7-11-2008

# On the Responsiveness of Supply Chains

Niels Dechow
*Oxford University*, niels.dechow@sbs.ox.ac.uk

芽|Sprouts Working Papers on Information Systems ISSN 1535-6078

# On the Responsiveness of Supply Chains

Niels Dechow
Oxford University, UK

**Abstract**
Increasingly often we hear that â we are entering the era of network competitionâ and that corporations increasingly recognize that they are competing as supply chains and not as firms (Hammer, 2001). What makes such statements interesting is the presumption that we already know a lot about the constitution of networks and supply chains. This paper is based on case studies of two firms at the very beginning of their SCM journey. Our research is driven by the following questions: How do supply chains come about? How does supply chain management responsiveness result? Our research suggests why it is important to recognize that Supply Chain Management does not begin at the gates of the company. Paradoxically, external supply chain responsiveness has more to do with the internal coordination of managerial and technical activities than current SCM theories anticipate.

**Keywords:** SCM, Supply Chain Management, Decoupling Points, Operations Management, Actor Networks.

**Permanent URL:** http://sprouts.aisnet.org/3-17



**Reference:** Dechow, N. (2003). "On the Responsiveness of Supply Chains," Case Western Reserve University, USA . *Sprouts: Working Papers on Information Systems*, 3(17). http://sprouts.aisnet.org/3-17

芽|Sprouts

# On the Responsiveness of Supply Chains

## Introduction

Much research on the concept of supply chain management (SCM) has already been undertaken. By and large, however, current research does not deal with the ontological question *where do supply chains come from?* They are simply seen as a boundary condition for doing business, as when, for example, Christopher and Towell (2000) state:

> Identification is growing with the idea that individual businesses no longer compete as stand-alone entities but rather as supply chains. We are now entering the era of network-competition.

Meanwhile, different 'SCM-practice' studies suggest that practitioners find it difficult to implement supply chain management. Fawcett and Magnan (2002) find that SCM is not widely adopted by industry and that supply chain practice rarely resembles the theoretical ideals (or prescriptions). Identifying with the idea of competing as a supply chain is easy; recognizing what this idea implies is difficult. As suggested by Price (1996), current theories fail to recognize that the problems in reality are more social and less technical, and, as Frohlich and Westbrook (2001) conclude even though the fundamental importance of supply chains is widely accepted, important questions remain open about how to characterize them.

Our goal is to explore the SCM creation process, and in particular our interest is to understand the way organizations decide on the mechanisms for integrating on an inter-organizational basis. According to current SCM theory, choosing mechanisms should be easy, given that supply chain integration can be thought of in terms of two 'decoupling points': One is informational and one is material (Christopher and Towell, 2000). On the basis of simulation studies, Mason-Jones and Towill (1997) suggest there is evidence for the argument that the responsiveness of supply chains increases the further 'decoupling points' can be extended apart.

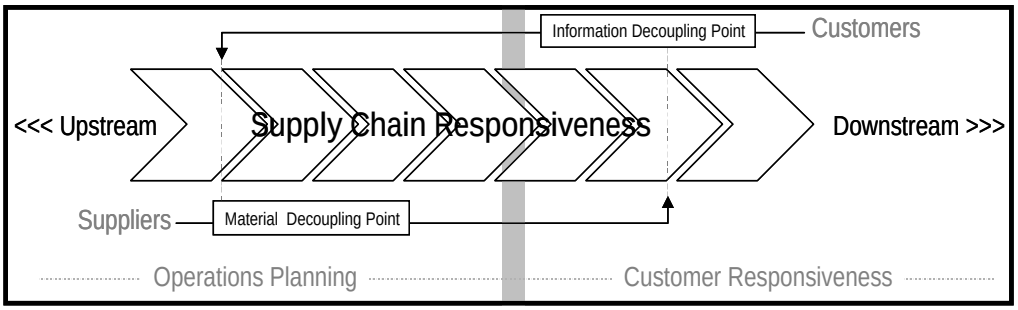


**Figure 1. Decoupling points - A measure of supply chain responsiveness**

The 'informational decoupling point' refers to the furthest point upstream to which information on real final demand can penetrate the supply chain. In contrast, the 'material decoupling point' refers to the furthest point downstream to which products/services can be modularized or versionized and still remain adaptable to customer specifications. As Hoekstra

and Romme (1992) argue, the assumption of a decoupling point is that one can separate the supply chain in two parts, of which the downstream part is geared towards responding to customers orders and the upstream part is geared towards coordinated planning. Through this assumption the challenges of supply chain management become a matter of optimization. As challenging and interesting as this question may be by itself, this assumption can also be problematic because it distracts our attention from the underlying question where *do supply chains come from?*

As Frohlich and Westbrook (2001) argue, a significant problem with current theories on supply chain management is that they all too often simply draw on banners such as 'world class manufacturing' (Hayes and Wheelwright, 1984); 'lean management' (Womack and Jones, 1991); and 'electronic data interchange' (EDI) (Sheombar, 1992; Bowersox and Daugherty, 1995). Most of these banners prescribe what corporations should do, but often these prescriptions are not sufficiently operational (Heikkilä, 2002) to be meaningful for corporations to act on. It seems that we do not yet know enough about the processes through which supply chains come about (Flynn et al, 1999) and as a result we revert to assuming that they are simply a product of the ways organizations trade off 'price' and 'quality' with each other (Cousins, 2002). As Choi et al (2001) suggest, we need to sophisticate our simplistic notion of 'systemness' which currently appears to take for given that all organizations within a value chain (Porter, 1985) are equally important links and that they interact as a unified virtual business entity (Tan, 2001).

If there is increasing identification with the idea that we are entering the era of network-competition, we believe that it is relevant to explore how these networks come about; and if there is an assumption that supply chain responsiveness is a function of how far it is possible to extend some 'decoupling points', we believe it is important to explore how organizations locate these 'decoupling points'. For that purpose we draw on the actor-network approach which suggests understanding the phenomena as 'networkings' (Latour, 1999). What we will do in the following pages is trace discussions about supply chain management in two organizations and, in particular, we study the different types of arguments about where to locate the 'decoupling points'. In tracing the arguments different parties bring into play, we draw on the 'boundaries of the firm' (Penrose, 1959) and on 'transaction costs' (Williamson, 1985).

The purpose of the case studies is not to measure the extent to which two corporations have implemented a certain definition of SCM. Rather the intent is to explore (a) the discursive process through which SCM is invented locally and in doing so to explore (b) arguments about how manufacturing and managerial competence translate into concerns about supply chain responsiveness.

Our research contrasts past research by illustrating how 'decoupling points' in practice are outcomes rather than determinants of 'responsiveness' because the supply chain itself is a function of the firm rather than an environmental variable in relation to which the firm operates. Our research illustrates why supply chain management is primarily a matter of crafting internal networks in relation to certain ideas about 'firm boundaries' based on the perceived 'transaction costs' associated with different ways of organizing managerial and manufacturing competences

## Research Method and Empirical Basis

Our case studies are based on two firms that we refer to as respectively SuperDesign and EuroOil. The corporations are not competitors. They work in different markets. Both of them are recognized as leaders within their respective industries. Within the oil-industry EuroOil is recognized for its innovate production techniques, and in the consumer market for audio/video products Super Design is recognized for the combination of high-tech and superior aesthetic looks. In each their respective markets both companies are recognized for their superior engineering skills.

