kong with 70% of the volume, Bangladesh with 15%, and India with 10%. The remaining volume is purchased from Pakistan and Vietnam. The changes in the production platform were mainly driven by an increased price-sensitive market. Even though aspects such as Corporate Social Responsibility, ecology, and clean and environmentally friendly products have become more important, price remains the most significant parameter when choosing suppliers. This is also the reason why production is moving from China to Bangladesh, Vietnam, and Pakistan. The COO predicts that within three years, the volume share will change so that China delivers 40%, Bangladesh, 20%, Vietnam, 15%, and Pakistan, 10%. There are two main reasons for moving the production: (1) access to cheap materials and (2) cheap labor. Wages in Pakistan are higher than in Bangladesh and Vietnam; however, they are one of the largest producers of cotton and fabric, which entail low material costs. In China, the sewing facilities are moving from the traditional production areas such the Pearl River Delta to more remote areas, where the labor cost is lower. The old facilities work as shell companies, which aid in establishing and managing the new facilities while handling the customer relations.

Currently, 200-225 suppliers are used, 3-4 of which are regarded as main suppliers with a volume turnover of 10-20%. They are also the only suppliers where general or framework agreements have been made. The agreements imply that the company promises to purchase a certain share of the production volume, which may ensure a faster response to market changes. However, this conflicts with normal practice of autonomous individual brands. It becomes difficult for the individual brands to control such things as quality and price levels in accordance with brand identity. This practice ensures that the division of responsibility is very clear when something turns out either above or under budget. However, the general tendency is to have fewer suppliers and to increase the number of framework agreements in order to gain access to the right prices and better-performing suppliers.

The focus has changed from production to development of new collections and sourcing, which have now become the heart and soul in the company. The other leg for a successful business is being able to create benefits from high volume, hence being able to source at the right price at the right quality from the right location. The activities performed by the brands can be summarized to *design, product development, sourcing, selling-in, and whole sales management*. Selling-in includes preparing agents for selling the products to the retail link. Wholesale management encompasses activities related to supporting the retail units and includes follow-ups on sales, local accounting, branding, and advertising.

Sewing and fabricating cloth are very labor-intensive tasks, as machines do not possess the flexibility required for trimming the cloth to the right dimensions. The task of sewing has not changed significantly since the introduction of the sewing machine. Thus, the manufacturing of cloth has two significant cost drivers: (1) labor and (2) raw material. Since consumers are very price-sensitive, the pursuit of ever lower costs has had an unavoidable impact on the textile and clothing industry's internationalization process.

As the company started to shut down its factories in Denmark, new plants were established in southern and Eastern Europe. At the same time, it started to source from external partners for the first time. Partnerships with tailors were made in Yugoslavia, Portugal, Greece, Morocco, Albania, and the Baltic countries. During the same period, the company decided to expand its business scope to cover more customer segments, as they believed that the old brand, with its up-market position, could not create sufficient growth. The purpose of introducing new brands was to capture a larger share of the clothing industry. This was done by acquiring and establishing new brands, which were structured like individual companies. The process of developing new brands has continued since then, and today the group has 17 individual brands in its portfolio. The same applies to the sourcing activity, which has become a central parameter for success. Due to the never-ending goal of reducing costs, the internationalization and relocation of activities have continued. With the economic liberalization of China, the fabrication of cloth moved to the Pearl River Delta and Southeast Asia. Today, cloth manufacturers have moved to Vietnam, Bangladesh, Pakistan, and more remote areas in China.

In 2008, the company closed down its last production facilities in Poland and Bulgaria. Today, the activities are focused on the input and output ends of the value chain. The restructuring of the company was intended to create a service platform that could support and release resources in order to enhance value-adding activities. These include brand development, design collection, sourcing, wholesale management, sales, and marketing. The COO recognizes that the competitive situation in the textile and clothing industry forces the company to continuously trim and develop the value-adding activities. However, he also recognizes that the activities related to the input of the value chain are difficult to copy, as they require intangible knowledge about Scandinavia fashion, trends, and market needs. In addition to the sudden changes in fashion, the frequent relocations of production sites to low-wage areas have determined the locations of companies in the upper right cell of figure 3. Furthermore, the strategy of supporting the growing number of individual brands in defining and maintaining their unique identify calls for the loose coordination of the operations network.

