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An Outsourcing Perspective of Planning and Control in Industrial Networks

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Abstract: In order to make use of the full-scale advantages of outsourcing and to mitigate the related risks, companies need to integrate the decision-making processes throughout the network of suppliers, i.e., proactively involve suppliers that possess complementary competencies. In this study, it will be elaborated how this integration can be facilitated and what levels of integration exist-from simple rules to advanced information systems. The underlying assumption is that companies by integrating suppliers into their working operations are moving away from the supply chain perspective and towards an extended network perspective. This change puts higher demands on the companies' ability to plan and control the collaboration and information exchange with their supplier base.

Key words: Planning and control, integration, outsourcing, supply chain, network

INTRODUCTION

Outsourcing is one of the most prevalent trends in industry at the moment, as companies are narrowing their business areas to focus on core competencies. Every company has unique capabilities and competencies. An organization's strategy should be based on its strengths, especially capabilities and competencies that distinguish it from other companies (Prahalad and Hamel, 1990; Hayes and Pisano, 1994; Davenport *et al*., 1998). This development is caused by changes in the industrial market such as:

- Customers demand shorter times of delivery, which means that companies must optimise all supply chain activities.
- Customers request customised products, which calls for a flexible production system.
- Markets are changing rapidly, which increases the investment risk in new technology, machinery and other equipment.
- Managers have realised the necessity of concentrating resources on core competencies rather than on diversification.
- Technology has made it easier to integrate the operations of separate companies into a cohesive whole.
- Global competition has forced organizations to re-examine and challenge every aspect of their operations.

These different changes have made outsourcing become a critical process of re-examining an organization's supply chain, of understanding its core competencies and of making strategic decisions to ensure that only non-core businesses are transferred to external parties (Momme and Hvolby, 1998). While considering the incentives of outsourcing, some important risks of transferring assets to suppliers must also be assessed (Walker, 1988; Bragg, 1998):

- Distribution caused by unwanted imitation by the supplier.
- The degradation of a product because the supplier pays less attention to it.
- The change from collaborative to opportunistic behaviour of the supplier over time.
- The difficulty in measuring the actual costs of the supplier, which are typically above baseline costs due to the learning curve involved.
- The potential problems associated with bringing the function back to the company or to another supplier when the outsourcing agreement terminates.

Most study on outsourcing tends to emphasize that one of the main motives for establishing outsourcing relationships is to obtain a win/win situation, based on an open-book principle. One may argue that this incentive is not fully consistent with the company making use of different control points to ensure that its outsourcing partners provide services according to all specifications

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agreed upon during the contract negotiations. Our notion of this paradox is that most outsourcing agreements in industrial practice will inevitably be governed by in-house intents of profit maximization that might not automatically fit the inter-company intentions of shared benefits such as cost savings, improved quality systems, communication flows and processes, better capacity utilisation and joint development projects. Therefore, a number of control points must contribute to ensuring that such inter-company benefits actually do occur throughout the outsourcing agreement. Relevant control points in relation to the supplier base, inspired by Bragg (1998):

- Regular audits of the suppliers' manufacturing system.
- Baseline agreements; specification of the minimum scope of delivery that might change (improve) during the relationship and thus should be reviewed en route.
- Supplier customer reference list; seek out performance opinions from customers that the supplier is or has been servicing.
- Assign a group of engineers responsible for assessing suppliers' compliance with quality and delivery time, for reviewing processes and quality system (ISO etc.), for identifying and resolving eventual problems and for continuously searching for potential areas of improvement.
- Create a customer complaint tracking and response system which must ensure that those customer complaints relating to the suppliers can be tracked and reported back to the suppliers for corrective action.

The focus on internal core competencies has to a large extent brought about more close, intimate and long-term relationships between company and supplier and has made the information flow and services between the parties in the supply chain more critical and value added.