Traditionally, both corporations have used large pools of suppliers and have not made efforts to cooperate with anyone in particular. In the past both corporations have always produced strategic components in-house, whereas non-strategic components were sourced from suppliers; and these were handled through arms-length agreements. Times have changed however, and in both corporations top management have launched supply chain management as a strategic imperative.

In both corporations the purchasing functions were among the most proactive to mobilize SCM and in both organizations their drive was based on the idea of creating supplier portfolios. In EuroOil, the purchasing function made explicit reference to Kraljic's (1983) HBR-article '*purchasing must become supply management*'. The objectives in both organizations were very much in line with the general purchasing and supply perspective in current SCM literature throughout the 1990s (see for example Tan, 2001), which was to: 1/ reduce the base of suppliers; 2/ involve some of the suppliers in RandD in order to speed the time-to-market ration and to 3/ reduce over all costs. In addition, both organizations wanted to 'catch up with' recent trends in the broader field of operations management - 'world class manufacturing' and 'lean management' in particular. These objectives created the basis for those discussions between different departments that we explore in the following.

Data collection, data analysis and theory building are closely related: they form an iterative process. There are two levels to our case-study analysis. Following Miles and Huberman (1994) the first round of our analysis was a 'within-case-analysis,' followed by a 'cross-case-analysis,' where the corporations were compared.

We conducted 22 interviews. In each organization one respondent was interviewed several times to confirm observations, elaborate on themes, and retrieve and discuss supplementary documentations materials. Our data reliability improved because of these iterations – although additional iterations with several respondents would of course have reduced the risk of becoming subject to undue influence from any of our respondents (Eisenhardt, 1989; Yin, 1984). The latter risk we, however, find mitigated by the fact that our data analysis is based on full-length transcriptions of all 22 interviews. During our first round of analysis we explored the themes that were unique to each organization and we traced how the networking in each organization compared to the other. Brown and Capdevilla (1999) describe this approach the following way:

> What the actor-network approach does is to take the end as its beginning and run counter to all chronology, moving 'backwards' to the flowering and beginning of networks. It makes the most curious of folds, where 'after' becomes 'before' the beginning. (P.35)

Another way to describe this approach is to compare it to archeological studies in a real-time setting. Whenever we encountered a theme, we started tracing its constituents, its origins

and its impact. During our *within case analysis* our work was to establish contextual coherence from observations and information garnered from the interviews.

The purpose of the following *cross-case analysis* was to search for cross-patterns, although our objective was not to search for a 'generalizable' truth, which we leave squarely in the hands of the reader to decide. Rather than focusing on what the arguments themselves propose, the purpose of our cross comparison was to explore what the arguments *altogether* convey about a process that is both social and technical. In other words, we are mainly interested in the local 'stories' as vehicle for understanding the mechanisms through which manufacturing and management competences are networked on an inter-organizational basis.

## Case Studies

### The SCM Vision at EuroOil and SuperDesign: Trusting, Lean and Agile

In both EuroOil and SuperDesign, top management had a vision about SCM. Contracts were to be replaced by trust in order to be able to gain leverage on their knowledge, contracts were to be replaced by trust in the early stages of product development, and product costing was to be used to clarify for all parties the 'fair costs' at different stages of the product and technology life cycles.

As such, these visions correspond with the attributes of both 'lean management' and 'agile management' (for example, Naylor, Naim and Berry 1997; Mason-Jones et al. 2000). In both companies these visions were crafted in the early 1990s, a time when manufacturing had become a strategic agenda, not the least because of a stream of manufacturing publications based on books on 'world class manufacturing' (Hayes and Wheelwright, 1984); 'lean management' (Womack, Jones and Ross, 1991); and books on 'industrial networks' by Johansson and Mattsson (1987). The extent to which these works had been used specifically as sources for the vision, we do not know. However, the important point is that the SCM vision resonated with state-of-the-art management banners without making clear, for example, how the vision of lean was to be balanced against the vision of trust-based supplier relationships, the idea of being agile, etc.

Through their visions, top management sent signals into their respective organizations that something was about to change, and their 'eclecticness' made it possible for people to take different positions. As a manager in SuperDesign stated, "*This is about creating a path into the future*"; but, as another manager from EuroOil acknowledged, visions can be difficult to work with:

> It's interesting, when you write something it seems that everybody agrees with you. Afterwards most people nevertheless have no idea how to realize it.

The case in both corporations was that progress came slowly because different parties understood the same vision differently. In both organizations, the purchasing functions argued that it would be possible to create a 'decoupling point' very close to manufacturing if only they – the purchasing functions – were allowed to represent the suppliers at the product-design stage. Against this position the engineering departments in both organizations argued that the 'decoupling point' had to be placed much further upstream given that suppliers for various reasons could not be 'trusted' to take over elements of the design work.

Management's vision stated the objectives but did not provide direction. Instead they provided vocabularies by which different parties in SuperDesign and EuroOil could discuss the transformation from being a 'firm' to becoming clusters of particular manufacturing and managerial competences. The case studies illustrate that the debate was not about whether and where the two companies had 'core competences' and it was not a discussion about whether or not things could be outsourced. What people disagreed about was how the core competences could be and should be nurtured. And therefore the debate was about the 'transaction cost' anticipated with different types of supply chain management scenarios.

**SCM at SuperDesign**

The following two sections introduce the cases one by one. We begin with the study of SuperDesign, where we focus on the three positions we encountered at different places in the organization. Each of these positions differs with regard to how they approach the SCM vision. First, there is the 'technology-mapping project'. This project was launched by corporate staff so that SuperDesign could decide how SCM should rank its various competences and determine which parts could be outsourced to suppliers.

Second, we introduce the purchasing function. They argued that in the future SuperDesign could rely much more on the design and manufacturing competences of its suppliers if only it focused a little more on the way these suppliers are managed. The purchasing function challenged the firms engineering departments, who traditionally have kept all design-related activities in-house. The rhetoric employed by the purchasing function argued that a greater degree of involvement with suppliers could reduce the cost of doing transactions. In particular, their rhetoric focused on the part of the corporate SCM vision in favor of lean management. Their position was that there would be no transaction costs for SuperDesign in changing its ways of designing new products – only gains.

The engineering departments strongly opposed this suggestion – not because they were against the SCM vision but because they did not think design responsibility could be extended across corporate boundaries. The engineers said design is one of the most important attributes of SuperDesign products. It's not that they didn't trust suppliers. They simply thought that involving suppliers in this part of the job would increase not only the costs of transactions but also the overall 'transaction costs' because SuperDesign would be limiting its design creativity.

**The Technology-Mapping Project.** The technology-mapping project at SuperDesign was launched by the strategic planning department as an attempt to drive the organization towards taking a rational approach to implementing SCM. As the project manager pointed out:

> It's a process – I mean, the result doesn't count as much as the fact that everybody in purchasing and everybody in engineering will have to familiarize themselves with our operational processes. It will make them build a lot of knowledge about what and how we are doing.