The case illustrates how competition with respect to price leads to frequent shifts in production sites. This calls for a production engineering capability to quickly establish production at a new site, often in a new country, and it identifies the importance of the strategic role of benchmarking and ramp-up. Also, a frequent reconfiguration of the network structure is called for.

#### **Case-study company 4 - Designer furniture**

Today, the company is part of a small, exclusive array of luxury brands that are representatives of quality and world-class design. The ambition of the company is to become the preferred and successful brand within exclusive design furniture and to enhance the customers' image by supplying such furniture. The company's self-perception has been based on the fact that they were the producers behind some of the most outstanding design furniture over the years. A number of years ago, the company fully mastered a broad line of in-house production lines of tables and lounge, dining, meeting, and stackable chairs.

In the run-up to the new millennium, the company experienced a slump in sales. Therefore, an analysis to clarify internal and external values was initiated. It showed that the company was facing a paradox: internally, they saw themselves as a company characterized by having a wide and dynamic range of products, created by many top architects and furniture



designers. However, externally, only a few products and designers dominated the target group's picture of the company. This initiated a shift towards an increased market orientation with a large-scale investment in a sales- and image-building platform, which would attract new designers and boost the sales profile of the company.

The shift from a product- and production-oriented mindset to a focus on sales and international branding meant that the roles of sales, marketing, logistics, and development processes increased tremendously and emerged as the new core processes that replaced the actual manufacturing competence. As a result, a broad number of production lines and processes traditionally mastered in-house were reduced dramatically by outsourcing, reducing the number of production lines managed in-house to approximately 36%.

Following a period characterized by a strong focus on rationalization and optimization within production and sourcing, a new strategy was developed, indicating how the company wanted to work with their suppliers. The strategy was supported by a set of tools, the introduction of which was intended to lead to considerable changes in the configuration and management of the relationship between the company and their suppliers and to put pressure on the different network actors' ability to change.

First of all, the objective of the new sourcing strategy was to support the overall business plan to create value in the eyes of the customer. Furthermore, the strategy should put focus on implementation and balance of input and output and relate to the differentiated and context-based conditions for the company's sourcing activities. The objective of the sourcing model was to differentiate and consolidate sourcing activities and to enable the formulation and execution of multiple sourcing and relation strategies related to different suppliers. Furthermore, the model served as a tool for securing "risk" sourcing and for measuring performance of the suppliers.

In relation to the activities of strategic and key sourcing, a partnership approach towards suppliers was developed. The decision to undertake a partnership approach was closely tied to the recognition that the competition in sales markets is not only between companies, but also between supply chains. Furthermore, in some situations, close cooperation with suppliers is necessary and beneficial for customers and stockholders. Finally, the development of partnerships was seen as a driver to create synergies and to:

- Increase cooperation and a holistic supply chain to reduce waste,
- Reduce the risk of low-performance and general company risk, and
- Increase flexibility.

Through the partnership approach, the company aims to build long-term relationships to ensure a tight alignment of activities and resources and to improve sourcing performance (strategic KPI) in order to minimize company and customer risk. In addition to coping with established relations with suppliers, the company continues to source key processes, components, and stainless steel, with the main focus on Poland as the number-one sourcing market.

Although new products are introduced, it seems fair to classify the company in the lower left cell of figure 3, thus also satisfying the need to tightly coordinate the many different suppliers so as to maintain its image among customers of a reliable supplier of high-quality designer furniture. The new sourcing strategy implies a significant need to address the supporting strategic roles of supply chains, such as benchmarking, prototyping, and ramp-up. The network structure may be described as a star, resulting in a highly complex sourcing task. It may be relevant for the company to consider shifting to a network structure with a number of loosely coupled networks for product groups using similar material and production technology.