From a manufacturing point of view, this is reflected in the fact that typical cost-based make-or-buy decisions (to gain access to external capacity buffers on a short term planning basis) are being challenged by outsourcing or strategic sourcing with more long-term motives such as rationalising the internal organisation and gaining access to complementary knowledge. This, of course, does not mean that make-or-buy decisions are fading out, since most industrial companies are not self-sufficient and thus have a continuous need to get access to external capacity. However, outsourcing and strategic sourcing agreements are becoming more widespread.

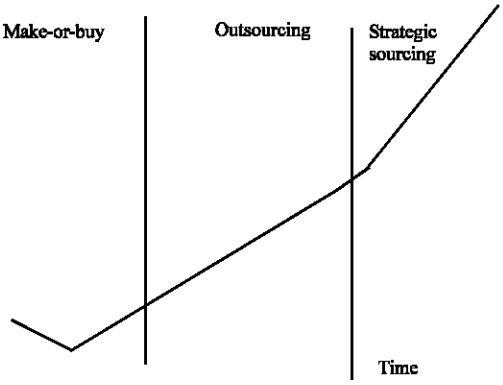

Fig. 1: The relationship between company and supplier

The gradual change in the company-supplier relationships from make-or-buy to outsourcing and strategic sourcing is illustrated in Fig. 1. The figure is adapted from (Andersen and Christensen, 1998).

In Fig. 1, the relationships between company and supplier are undergoing a gradual change from make-or-buy to outsourcing and strategic sourcing. This implies that the knowledge contribution from the supplier base is increasing over time.

In Table 1, the underlying implications of make-or-buy, outsourcing and strategic sourcing in terms of motive, characteristics, inter-company dependency and contract period are shown.

The assumption is that the higher supplier knowledge contribution, the higher demands on the company's ability to plan and control the collaboration and information exchange with its supplier base. Likewise, the need of integration in the decision-making process increases as companies move towards strategic sourcing, because of the close, intimate and long-term nature of the collaboration in the extended network.

Note that the three approaches are not static in the sense that certain overlaps most likely exist between them. This implies that some of the attributes of each approach might apply to one another.

In Table 1, the 3 approaches to company-supplier relationships: make-or-buy, outsourcing and strategic sourcing which typically differentiate with regard to motive, characteristics, inter-company dependency and contract period. The higher supplier knowledge contribution, the higher demands on the company's ability to plan and control the collaboration and information exchange with its supplier base.

Likewise, the need of integration in the decision-making process increases as companies move towards strategic sourcing, because of the close, intimate and

Table 1: The three Approaches to company supplier relationship

Approach	Make-or-buy	Outsourcing	Strategic sourcing
Motive	-Cost Reduction	-Rationalization of Internal Organization	- Complementary knowledge contribution
	-Flexibility through capacity extension	-Cost reduction	- Innovation capability
		-Focus on core competencies	-Optimization of the value chain
Characteristics	-Focus on the single delivery	-Relational competition	-Focus on knowledge transfer
	-Multiple sourcing	-Certification demands	-Benchmarking
			-Single sourcing
Inter-company dependency	-Low	-Medium	-High
Contract Period	-Short	-Medium	-Long

Source: Adapted from hvolby, Momme and Trienekens (2000): Planning and control in industrial set-up

long-term nature of the collaboration in the extended network, the focus of this study thus is to elaborated how this integration can be facilitated and what levels of integration exist-from simple rules to advanced information systems.

TOWARDS INTER-COMPANY PLANNING AND DECISION-MAKING

According to Simon (1960), rational decision-making presupposes complete information availability and the tools/intelligence necessary to choose the decision that offers maximum profit/returns. Most problems, however, are too complex and too much surrounded by uncertainties to make a rational decision possible. In practice, usually limited information is available and decision-makers do not have the proper tools to find the maximum return decision.

In this connection Simon makes a distinction between the two opposing extremes “bounded rationality" (limited information and tools availability) and “objective rationality" (complete availability of information and tools). Because of the dominance of bounded rationality, the choice in most decision-making situations is for so-called satisfactory decisions. Simon (1960) states:

> "Most human decision-making, whether individual or organizational, is concerned with the discovery and selection of satisfactory alternatives; only in exceptional cases is it concerned with the discovery and selection of optimal alternatives".