The tool for this learning process was a relatively simple map that required everyone to evaluate the extent to which a work process added customer value to the final product ('external productivity') and the extent to which SuperDesign was performing this process better (internal productivity) than any current or potential supplier would be able to do:

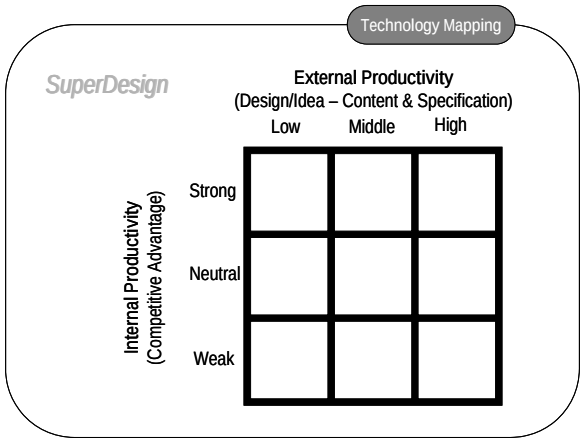


**Figure 2. The Technology Mapping Matrix**

The project manager continued:

> The whole point of this exercise is to look at how much this knowledge contributes to the value that customers perceive. Well, of course you can't ask customers about this. It's impossible because they can't see the processes. But we can do it – at least we can assess it and that is what we do. You know, an important process will be placed in the top right corner. The whole point is to assess which of our capabilities contribute to our competitive advantage. If we are not at least as good as the market – then we are 'weak'. And if we outperform the market, then we are 'strong' – and that will be in terms of prices, quality, logistics – everything. We include everything here. However, we do not attempt to calculate it. It's all about using common knowledge.

The assumption behind this project was that SuperDesign -- driven by the needs of particular projects – should be and would be able to integrate people, functions and competences across corporate boundaries. Purchasing had no problems with this project. They saw it as an opportunity to reorient the organization towards realizing the potential value of administrative resources and away from its almost exclusive focus on design and manufacturing resources. In order to mobilize this new view of the organization, purchasing focused on finding examples that current production costs were unrealistically high because designers did not create products that were designed for manufacturability.

**SCM according to SuperDesign's purchasing function.** At the beginning of our interviews with the purchasing function, several examples were given to illustrate that current manufacturing costs were unrealistically high simply because product design did not take manufacturing costs seriously. The purchasing officer provided examples:

> Right now we have a supplier where we scrap eighty percent of the steel they supply. It's because the process we ask for is close to impossible. However, we need the steel for one of our top-of-the-line products. It's unfortunate and of course the high scrap level means that we have to monitor that supplier very closely.
>
> Another example of special cases is a supplier in Austria. Really, his main market is the dairy industry. But we were very fortunate to find him, because we can find no one else who can produce a cone – a component for another top-of-the-line product – like he can. You know, it's really a small place. The owner himself is working for us together with a few people. It's really only a workshop. But currently we are very dependent on him.

> Traditionally, product development has been done without any involvement of suppliers and without using the purchasing officer's knowledge - simply because engineers often appeared to take great pleasure in traveling around to make arrangements with a supplier with a sense of craftsmanship that they considered similar to their own.

Purchasing wanted to change this regime and in their mind the SCM vision meant that SuperDesign should consider substituting some of its design and engineering competences with new administrative practices/resources which the purchasing function could deliver. The purchasing function wanted to be more involved in the design of new products. They wanted to act as 'boundary spanners' (Tushman and Scanlan, 1981) between suppliers and the engineering functions at SuperDesign. The objective the purchasing function attributed to this role was to find ways to reduce costs:

> …we ourselves should participate in calculating what the price should be. We believe in 'open book' calculations – and that means we know how much the different things cost – materials, packaging, transportation, wages, overhead. It means that we are there already before the thing is created and that is why we can negotiate a fair price with the supplier…

Whereas the technology-mapping project was designed to create the basis for an unbiased decision about where to place the decoupling points in relation to suppliers, purchasing was on a mission to place the decoupling point as close to operations as possible in order to integrate suppliers in the design process. The premise for making this happen, however, was that SuperDesign would be able to extend its design competence to suppliers and manage this extension via managerial procedures. At SuperDesign such a thing had never been tried before. Design competences had always been founded in manufacturing skills exclusively.

**SCM according to SuperDesign's design and engineering functions.** Engineering was not against 'open book calculations'. Their concern was that it would not be possible to articulate the company's design competence to suppliers. The response from the engineering department was as follows:

> Although this is a nice proposal in theory, it wouldn't work in practice since the capability to develop superior product design is something that is inherent in our corporate culture. You can't outsource the skills of a SuperDesign craftsman without losing the SuperDesign. You have to be competent. You have to know what you are talking about. You need this surplus of technical skills and knowledge so that you just know what is and what isn't possible. It is not enough simply to sketch our good ideas on paper drawings.

The engineering department responded with a technical argument. In theory, the proposal to move the decoupling point back to the point of product design was nice. However, in practice, engineering did not think that it was possible to stretch this competence across organizational departments. In their view, there was (Williamsonian) 'transaction *gain*' involved with this approach that the purchasing function did not take into account when arguing they could reduce the costs of transactions. As the following respondent explains the 'transaction gain' by keeping design internal allowed the company to rely on tacit product knowledge and corporate culture as mechanisms that would ensure 'the right feel' to a SuperDesign product:

> All the things that are difficult to specify – the tacit stuff – is exactly what makes it difficult to outsource. It's in our culture and you can't outsource this knowledge to someone who on the one hand produces high quality but on the other hand is not able to get the finish right. It always ends

> up in an argument that their products are/are not good enough according to the specifications. And we just can't make them understand that it simply doesn't have the little extra that can't be specified.
>
> The thing is we can specify and specify and then specify a little more. However, we don't when working with things ourselves. We specify to a certain level and then we stop, knowing comfortably that our culture will pick up where we leave things. This only works if we do things by ourselves.

The engineering departments were not against involving the purchasing department. Their position was simply that it was not possible because SuperDesign would make itself dependent on the extent to which suppliers would incorporate 'SuperDesign craftsmanship' in their work. Where purchasing wanted to pull back the decoupling point in order to include suppliers in the design of products, the engineering departments argued that customer expectation would not permit this kind of integration because there is a difference between meeting a technical standard and meeting the customers' expectations. An 'informational decoupling point' in other words was pulled into the discussion in order to defend the current location of the material decoupling point. However, what the engineering function argued (in contrast to current SCM theory) was that SuperDesign would only be able to maintain its responsiveness to final customers if it kept suppliers at arm's length. In order to make this argument, certain aspects of technological complexity were unraveled in such ways that everyone could see that the 'material decoupling point' shares many properties with the 'informational decoupling point' and in such ways that SuperDesign could only maintain its downstream responsiveness by keeping the material and the information decoupling points as close as possible.

What this also illustrates is that the SCM debate in SuperDesign had launched two very different positions on the competences of the firm. One was the old one in which competence associated exclusively with manufacturing and design skills. The other - represented by the purchasing function – was new arguing that SuperDesign's competence could only be nurtured if it improved its ability to blend manufacturing and managerial procedures. But engineering did not agree, as illustrated by the following statement:

> You know, the only thing that makes us different from everyone else in this business is that we are focused on the design – the product. Everyone else focuses on the process. That's why their design lags behind - because everything is designed for manufacturability. If you constantly focus on the manufacturing process, you will never produce innovative products. Then you are only following the beaten-path. We, in contrast, emphasize the product.