## 6. Cross-case analysis

As the four case-study companies represent different industrial contexts, it is tempting to look for a pattern of configuring the operations network primarily based on contextual influencers. We, however, find that contextual influence alone cannot explain configuration as companies competing with similar industrial conditions may choose to compete with different means and, as a result, end up with different configurations. To reflect these ambitions of companies to pursue different things with their supply chain set-up, we have used the coordination of the operations network as a proxy for the level of interdependency and commonality between partners within the supply set-up.

With respect to the strategic roles of plants within the chain, companies experiencing a high rate of change may find that prototyping and ramp-up are of significant importance in addition to the full-scale manufacturing and sourcing due to the need to integrate new inputs from process and product innovations continuously. On the other hand, companies with a low change rate will need to address benchmarking in order to push the utilization of available resources. With regards to the overall network structure, the case studies illustrate a development of frequent restructuring in search of an appropriate balance between the request for proximity to the markets and the need for specialized manufacturing in one location (economy of scale). This has challenged production engineering to develop new technologies in support of parallel production and agility. A third issue of configuration is the organizational aspects related to the infrastructure of operations. It seems that the case-study companies have been able to develop appropriate management systems and organizational structures for their full-scale manufacturing and sourcing, and they have even been able to restructure as new markets have been addressed.

However, the companies have been less aware of the importance of developing key supporting and/or indirect roles, which may assist the company in securing a more robust and effective supply chain, as they moved along their globalization trajectory. For example, critical links was unveiled in the processes related to e.g. the cooperation between functions in the value flow of the company (production, production engineering, product development, and sales), which with increased distribution and changing governance structures became even more critical for planning and improvement purposes. The case studies have also shed light on the importance of supplementing the organizational means relevant to full-scale operations with the means of knowledge sharing and development, which are typically found in the other three generic roles.

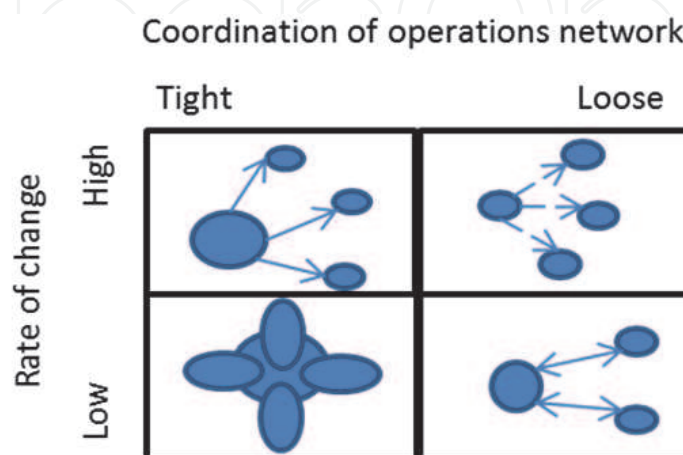


Fig. 4. Types of supply networks

## 7. Implications for configuration of supply chains

The case studies have given rise to issues of configuration of operations systems and future challenges. In view of the small sample, we have drawn on a number of additional case studies that we have been actively involved in and we have taken note of trends in the literature in an effort to extend our empirical base. This has led to a number of implications for configuration of operations and supply systems to be presented in the form of propositions. In this way, we hope to hand the baton on to other researchers to engage in a continued discussion of configuration issues and means.

### **P1 - The indirect strategic roles of supply chains will become increasingly important**

Without neglecting the significance of the role of full-scale production, it seems that the contributions that manufacturing and supply chain make to competitive advantage in cooperation with other functions will become more important in the future; for example, ramp-up, benchmarking, and prototyping.

In companies with increased customization of products and processes, the role of prototype production will require more attention and, on the other hand, offers potential for a differentiated corporate strategy. As pointed out by Slack et al. (2004), attention should be given to the increased integration of product and service offerings. This ongoing servitization of manufacturing is becoming a dominant driver of supply chain configurations as it brings in new agendas related to serving customer-specific needs through operations processes such as extended logistics services, customized product properties, and life cycle management as is particularly evident within case 4, where an increased focus on service-manufacturing integration has become the new competitive platform for the company.