Silver *et al.* (1998) states that in many chains in practice each link makes independent replenishment decisions based on:

- Cost factors and service considerations.
- Forecasts based on historical demand that this link has observed from the next stocking point downstream.
- Replenishment lead-time from the next stocking point upstream.

This narrow view easily leads to the bullwhip effect illustrated by Forrester (1961) in his Beer Game where a small change in the customers’ purchased quantity has a comprehensive influence throughout the supply chain. Silver stresses four factors which facilitate the creation of the bullwhip effect:

- Demand signal processing (if demand increases, companies order more in anticipation of further increases, thereby communicating an artificially high level of demand).
- The rationing game (there is, or might be, a shortage which will induce the company to order more than the actual forecast in the hope of receiving a larger share of the items in short supply).
- Order batching (fixed costs at one location lead to batching of orders).
- Manufacturer price variations (which encourage bulk orders).

According to Alber and William (1997), the systems and processes of the current supply chains are not designed to meet the requirements now placed upon them. Like Forrester (1961), Alber *et al.* (1997) states that each link in today's supply chain makes individual plans, because the relevant demand information is not available. Alber describes a number of characteristics of a strained versus a capable supply chain:

- Strained Supply Chain Capable Supply Chain.
- No formal supplier partnerships Daily supplier integration.
- Frequent schedule changes Synchronised supply and demand.
- Different schedules in the chain Same schedule throughout the chain.
- Functional silos Supply chain process focus.

From these seminal considerations it can be stated that the increasing use of outsourcing in most industrial segments has brought about a need for tools to integrate activities related to planning and decision-making in the supply chains. When companies in a supply chain plan

individually and use traditional purchase orders as their main communication source, push would be the right description of the chain. If, on the other hand, the individual company demands are co-ordinated throughout the chain by use of information technology, a plan much closer to the actual demand can be achieved and the production capacity can be adjusted to this demand. In other words, *pull* is governing the planning activities, (Thompkins, 1997).

INTEGRATION OF INFORMATION SYSTEMS FOR DECISION SUPPORT

Especially in small and medium sized companies with access to few information systems for decision support are available, which according to Simon implies that satisfying decision making will be most predominant. Therefore, an important field of research is how decision making can be rationalised with the help of information systems, support models and methods.

With regard to inter-company relationships, information technology can support the following forms of collaboration, adapted from (Clemons and Row, 1992; Foss, 1994):

Vertical integration: Existing relationships with customers and suppliers can become more tightly coupled.

Horizontal integration: Companies within the same line of business which are bought up can become more tightly coupled.

Diversification: Companies may co-operate across markets and industries in order to leverage their key resources in new areas, thereby exploiting increased economics of scale and scope in those resources. Relationships with other companies that were previously not possible due to high co-ordination costs or high transaction risks may become feasible.

Outsourcing: Activities previously performed within the company due to high transaction costs and risks may now be advantageously transferred to external suppliers, allowing the company to benefit from the suppliers' higher production economics, such as scale and specialisation. Further understanding of outsourcing relationships can be provided by agency theory, which analyses the relation between principal and agent. As the principal is the party who outsources activities and the agent is the party who becomes the (new) supplier, an important question for the principal is how to control the work done by the supplier.

The central tenet of agency theory is the choice between "behaviour based" and "output based" control systems. If a behaviour based control system is chosen, information about the production processes of the agent (his behaviour) should be available for the principal. If an output based control system is chosen, information about the product (e.g., visualised through quality control) should be available. Trienekens (1999) concludes that agency theory seems to be most relevant in situations with goal divergence and incomplete information.

Because of information technology opportunities such as EDI, the Internet, supply chain planning systems and product and process registration, outsourcing companies should be able to reduce the costs related to monitoring and controlling their network of suppliers. But concurrently with the trend of companies outsourcing a relatively large part of their non-core manufacturing processes to a number of suppliers, the information systems have to cope with this situation in order to make the best of the outsourcing process. The planning procedure, however, is more complicated the more parties involved in the process, which calls for new investments in flexible planning systems and information technology to ensure that information is shared fast and safely.