On the basis of the input from the purchasing department and the design and engineering departments respectively, the *technology-mapping project* at the same time made a lot of sense as it was also about to prove its own impossibility. The purpose of our project was to create an objective basis on which to decide where to create the decoupling points. The positions provided by the purchasing and engineering functions illustrate that the basis of inter-organizational relationships was not the separability of activities but rather the extent to which competences could be spanned across organizational spaces. In order for SuperDesign to compete as a supply chain it would have to include suppliers in the design process. This would require the company to examine how it associated own manufacturing with own managerial procedures, internally. As the engineering department pointed out, this is not just a matter of doing a cost calculation. Altering the current regime altered the 'transaction costs' – i.e., the choices available to

SuperDesign. The cost savings earned from including the suppliers might not mitigate the potential adverse effect of no longer focusing primarily on the craftsmanship customers expect to find in the products

At SuperDesign the supply chain in other words was not definable through the decoupling points the technology-mapping project tried to establish simply because Supply Chain Management does not begin where competitive advantages end. On the contrary, company discussions illustrate that supply chain management is a matter of finding out how far it is possible to stretch out the competences that define SuperDesign and at what cost. Supply chain management therefore does not begin where SuperDesign ends. On the contrary, the possibility for supply chain management ends at the point where SuperDesign is no longer able to ensure that the supplier is able to produce what the customer expects. SCM therefore ends where SuperDesign is no longer able to connect and coordinate the informational with the material 'decoupling points'.

**SCM at EuroOil**

EuroOil is a very different company. Where SuperDesign designs and produces sophisticated audio and video equipment, EuroOil engages with large turn-key projects drilling for off-shore oil.

The traditional work process would follow a path where EuroOil first wrote a detailed specification of almost everything down to the size and quality of nuts and bolts after which it on the one hand assigned a contractor to take over the project but on the other hand continued to review whether specified requirements were met. Decoupling points had been very important as a demarcation of responsibilities in the turn-key projects.

With the new SCM vision, the purchasing function at EuroOil began to mobilize in very similar ways to the purchasing function at SuperDesign, but again, engineering was reluctant to follow the new approach. But, whereas SCM at SuperDesign was a question of how far and at what cost the company could stretch competences out to suppliers the question at EuroOil was: how closely could they allow suppliers to become partners in their turn-key projects? In other words, it was a problem of how close EuroOil could allow itself to connect the material and the informational decoupling points.

**EuroOil SCM - the engineering way.** Engineering departments at EuroOil described their practice as one of double-checking everything their suppliers did. Decoupling points were important as a means to allow EuroOil engineering departments to double-loop everything the suppliers worked on. This was necessary because EuroOil carried all liability in relation to these turn-key projects. Because the oil rigs were controlled by EuroOil, it would not be possible to blame suppliers if an accident happened – not even if suppliers were de facto responsible:

> So really, if you look reality in the eye this is back to what I said before – we normally did the job 2 or 3 times. We would employ a company to do the work for us. But on top we checked up on everything they did.
>
> What happens is really that we have created an enormous organization to control our suppliers – and that's because we carry all liability.
>
> In theory it would be much cheaper not to specify subcontracted projecting in detail. In practice, however, it is necessary. The idea of functional specifications would leave too much space for uncertainty, which could not be accepted as long as EuroOil carries liability for the project.

Like the engineering departments at SuperDesign, the EuroOil engineering departments are not against the purchasing functions' initiative. They just don't see how it would be possible to allow the suppliers to become supply chain partners.

**EuroOil SCM according to the purchasing function.** The purchasing function saw this very differently. To them it was a mystery that EuroOil would maintain a large organization in order simply to control what others supposedly knew much more about:

> Well, we are the 'new kid on the block'. Our department has not existed more than five years, so many still see us as intruders. We are trying to get a more central role, where we are closer to the projects and closer to the suppliers. The external suppliers are really the ones that we consider as future partners – far more than the internal EuroOil departments.

Like the purchasing department at SuperDesign, the EuroOil purchasing function saw itself as a boundary spanner – as the supplier's representative internally at EuroOil. But purchasing thought that EuroOil no longer had any significant technical competence:

> …we have to acknowledge that we have theoretical competence only when it comes to engineering. We can scale a project. However, it doesn't change that we depend on the suppliers and their experience when it comes to operations.

Purchasing therefore took a quite aggressive stance internally at EuroOil in order to gain some ground:

> …we in the purchasing department cannot accept to be involved only on the basis of already-made decisions…We need to change the rules of the game. People should not consider purchasing to be a cost. It's our investment for future revenue. The thing is that we never had an incentive to think full costs and total life cycle. Well, we didn't have the foundation because we didn't have the statistical data we have now.

Also at EuroOil the purchasing function saw that in the future cost control would be a major function. But where SuperDesign purchasing officers talked about "open book calculations" EuroOil focused on the concept of 'life-cycle-costs". However, like their counterparts at SuperDesign, they had the idea that suppliers could be organized into pools according to their strategic relevance:

> Now we have to find out which supplier types are important to us in general – we have to think beyond each individual project… Once we've established that, then we must look at the specific suppliers and assess how they can help us develop our skills. This is, of course, all theory – it's not for real yet. But for sure, it will involve a completely different profile for purchasing. The good thing is that we got an action plan that defines what we need to do in order to reach our goals – for example, it specifies that we must standardize the equipment we are sourcing from various suppliers.

Although the context is different, what the SCM vision spurred in both corporations was a new tension between manufacturing and managerial competences. Purchasing departments in both places emphasized the managerial competences, and thereby replicated much of the current thinking in SCM theory. In each company way engineering departments pointed out that the issue of SCM cannot be reduced meaningfully to a matter of managerial skills and representations. But where the engineering functions at SuperDesign doubted that manufacturing

competences could be stretched towards suppliers, at EuroOil the issue was liability: how closely they could afford to rely on suppliers. Here, supply chain management is a matter of contractual arrangements – or simply who to blame if something goes wrong and how to do everything possible to avoid technical 'mishaps'.

**EuroOil SCM – from the perspective of business units.** The practice of different business units at EuroOil was to serve both parties as needed. One business unit, building a 'floating oil rig,' had chosen to approach the project without the assistance of the engineering departments. Their argument was that the contractual focus traditionally endorsed by EuroOil has become a costly practice. The business unit manager explains:

> The new thing that every one is talking about is actually quite simple – we are bringing it all back to basics, because things had become so incredibly complicated. The new thing simply is that we are suggesting to our suppliers a partner-contract with a number of milestones. If everything works, then we all win. If not, we will all loose.
>
> In the contract we have taken out all clauses that produce confrontation. We don't have any punishment clauses. They always cause confrontation. But we have also added new clauses that stipulate they cannot make claims against us for things we have done together in the integrated team. It's like a marriage if you like. If one of us makes a mistake, the other one has to accept it. This is all based on that we have confidence in each other for a common goal.