The scope of this proposition is supported by Maletz and Nohria who point to the need to manage white spaces within organizations, i.e. the large, but mostly unoccupied territory, in every company where rules are vague, authority is fuzzy, budgets are nonexistent, and strategy is unclear – and where, as a consequence, entrepreneurial activity that helps reinvent and renew an organization takes place (Maletz & Nohria, 2001). But the proposition extends the scope of these white spaces to the extended enterprise and the entire supply network, i.e. the participation and interplay in various networks with respect to both daily operations and introduction of new products, technologies and systems. Because of these increased dynamics and uncertainty of demand, the ramp-up production capability is expected to play an increasingly important role. This calls for modular and platform thinking in the design of production systems and well-described business processes.

The case-study companies demonstrate that the key role for operations capabilities in the emerging supply networks is that of managing virtual manufacturing processes focusing not only on supply chain management, but also on the maintenance of sufficient competencies at the suppliers. The case studies also show the increased awareness of the importance of the interplay between product development, handling of customer orders, and production and supply chain management coordination and planning.

As an implication, P1 points to the need to focus attention on developing competencies in managing the interplay between functions, which may not necessarily be under the direct control of the focal company, e.g. sales, product development, sourcing, and manufacturing. As the indirect strategic roles come into focus and operations take place globally, new competencies are called for. Traditionally, emphasis has been placed on knowledge and

know-how about production processes; and this represents an important challenge for key processes. But increasingly, the capability to manage complex interplay between many actors involved in a value chain becomes equally important for organizational performance. In many companies the competitive strength lies in these complex competencies, requiring holistic thinking, relying on tacit knowledge located in the hands, heads and minds of a group of employees, and in their interplay with the historically generated systemic set-up. Knowledge sharing across organizational boundaries will become a key issue in the supply network. The case company 2 in particular with its regional set-up has recognized the need for knowledge sharing between its manufacturing sites around the world, not only on specific production processes, but in particular the management practice of stimulating continuous improvements and systematizing cooperation between production development, production engineering, operations and suppliers in the introduction of new products. The company has started to work with virtual communities of practice to share ideas about future production practice (strategic challenges, organizational forms, business processes, management systems and production technologies and processes) and as a vehicle for a joint exchange of ideas and know-how between managers and engineers across the various sites and main hubs. This case has over time progressed through a number of maturity steps as illustrated in figure 5. where it is now approaching the outer ring where the performance of the individual sites becomes increasingly dependent on the performance of other sites and not only sequentially as it would typically be seen within the traditional supply chain, but increasingly through joint achievements on issues such as sustainability, R&D and sourcing.