But are companies in general ready for these changes in the planning procedure? A comparison between ten discrete industrial companies and ten food producing companies showed that the application of fax and letter post is still predominant, although electronic communication is becoming more widespread (Hvolby and Trienekens, 1999). Only three companies communicated with their suppliers by EDI, but all companies expected to start working with EDI in the (near) future. Furthermore, an analysis of one Dutch and two Scottish supply chains states that "bulk ordering (to avail of discounts) and extensive forecasting with a tradition of associating cost with production efficiency tend to distort the demand pattern" (Coll *et al*., 1998). These findings support the previous statements of Silver and Alber, emphasising that companies in the network are still inclined to make independent decisions.

Experience from the shop floor planning area indicates that a full integration of information systems between the company and its suppliers is not possible at present. MRP systems have been pushed to the limit of their ability causing a number of problems in industry. MRP was developed in the seventies for mass production of products with a long life span. Today's situation with customer specific production and a demand from industry for an accurate delivery makes planning more difficult, both regarding materials and capacity. MRP and ERP systems have not been adapted to these changes. Experience from implementing shop floor planning

systems indicates that even within each company, it is not always possible to make up-to-date production plans according to the actual order situation, as the horizon and frequency of the MRP/ERP-plan often are too long. As stated by Harrison (1992) "detailed control of operations have become an art performed by the foremen and expeditors, rather than the science reason tells us is possible". Harrison also states that "faced with pressure of time, the planners will simply issue work on an unachievable schedule, hoping to sort it out through expediting, overtime and sub-contract".

As companies outsource more and more the planning procedures become even more complicated in terms of different planning horizons and a missing agility in the planning procedures between suppliers and their customers in the network. Each supplier has to plan according to the demands of many different customers who all have their own planning systems. Even though supply chain planning systems or "Advanced Planning Systems" focus on integrating decisions in the chain, this only works when a limited number of (main) suppliers synchronise their production plans with a major manufacturer.

CONCLUSION

In this study, the trend that companies are gradually moving from make-or-buy decisions towards outsourcing and strategic sourcing has been elaborated. Decisions concerning whether to make or buy components involve both economic and noneconomic considerations. Economically, an item is a candidate for in-house production if the firm has sufficient capacity and if the component's value is high enough to cover all the variable costs of production plus make some contribution to fixed costs. Low volumes of usage favour buying, which takes littles or no fixed costs.

The change in company supplier relationships implies that knowledge contribution from the supplier base has increased and the nature of the collaboration among partners in the network has become more close. In line with these findings, the study argues that companies by integrating suppliers into their working operations are changing focus from the supply chain perspective to the extended network perspective. Consequently, the demands on companies' ability to plan and control the collaboration and information exchange with their supplier base and the need of integration in the decision-making process have increased.

In order to handle these changes successfully, companies need information systems to effectively process and store the information exchange in the extended network. Information technology opportunities like EDI, the Internet, supply chain planning systems and product and process registration facilitate outsourcing companies in monitoring and controlling their supplier network. However, experience from the shop floor planning area indicates that a full integration of information systems between the company and its suppliers is not possible at present.

When companies move towards strategic sourcing it must be obvious that an integrated planning system is needed in order to obtain a satisfactory result for all parties. Especially when customised production and short lead time are in focus. According to Suri (1998), the Quick Response Manufacturing approach sees short lead times as the most decisive measure to use in order to achieve the overall business objectives. In particular, this is viewed to be the case for customer oriented make-to-order producing companies. The question is therefore whether most companies are ready to enter the outsourcing age or if the costs are actually greater than the benefits ?

Further research will address some of the undeveloped issues raised throughout this study. This includes an explorative analysis of: horizontal linkages within a network and the effect of multiple relationships on the co-ordination of decision making.

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