In essence, contracts have not been eliminated. They have simply been changed in such ways that they will always create either 'win-win' or 'both-loose' arrangements. Trust in that sense still has a financial lever. In particular the practice of this business unit becomes interesting when mirroring another business unit, which argues about the ways old oil-rigs need to be managed. The business unit manager explains:

> You know, they have started talking about ways of creating improvement programs – and we are of course appreciative of these trends, too. We have asked our suppliers to come up with an improvement program. However, it all comes down to the contract. There has to be positive and negative aspects to it – otherwise it stays with talk and good intentions. There has to be a way that I can punish a bad supplier and reward the good one.

This business unit follows the old ways of doing things – and thus agrees more with the engineering department than with the purchasing department. As already mentioned, the difference between these two business units is that they were located at each their end of two product life cycles. The first business unit was just at the beginning - building an oil rig. The second business unit was managing an older oil rig, where the number of surprises is few.

What these two business units point out in relation to the debate between purchasing and the technical controllers (the engineering departments) is that SCM at EuroOil should be handled in relation to the dynamics of the technology life cycles of turn-key installations. In context, the question was not how far EuroOil can extend its technical competence towards suppliers. Here the issue was about when to bring in the suppliers closely and when to manage them at arm's-length. Decoupling points in this sense are not a function of competence, but a function of time. As explained by the latter business unit manager, there is no need to partner with suppliers when it is possible to manage them by a contract. On the other hand, as pointed out by the first business unit manager, it may not make sense to tie suppliers down to a contract in the early stages of a turn-key project when reality is that both parties are mutually dependent.

## Discussion

Supply chain management does not begin at the gates of the company. Suppliers and customers may represent the polarities of what at some point becomes a supply chain. But in contrast to these polarities, supply chain management is about creating a meeting point of these polarities inside the firm. In other words, supply chains do not run through corporations; they extend from corporations and their extension depends on the ability of each corporation to make ends meet.

In the SuperDesign and EuroOil case studies we learn that purchasing traditionally have not been actively involved in the management of suppliers. They may have handled administrative issues and done the paperwork, but in neither of the two organizations have they been involved in managing suppliers. With the new SCM visions, however, they are given a script that allows them to mobilize and make a powerful argument about why and how things should be different. SCM vocabulary allows the purchasing functions to represent their managerial skills as a competence from which both corporations could gain strategic leverage. The problem with these mobilizations is that on the one had they may present ideas about what the corporations should do; on the other hand they do not represent solutions. Overall, they create a banner for a new debate about the corporation, its future and how to get on with the past ( Mouritsen and Dechow, 2001).

What the engineering functions in both corporations address is that changing the way interorganizational relationships are managed doesn't stop outside the firm. Opening this debate also puts into question the organization of *inter*departmental relationships. Those who internally represent both the customer and the supplier also define the 'boundaries of the firm' – internally and externally. In both SuperDesign and EuroOil we see that the engineering departments use customers (SuperDesign) and the regulatory environment (EuroOil) as the argument for why the engineering function should control the way the company interfaces with suppliers. It is not that things could not be different, but, as they both point out, one should not change them simply because it will reduce the cost of transactions. What is really at stake is not *accounting costs* but 'transaction costs'.

The supply chain management visions challenged the corporations as to whether they can afford to work and compete on the basis of a potentially very different set of competitive levers. Previously both corporations had based their position on a definition of competence that has been nurtured primarily through the manufacturing skills that both corporations possess. The SCM visions make it possible that this could be changed in favor of a new mix of both manufacturing and managerial skills. However, this puts the internal organization at stake. The engineering departments illustrate how their thinking is as constrained by tradition as the purchasing departments are limited by the prescriptive ideas on supply chain management. In both corporations all functions start out by neglecting what they could do and would have to do together. Drawing on Bowker and Star (1996) the prescriptive SCM text provides the purchasing functions in both organizations with strong 'material texture' – a coherent text that forces their opponents (the engineering functions) to react because a scenario is presented that could render the past indeterminate. They therefore start out by explaining what they do, realizing that the quality of tradition has come up for review. From a Latourian perspective what we see in the case studies is a 'process of enlargement' where organizational 'common knowledge' (Dixon, 2000) is revisited in order to be tested for its ability to withstand criticisms and challenges

(Briers and Chua, 2001) that are mobilized through the SCM vision in relation to the underlying questions: Where does our supply chain come from? Where does it begin and where does it end?

What it shows us is that the supply chain comes from nowhere – except out of the firm itself. The organization of the supply chain is an effect of the way the firm organizes itself. When the supply chain does not have an ontology it is because the firm does not itself have a set ontology. It may be characterized by 'path dependence' (Garud and Karnøe, 2001), but there is no set definition of the firm that co-defines the supply chain. On this basis, the remainder of this discussion is organized in three sections that address (A) the explanatory power of the 'decoupling points' hypothesis; (B) how the implementation of supply chain management necessarily has to go through a process of debating intra organizational positions and finally; and finally (C) the issue of supply chain responsiveness from a transaction cost perspective.

**The Explanatory Power of 'Decoupling Points' Hypothesis**

Even if in theory we can define the optimum location of decoupling points, locating them is not an easy task. The assumption that one can divide the supply chain in two parts, of which the downstream part is geared towards responding to customer orders and the upstream part is geared towards coordinated planning (Hoekstra and Romme, 1992), in practice, is complicated by being situated in the middle of the internal organization of the firm. Decoupling points in that sense paradoxically is about integration – because, as the case studies illustrate, how we arrange our interorganizational relationships depends on our intra-organizational relationships.

The hypothesis about decoupling points (Christopher and Towell, 2000) argues that the further one is able to extend the material from the informational decoupling point the more responsive supply chains will become. Simulations support this argument (Mason-Jones and Towill, 1997). But a significant difference between simulations and practice is also that simulations portray communication mechanisms as unproblematic – as if they were empty data strings.

Our case studies show that, on the contrary, communication has significant value to many different functions in the organization. Organizational significance comes from the ability to represent customers and suppliers. Those who can represent both are much more powerful and important than those who can only represent themselves. Losing the representation of suppliers is something that the engineering functions in both corporations resist because it would alter not only current practices but also current ways of creating supply chain responsiveness. In SuperDesign the argument is that it is not possible to extend the design competence out to suppliers, because they will not be able to deliver the craftsmanship that customers expect. In EuroOil the argument is that if the engineering departments lose the opportunity to double-check every technical specification, they will not be able to prevent a failure and a financial liability. Obviously this argument is not as customer driven as the one at SuperDesign. The mechanisms of the argument, however, is the same, namely that responsiveness comes from the ability to integrate informational (customer-related) and material (supplier-related) concerns into one and the same procedure. Instead of thinking about the material and the informational as two separate streams of communication, the argument that the engineering departments in both companies defend is that, in the past, core competence has been created and nurtured because of the ability to keep them together. Our case studies do not reveal who is more right - the engineering mobilizing the past, or the purchasing functions mobilizing the SCM visions. But they illustrate that the hypothesis about the extension of decoupling points as a measure of the responsiveness of supply chains in critical ways delimit our understanding of how supply chain responsiveness

is constructed. On the basis of our studies it seems that responsiveness results much more from the ability to integrate practices across space than from the ability to separate or decouple them.