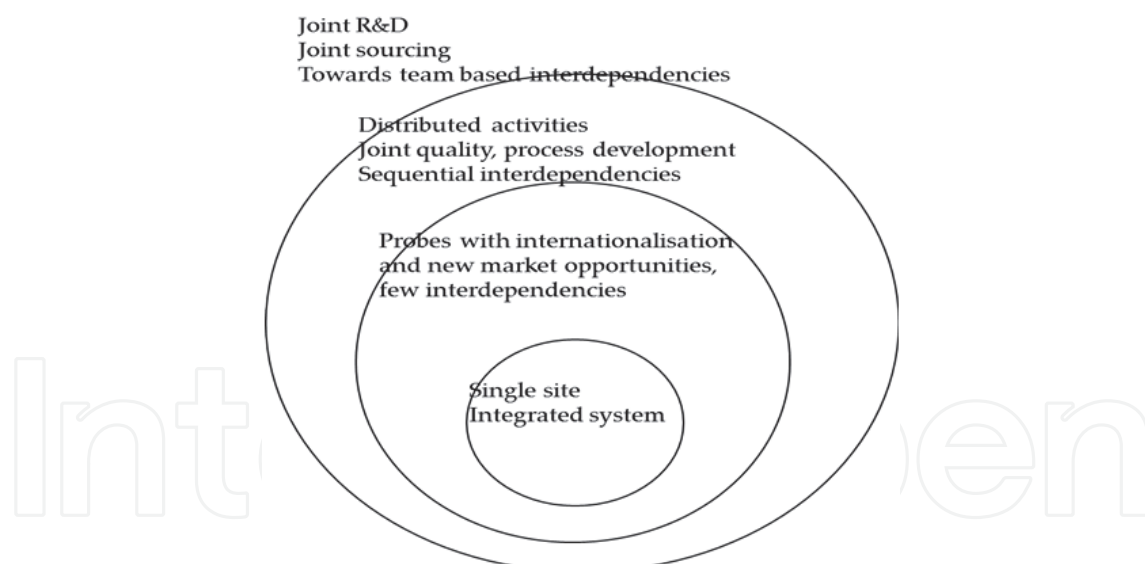


Fig. 5. Evolving network relationships

## P2 - From value chain to value network

The case-study companies may be characterized as an Integrating Firm serving as an OEM company at the end of a supply chain. Most of them have adopted an outsourcing strategy to focus on product development, assembly, and distribution. However, when we look at manufacturing, a shift of thinking may be observed, for example from a single lead factory in Denmark to several lead factories forming a network of interactions with one factory having been designated a center of excellence in a specific production process.

The archetypal Networking Firm is characterized by a number of nodes (partners) offering complementary capabilities useful for the products and services offered. The new sourcing strategy of case-study company 4 illustrates this trend, as it has adopted a partnership approach with some key partners, and aims to use these partnerships to move beyond the basic tradeoffs its own operations were tied down by. In case company 3 a similar set-up has been established with a pool of preferred partners (capable of supplying flexibility, reliability and speed) and a larger pool of arms-length partners (working with a cost and capacity focus).

A key question is how companies will be capable of retaining sufficient competencies in-house for leading the development of future activities as their operations capabilities become increasingly distant in time and space. Longitudinal studies will be required to study the dynamic effects as competencies unfold within manufacturing networks, but there are key indications that companies can outsource too much leaving them in a position where the ability to influence, coordinate and specify key deliverables becomes increasingly distant.

An implication of the move from a value chain thinking to that of a value network is that the power structure becomes more distributed and diffuse. In most cases, the integrating firm holds the final word, being closest to the customers and being willing to adopt the risk. In the networking firm all complementary contributions are necessary, and the power is distributed among several partners. As a consequence, P2 calls for a shift from trade-off thinking to a capability for working with dualities, e.g.

- Living with hierarchical roles and evolving networks
- Empowering plants and setting direction for the overall network
- Centralizing strategy development and decentralizing operations
- Standardizing for cost, reliability and global reach and on the other hand customizing for responsiveness

An interesting aspect to explore is the potential synergy expressed by Milgrom and Roberts, a point that holds that doing *more* of one thing increases the returns of doing *more* of another (Milgrom & Roberts, 1995). This points to the notion of strategic complementarities, according to which investing in one practice makes it more profitable to invest in another, setting off a potential virtual circle of high performance.

### **P3 – Shifts in strategic supply chain roles may be seen as a sequence of moves similar to a multi-player game**

Case 1 illustrates how an initial set of decisions to establish joint production with a partner in Eastern Europe led to unforeseen consequences, which called for a new set of decisions and essentially set the company off on a new trajectory. The case description talks about three waves of decisions and reactions from the environment (test, full scale, withdrawal).

Case 1 also demonstrates that the initial decision to establish the collaboration might have been justified; but due to the reactions from customers and competitors new challenges and opportunities emerged, changing the foundation of the initial decision. These hidden costs of offshore operations often play a fundamental role in the relocation process, but also influence the longer term strategic role of operations processes within the company.

This and similar case examples have led us to use an analogy to a multiplayer game. A player makes a move, and the other players *react* and make their moves, which leads the first player to make a new move. The ability to foresee more than just one move is a key to success in chess and other games.