Nevertheless, the hypothesis about 'decoupling points' remains powerful in one important respect. Phrasing the problem as a matter of 'decoupling' resonates with the way that the various actors in both organizations talk about the SCM vision. Even if our case studies illustrate how the different departments in reality started a discussion about ways of integrating manufacturing and managerial positions inside the firm, externalizing the issues at stake is the way they go about this. Only once in our conversations with the different parties did one of them – the purchasing department at EuroOil – put itself in the center of the discussion when stating that they, as the *new kid on the block*, no longer could accept *being left out* of the discussions. Otherwise, the various parties mostly externalized the discussion into matters of 'what the customer wants' and 'what the suppliers can do'. It was however as much a discussion about internal positions at SuperDesign and EuroOil.

**Managing Firm Boundaries through Information Delivery Mechanisms**

The 'decoupling points' hypothesis does not focus on the relationships between parties in the supply chain. Traditionally, the operations research-based modelling approach has primarily dealt with communication as a matter of resource allocation optimisation. As Gattorna and Walters (1996) argue, this optimisation problem has three components: (accounting) *costs*, (physical) *constraints* and (other) *conditions*. The latter category encompasses broadly the following:

> Conditions [that] are logical, non-numeric characteristics that must be respected in developing the optimum allocation of resources. They usually reflect business considerations, such as policies, contractual obligations or customer service needs. (P.258)

As our case-studies illustrate, various parties in both SuperDesign and EuroOil spend considerable time trying to figure out these other conditions – and they are not trivial.

On one level, the purchasing functions represent the conditions as if communication is simply a matter of designing 'clever' cost control systems, i.e., 'life-cycle costing' at EuroOil and 'open-book accounting' at SuperDesign. But on another level they talk about how their role in conjunction with these accounting based methods of communication is to become the 'boundary spanner' between external suppliers and internal engineering functions. Engineering is not thrilled about this proposal in either of the corporations and therefore offer a number of arguments about why this is not feasible. At SuperDesign, they argue that core competences cannot be nurtured across boundaries simply because of the amount of tacit knowledge (Polanyi, 1967), and in similar ways EuroOil engineering functions argue that the company would not be able to take proper care of its liabilities if one were suddenly to include suppliers. Hereby our case studies illustrate a discussion with more faces than interfacings. The various parties challenge each other with different arguments without necessarily answering – or at least not answering directly - to the arguments presented by their counterparts. Each of the parties are trying to network a number of arguments into scenarios that make certain things obvious.

For purchasing, the situation is no less political than it is for engineering. The arguments about how cost controlling should be used as means to communicate with suppliers are not primarily about managing suppliers. The purpose of introducing new cost-accounting practices is probably about managing suppliers. Working with 'clever' cost controls, however, requires that purchasing is given more responsibility (relative to engineering). In the SuperDesign setting, cost

control is a management tool. With this tool, purchasing is trying to build a scenario in which SuperDesign's core competence can be nurtured as much through management as through manufacturing skills. The arguments used are consistent with current SCM-theory and, as argued by the purchasing functions, their ideas are nothing exceptional. They are founded in 'best practice'.

The 'side-effect' of this scenario is that suddenly purchasing will have to play a much more prominent role in the organization. Neither of the two engineering functions are thrilled about it, which is why they counter by expanding on the invaluable 'tacit dimension' of their work. As such, the engineering functions have no problem with the presentation of the 'clever' cost controls. However, they realize this is not only a presentation of a new tool, but also a different representation of great variety of issues related to the organization of functions. The point here is that the cost-control instrument tools do not speak by themselves. They represent an element of a new and different SuperDesign, in which the engineering role could be at stake not only in relation to purchasing but potentially also in relation to external suppliers – that is if purchasing is really serious about becoming the 'boundary spanner' between internal and external parties.

Engineering is not against 'clever cost controls'. But they realize that the accounting instruments will enable purchasing to counter and perhaps even overrule an engineering point of view. Never before in either of these two companies have engineering functions had to take purchasing into account. Accounting technologies are not only instruments for external communication. They are as much instruments that can be used to reorganize the internal boundaries of the firm in addition to the external ones.

The SCM visions may only have been launched in order to change the ways these two corporations go about handling their interorganizational relationships. But the idea of supply chain management reaches far beyond that, and what the various internal functions realize is that their positions are at stake. None of them are safe. Given the SCM vocabulary, purchasing has the opportunity to present their administrative practices as a resource that could be, and perhaps is, strategically important to the future of the firm. Drawing on Bowker and Star (1996) what we see is how the prescriptive text on SCM provides the purchasing functions with a strong 'material texture' – a coherent text that forces the engineering functions to react because suddenly the past is rendered indeterminate. In other words the SCM vision has reopened history and what it means to get on with the past. With the SCM manuscripts, however, the purchasing functions can do no more than the engineering departments can do with their traditions. All of them see that their positions are at stake – purchasing because history does not automatically legitimise their future position, and engineering because history no longer produces accounts that the future continues the past.

The decision to implement supply chain management therefore reaches much further into the company than often anticipated by the literature on SCM, which focuses mostly on the outreach of supplier's supplier and customer's customer (Ellif, 1996). SCM *is* about managing suppliers, but *is not primarily* about managing suppliers. As already mentioned, supply chain management does not begin at the gates of the company. On the contrary, our case studies suggest that this is where it ends. The way suppliers are organized in relation to the firm depends on the way internal positions are negotiated. As illustrated in our case studies it is not only the purchasing functions that bring in external parties. Engineering functions do that as well, as illustrated most notably at SuperDesign, where the engineering functions argue that even if in principle it would be a neat idea to involve suppliers, this is not possible in practice because

suppliers do not (unlike the engineering functions) understand what the customer expects. It goes to show that suppliers and customers are present in the forefront of discussions because they support arguments about internal positions. This does not suggest that the organization of suppliers and customers is unimportant. However, it underlines why we should not take supply chains for granted. They appear to be the result of firms realizing that in practice their ontology is variable. This is something current theories on SCM tend to neglect. Our case studies go to show that because there is no set definition of a firm that in turn would define the supply chain, it also remains a problem to define the role of suppliers and customers, and these constituents can in fact even be used to reorganize internal positions. What this shows is that the resource allocation question is much less about accounting 'costs' and physical 'constraints' than it is about the category of other 'conditions'. As Gattorna and Walters (1996) argue:

> Conditions are logical, non-numeric characteristics that must be respected in developing the optimum allocation of resources. They usually reflect business considerations, such as policies, contractual obligations, or customer service needs. Conditions can be described in terms of expressions involving logical operators, such as: 'if/then else'; 'and/or'; 'not/nor' (P.258).

Our case studies do not contest these operators. They simply show that the logic is not given. On the contrary, it is invented on the basis of numerous operative iterations - *if* purchasing gets to control the suppliers, *then* SuperDesign engineering cannot continue its way of specifying products and *then EuroOil* engineering cannot safeguard liability etc. But what this means in a Latourian sense witness is that we cannot think about the conditions before first going through a 'process of enlargement' where operators are introduced and combined in order to articulate the future boundaries of these two firms. Because there are very few limits to the number of ways that these operators can be modelled this process is complex and as our case studies illustrate in order to advance the process – and delimit the operators - both organizations must go through another parallel process which is all about assessing the 'transaction costs' related to the various scenarios introduced in relation to the SCM vision. This process in parallel suggests that the premises of supply chain responsiveness may not be what we expected them to be based on the hypothesis of decoupling points.

**Supply Chain Responsiveness – The Transaction Cost Assessment of 'firm boundaries'**

Traditionally, SCM theories have described 'responsiveness' as an effect of the ability to think supply chain management from 'customer's customer to supplier's supplier' (Ellif, 1996). In relation to this broad idea a clear quality of the 'decoupling points hypothesis' will be revealed by seeking the answer to this question: how far can one extend the informational from the material decoupling point?

Even if our case studies do not contest the decoupling hypothesis in principle, they provide a very different account of how responsiveness results from supply chain management practice. Perhaps the most important result is that our case studies illustrate how organizations have the potential to design many different types of responsiveness.

Ultimately, our analysis suggests that responsiveness is defined through the actor network that is able to command the organization of managerial and manufacturing competences and thus the boundaries of the firm. However, as our analysis also suggests, this doesn't happen overnight. Before anyone rises to the position of being able to command how other parties network with managerial / accounting technologies, internal functions and external customers

and suppliers, the organization as a whole first goes through a process of debating the transaction costs associated with different ways of doing things.

In both organizations it may be the clever cost controls that are most visible in the purchasing functions' arguments. But in both organizations we see that the accounting cost is mobilized only to suggest that purchasing would be able to command their role – in spite of no prior experience with this type of work. However, it is not the accounting cost argument that explains the concerns we see in both organizations. In both places, purchasing and engineering functions refer to the much broader idea of 'transaction cost' (Williamson, 1985).

At EuroOil the engineering functions argue that the transaction cost of not controlling suppliers far outweighs the transaction gains of outsourcing manufacturing control, because the company will lose the opportunity to double-check suppliers and learn from them in relation to other projects. Purchasing disagrees because they think learning from suppliers is redundant: there is no use for an in-house competence center. To them, the current ways of managing suppliers incurs the opportunity cost of not being able to introduce accounting cost management as a control and communications tool.

At SuperDesign the purchasing function argues that designing products independently of suppliers incurs an opportunity cost in not being able to draw on their competences, and a transaction cost in that sometimes products are designed without knowing whether suppliers can deliver the specified qualities, which sometimes increases the accounting-based cost of quality beyond what should be reasonable. The engineering functions counter this argument with another transaction cost argument, which is that the current organization of roles and responsibilities ensures that SuperDesign is able to design and manufacture products the customer wants. In their view, including suppliers in design work equals a transaction cost because SuperDesign will loose control over the way that products respond to SuperDesign's customer expectations.

Clearly, because the debate is about the allocation of internal positions in the two companies, some of these arguments entail self-serving components. Regardless, they remain important to our understanding of the constitution of supply chain responsiveness because they illustrate how a change in the way that manufacturing and managerial competences are combined presents companies with a very different transaction cost setting. Implementing SCM is not only about streamlining and cost reduction: it is primarily about the premises on which companies can nurture their core competences.

At EuroOil there is a dispute about whether the company has a technical competence or not, which is not an issue at SuperDesign. Everyone – including purchasing - agrees that a product design constitutes a core competence. However, they disagree about how this competence is sustained over time. According to the purchasing function, this competence is only sustainable if SuperDesign pools its manufacturing and managerial competences. But as the engineering function argues, doing so will change the transaction cost setting under which the company operates, and at the time of our studies the purchasing function did not have an answer to this argument. They could not yet account for the type of responsiveness they envisioned. This shows, on the one hand, that a component of the resource allocation problem - as modelled by Gattorna and Walters, (1996) – certainly has to do with constraints; on the other hand, those which the organizations discuss are transactional, not physical. The discussions are not so much about what 'we have or don't have'. They are more about the consequences of different actor networks, i.e., what will happen if we do or don't do things in certain ways.

Supply chain responsiveness is therefore not simply a function of 'supplier's supplier and customer's customer,' and if it is a function of how far the informational and the material decoupling points are extended from each other, this is only because an actor network has emerged that has been able to organize firm boundaries based on a trading of different transaction cost scenarios. In other words, it has become able to withstand organizational criticisms and challenges (Briers and Chua, 2001).

Responsiveness does not result from separating the supply chain into a planning section and a service section. It results from the actor networks' combined ability to handle different transaction cost scenarios related to the negotiation of organizational positions – internal boundaries. In practice this comes down to solving the problem: what does it take to nurture our core competences? As illustrated, this requires a process that first has to define its own firm-specific logic, which in EuroOil traditionally has been about separation of engineering responsibilities, and in SuperDesign traditionally has been about manufacturing-based integration of responsibilities.

## Conclusions

The two case studies presented in this paper show that corporations struggle in order to implement supply chain management. However, their struggle is not – as often presumed - caused by their inability to transform theory into practice. The reason they struggle is because they first have to establish new actor-networks within the organizations – apart from suppliers and customers. Our research suggests that supply chain management has to be invented locally before it can be extended globally. Supply chains do not exist independently of firms, because it is not given what constitutes these firms.

The case studies illustrate that each company has a whole range of possibilities, and that the outcome therefore remains ambiguous as long as there are no translations that are strong enough to create a space and a pragmatism that organizes internal functions. In both organizations purchasing may have a solution principle on which to elaborate. But in neither of the two companies do they have a practical solution because they had not yet been able to deal with the transaction cost-related arguments presented by the engineering departments. At the time of our research everyone – including the engineering functions – remained in positions that the SCM vision had made controversial, but they had begun a process of determining alternative ways of organizing administrative and manufacturing assets in relation to external resources.

Our research suggests that supply chain responsiveness is not a function of volume and quality of links within the supply chain. In each of the two companies we studied, there are a several competing definitions of what it means to be responsive. Each of them translates the SCM vision differently and in ways that favour certain parties to gain control over others. Responsiveness, rather than being seen as a function of the constellation of outside parties, should be seen as an effect of the internal struggles for centrality in the actor-networks. Those who become nodes loose control over the type of responsiveness that results from different ways of organizing, and in order not to lose positions, different parties blame the transaction costs incurred with the different ways of organizing.

Our research builds on and adds to our understanding of the syntax presented by Ballou et al (2000), in which it is argued that the coordination work of SCM takes place not only on an

inter-organizational level but also on an 'inter-' and 'intra-'functional level. Our research also echoes and adds to Price (1996) who argues that current SCM theories fail to recognize the social component of SCM struggles. But in contrast to others we do not argue in favor of applying any *one* of the following: a 'learning perspective' (Price, 1996), a 'process perspective' (Cousins, 2002), or a 'resource-based perspective' (Coates et al. 2002). Our methodological stance is that one should approach the scene being as open as possible to understanding how corporations in practice work with preconceived and packaged concepts – such as, for example, 'life-cycle costing' and 'open-book accounting' – in order to understand how such technologies are networked into the social setting. Even if the hypothesis about 'decoupling points' makes a lot of sense in principle, our research shows why corporations in practice cannot approach this hypothesis without first working through numerous, firm-specific issues that modelling hypotheses necessarily have to leave out. In practice, supply chain management does not begin at the gates of the company. In order to decide on the decoupling points, corporations have to go through a process of explicating transaction costs related to different scenarios which at the same time brings them through a process of negotiating internal positions. What in the case of SuperDesign and EuroOil seemed to influence the decoupling points the most were questions like these: To what extent can we span our competences onto suppliers? To what extent can the supplier understand the customers' expectations? How far can we allow the supplier to become a partner? But, as our case studies and discussion illustrated, the answers to these questions need not involve the suppliers. They depend much more on the way internal functions assess transaction costs with different manufacturing scenarios and how they, in relation to these assessments, are able to mobilize their own positions in relation to those internal and external parties they aspire to inscribe.