Case 1 illustrates that management was not aware of this dynamic process and was caught by the difficulty of reversing decisions made. The company, however, managed to turn the situation into an advantage by using it as a learning process, where it has learnt about the underlying fundamentals of its own operations, which has left the company in a much stronger operational situation with a robust and well-functioning supply network.

As an implication of these emerging requirements, an organizational learning approach is warranted, which emphasizes experiential expansion and connectivity between parts. In a distributed manufacturing network a concerted effort is needed to transfer the work-object and to explicitly codify and transmit sticky knowledge through systemic and social communication channels. The difference between tacit and explicit interdependences is critical for understanding the implications of increased distribution.

Another implication is a need to develop interactive scenarios, perhaps in the form of social experimental simulations, which would explore possible consequences of a series of moves. We find that this way of thinking about strategic planning is quite different from the traditional development of a master plan for the next period. Such experimental simulations may include identification of irreversible elements requiring special management attention.

#### **P4 - Knowledge development and sharing within the supply network will become key**

The nature of knowledge development will be different for the four strategic supply chain roles. For example, the Full scale role may better allow for including intelligent systems, whereas the other three types to a larger degree rely on personal contacts and tacit knowledge due to the non-standardized way of working.

A recent study has estimated that a significant proportion of corporate innovation comes from external sources (suppliers, customers, etc.) (Linder et al., 2003). This indicates that firms should emphasize capability buying adding a new level to the sourcing activity beyond materials or modules, which has preoccupied our thinking so far. In line with this MNC literature tells us that knowledge generated in any part of the value chain is valuable not only for the knowledge generator itself, but for the overall value chain (Dunning, 2001). The inherent implication of this is that more knowledge in the chain (of any type) ought to generate a stronger drive for knowledge transfer within the chain. This drive is, however, dependent on the presence of strong intensives, the level of absorptive capacity of the partners, and the availability of a supportive network infrastructure. In other words some level of internal knowledge and systematic support is needed to acquire and assimilate external knowledge, which is valuable to the supply network although it may be less valuable to its individual partners.

#### **P6 - Accessibility will become more important than ownership**

The issue of whether to outsource or to offshore production has caught much attention both in theory and in practice. However, an underlying dimension is the extent to which a company has access to competences and capabilities and is capable of appropriating these for its own value creation. The scholarly as well as managerial debate need to discuss how this dimension can be given a more prominent place as a variable when configuring the supply network of the future.

## **8. Conclusion**

The increased scale and scope of global operations has called for a reconsideration of supply chain configuration. For instance, offshoring of operations has rendered the traditional separation of operations management and supply chain management obsolete.

As part of the configuration framework introduced, we have focused on network structures and strategic roles, the latter including interdependencies to other functions, such as product development, sales/marketing, and purchasing.

Four different industrial contextual situations were identified based on respectively low or high rates of change, and tight or loose coordination of operations. Four industrial case studies representing different situations were presented to illustrate configuration issues as they were addressed and managed over a number of years.

Combined with experience from other industrial cases and trends in the literature, the case studies gave rise to the formulation of implications for configuration of supply chains and global operations in the form of a number of propositions. They indicate that

- Managing interdependencies between supply chains, operations, product development, sales/marketing, and purchasing will become increasingly important, all of which emphasize effective indirect strategic roles.
- A shift of focus will take place from value chain to value web with multilayered relations and interdependencies.
- As a consequence of these changes, configuration should be dealt with in a sequence of moves, similar to a multi-player game, as the traditional linear planning-based approach will fall short.
- Building infrastructures in support of knowledge development and sharing will become key, and
- Accessibility of and ability to appropriate external operations capabilities will become more important than ownership.

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Over the past few decades the rapid spread of information and knowledge, the increasing expectations of customers and stakeholders, intensified competition, and searching for superior performance and low costs at the same time have made supply chain a critical management area. Since supply chain is the network of organizations that are involved in moving materials, documents and information through on their journey from initial suppliers to final customers, it encompasses a number of key flows: physical flow of materials, flows of information, and tangible and intangible resources which enable supply chain members to operate effectively. This book gives an up-to-date view of supply chain, emphasizing current trends and developments in the area of supply chain management.

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