## References

Ballou, R. et al (2000): New Managerial Challenges from Supply Chain Opportunities. *Industrial Marketing Management* 29, pp. 7-18

Bowersox, D.J. and Daugherty, P.J. (1995): Logistics paradigms: The Impact of Information Technology. *Journal of Business Logistics* 16 (1) – pp. 65-80

Bowker, G.C. and Star, S.L. (1996): "How things (actor-net) work: Classification, magic and the ubiquity of standards". *Philosophia*, (25), pp.195-220

Briers, M. and Chua, W-F. (2001): "The role of actor-networks and boundary objects in management accounting change: a field study of an implementation of activity-based costing". *Accounting, Organizations and Society* (26), pp. 237-269.

Brown, S.D. and Capdevilla, R. (1999): "Perpetuum mobile: substance, force and the sociology of translation". Ch. 3 in Law, J. and Hassard, J (Eds); *Actor Network Theory and After*. Blackwell Publishers

Choi, T.Y. et al. (2001): Conceptual note – Supply networks and complex adaptive systems: control versus emergence. *Journal of Operations Management* 19 (2001), pp. 351-366

Christopher, M. and Towell, D.R. (2000): "Supply Chain migration from lean and functional to agile and customized". *Supply Chain Management*, Vol. 5 – No. 4 – pp. 206-213.

Coates. T. et al (2002): An exploratory analysis of new competencies: a resource based view perspective. *Journal of Operations Management* 20, pp. 435-450.

Cousins. P.D. (2002): A conceptual model for managing long-term inter-organizational relationships. *European Journal of Purchasing and Supply Management* 8, pp. 71-82

Dixon, N (2000): Common Knowledge: How Companies Thrive by Sharing What They Know. Harvard Business School Press.

Eisenhardt, K. (1989): Building theories from case study research. *Academy of Management Review* 14 (4), pp. 532-550

Ellif, S.A. (1996): Supply Chain Management – new frontier. *Traffic World*, 21 October, p 55

Fawcett, S.E and Magnan, G.M. (2002): The rhetoric and reality of supply chain integration. *International Journal of Physical Distribution and Logistics Management*, Vol. 32 – No. 5, pp. 339-361

Flynn, B. et al (1999): World Class Manufacturing: an investigation of Hayes and Wheelwright's foundation. *Journal of Operations Management* 17 (1999), pp. 249-269.

Frohlich, M.T and Westbrook, R. (2001): Arcs of integration: an international study of supply chain strategies. *Journal of Operations Management* 19 (2001), pp. 185-200

Garud, R. and Karnoe, P. Eds (2001): *Path Dependence and Creation*. Lawrence Erlbaum Associates, Publishers - London

Gattorna, J.L. and Walters, D. (1996): *Managing the Supply Chain – A Strategic Perspective*. Macmillan Business

Hammer, M. (2001): The Superefficient Company. *Harvard Business Review*, Sept. – pp. 82-91

Hayes, Robert H., and Wheelwright, Steven C. (1984), *Restoring Our Competitive Edge: Competing Through Manufacturing*. New York: John Wiley

Heikkilä, J. (2002): From Supply to Demand Chain Management: efficiency and customer satisfaction. *Journal of Operations Management* 20 – pp. 747-767

Hoekstra, S. and Romme, J. (1992): *Integrated Logistics Structures: Developing Customer Oriented Goods Flow*. McGraw-Hill, London

Johansson, Jan, and Mattsson, Lars-Gunnar (1987), "Interorganizational Relations in Industrial Systems. A Network Approach Compared with the Transaction-Cost Approach." *International Studies of Management and Organisation*. 17, No. 1, pp. 34-38.

Kraljic, P. (1983): Purchasing must become supply management. *Harvard Business Review*, Sept.-Oct., pp. 109-117.

Latour, B. (1999): "Pandora's Hope – Essays on the Reality of Science Studies". *Harvard University Press*.

Mason-Jones, R and Towill, D.R. (1997): Information enrichment: designing the supply chain for competitive advantage. *Supply Chain Management*. Vol. 2, No. 4 – pp. 137-148

Mason-Jones, R, Naylor, J.B. and Towill, D.R. (2000): Engineering the leagile supply chain. *International Journal of Agile Management Systems*. Vol. 2, Iss 1. pp.54

Miles, B. and Huberman, A.M. (1994): *Qualitative Data Analysis – A Sourcebook of New Methods*. Sage – Beverly Hills, CA

Mouritsen, J. and Dechow, N. (2001): Technologies of managing and the mobilization of paths. Ch. 13 in Garud, R. and Karnoe, P. (eds.): *Path Dependence and Creation*. Lawrence Erlbaum Associates, Publishers – London

Naylor, J.B, Naim, MM and Berry, D. (1997): Leagility: interfacing the lean and agile manufacturing paradigm in the total supply chain. *International Journal of Production Economics*, Vol. 62 – pp. 107-118

Penrose, E. (1959): *The theory of the growth of the firm*. Oxford, Basil Blackwell

Polanyi, M. (1967): *The tacit dimension*. New York, NY: Doubleday

Porter, M. (1985): *Competitive Advantage – Creating and Sustaining Superior Performance*. The Free Press, London

Price, H. (1996): The anthropology of the supply chain. Fiefs, clans, witch doctors and professors. *European Journal of Purchasing and Supply Management* Vol. 2 No. 2/3, pp. 87-105

Sheombar, H.S. (1992): EDI-induced redesign of coordination in logistics. *International Journal of Physical Distribution and Materials Management* 22 (8) – pp. 4-14

Tan, K. H. (2001): A framework of supply chain management literature. *European Journal of Purchasing and Supply Management* 7, pp. 39-48

Tushman, M. L. and Scanlan, T. J. (1981):Characteristics and external orientations of boundary spanning individuals. *Academy of Management Journal*, 24(1): 83-98.

Williamson, O.E. (1985): *The Economic Institutions of Capitalism*. New York. Free Press

Womack, J., Jones, D. and Roos. D. (1991). *The machine that changed the world*. New York: Harper-Collins:

Yin, R.K. (1984): *Case study research – design and methods.* 2nd edition. Sage Publications.

芽|Sprouts

Working Papers on Information Systems | ISSN 1535-6078



*Office*:
Sprouts
University of Amsterdam
Roetersstraat 11, Room E 2.74
1018 WB Amsterdam, Netherlands
Email: admin@sprouts.aisnet.org

芽|Sprouts