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DIFFERENTIATION OF SUPPLY MANAGEMENT PROCESSES IN A GLOBAL MANUFACTURING COMPANY

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ABSTRACT

Purpose of this paper
The paper studies differentiation on operational level in a global purchasing environment.

Design/methodology/approach
In order to understand the need and practice of supply management process differentiation, we carried out a literature review and a case study research in a large global electronics manufacturer. We analyzed in-depth the coordination practices, planning processes, inbound logistics models, and how different practices are selected in the case company. We interviewed 28 experienced sourcing and procurement experts in the case company organization.

Findings
Differentiation of manufacturing and supply chains has been researched and discussed in the literature. Discussion has centered around manufacturing capabilities (e.g. Hayes and Wheelwright, 1984), selection between lean and agile manufacturing paradigms (e.g. Naylor et al. 1999), and downstream supply chain structures (e.g. Fisher, 1997).

Our review of purchasing literature revealed that it is centered around portfolios (e.g. Kraljic 1983) and supplier relationships, and that surprisingly few advice or guidelines is offered for companies on how to implement efficient purchasing and supply management processes in global business environment. We found that the case company has focused on the problem, but academic discussion is not addressing the field yet.

Research limitations/implications
In our research only one case is studied. The paper analyzes opportunities for differentiation, and ends in suggestions how differentiation should be systematically implemented in the case company. For empirical testing and generalization it is necessary to study more cases, and implement suggestions in the case company in the future.

Practical implications
Due to the complexity of the case company, explicit policies and guidelines regarding processes and ways of operations are essential for effectiveness and global consistency. Through this research an initial roadmap was developed on how to systematically proceed in purchasing differentiation with the global supplier base.

What is original/value of paper
The paper introduces a way to differentiate global purchasing and supply processes by developing an initial framework.

Keywords: differentiation, supply, purchasing, case study, supply chain, global supply chain.
1. INTRODUCTION

The phenomenon this paper studies is supply differentiation on operational level in a global purchasing environment. In purchasing literature there seems to be common understanding that companies need to manage their suppliers in a differentiated manner, despite that differentiation adds complexity to the management of supply base (Choi and Krause, 2006). The higher the number of suppliers, degree of differentiation, and interrelationships among these suppliers, the more resources are needed to manage them. This is a first report of a case research, focusing on findings from three long-lasting relationships between a globally operating focal company, and three major members of its supply base, which, by a definition, consists of suppliers that are actively managed by the focal company (Choi and Krause, 2006).

Discussion on differences and fit in supply chains was initiated by Fisher (1997) with his Harvard Business Review article on effective supply chains. As he recognizes, despite of all new concepts, the performance of many supply chains is not satisfactory. The problem is to decide – out of all alternatives – how to build the right supply chain for a particular business situation (Fisher 1997). In a spirit of an end-to-end consideration regarding supply chain performance and competitiveness, alignment of supply chain capabilities should take place across the chain, including the upstream i.e. supplier capabilities, in a consistent manner. So far discussion on supply chain differentiation has focused on differentiating demand chains according to customer demand (Aitken et al., 2005). This statement is supported for instance by a survey among Swedish manufacturing companies, which revealed that integration in supply chains concerns more commonly customers than suppliers (Olhager and Selldin, 2004).

However, the challenge continues to be pressing also upstream, where fit and alignment of supply chain capabilities in a particular business situation needs to be achieved for the whole supply base. The paper proposes an initial framework on the differentiation of global purchasing and supply processes. The paper starts with a literature review on various aspects of supply chain differentiation, and continues with presenting the methodology. Next the case and case results are presented, and the initial framework is proposed. The results are then discussed in the light of the literature findings. Last, conclusions are drawn and limitations are discussed and further research is proposed.

2. LITERATURE REVIEW

Literature review discusses first certain aspects in supply chain differentiation, and continues to differentiation in supply.

2.1. Differentiation in supply chains

Differentiation of supply chains is a challenging concept to handle. By definition, supply chain as a concept captures a broad range of activities. As stated by Mentzer et al. (2008): “Supply Chain encompasses the planning and management of all activities involved in sourcing and procurement, conversion, demand creation and fulfillment, and all logistics activities”. In short, supply chain management addresses the fundamental business problem of supplying product to meet demand in a complex and uncertain world – from the point of view of the entire supply chain (Kopczak and Johnson, 2003).

Supply chain configuration should start by understanding the specific customer needs and designing the overall chain, from customers to suppliers, to satisfy these needs (Heikkilä,
Demand is the key criteria in supply chain design, even up to a level where some authors have suggested an approach called demand chain management to be used (Heikkilä, 2002, Juttner et al., 2006) to emphasize sufficiently market mediation, adjustment of production and the entire supply chain to fit actual customer demand as it materializes (Fisher, 1997).

2.1.1. Order penetration point (OPP) considerations

Among the reviewed literature, order penetration point (OPP) considerations appear among the most discussed means to differentiate supply chain structure (e.g. Childerhouse et al., 2002; Heikkilä, 2002; Pagh and Cooper, 1998; Naylor et al., 1999; Olhager, 2003). Order penetration point (referred also as demand decoupling point, customer order decoupling point and push-pull line) refers to several aspects of supply chain design.

OPP is traditionally defined as the point in the value chain, where the product is linked to a specific customer order (Olhager, 2003). Location of OPP influences various aspects of supply chain design and performance, e.g. operating model, i.e. whether the overall production and delivery takes place in e.g. make-to-order, assembly-to-order or make-to-stock model (Childerhouse et al., 2002; Naylor et al., 1999), postponement strategy including aspects of product design and variation, (Pagh and Cooper; 1998, Olhager, 2003), and positioning of buffer inventories (Fisher 1997; Heikkilä 2002), and overall demand chain architecture (Heikkilä, 2002).

OPP is a fundamental concept in supply chain design. Through selection of OPP the core logic of a particular supply chain, and frame for achievable performance, is largely defined.

2.1.2. Inventory positioning and sizing

Positioning of inventory buffer, both finished goods and component inventory, is another efficient way to differentiate supply chains. For example Fisher (1997), with his analysis on functional vs. innovative supply chains, promoted inventory as one of the means to differentiate innovative supply chain from a functional one.

Inventory buffers have multi-sided significance in a supply chain. First, when positioned correctly in relation to OPP, they offer responsive supply capability i.e. speed (e.g. Pagh and Cooper, 1998; Fisher, 1997). Secondly, inventory is having a role as a hedging mechanism against demand uncertainty (Fisher, 1997; Heikkilä, 2002). Thirdly, inventory in certain cases absorbs the fluctuation of demand (Fisher, 1997; Lee, 2004), which provides more stable operating environment for the operations upstream from the buffer. Roles of inventory buffers as a source of agility, and as an absorption mechanism, naturally make also sizing of the buffers critical, in addition to correct positioning only.

2.1.3. Differentiating factors in manufacturing and assembly

Differentiation of manufacturing to respond to different customer needs and competitive situations is proposed in the famous product-process matrix (Hayes and Wheelwright, 1984), introducing how fit is reached with manufacturing and product demand characteristics. Their fundamental point is generally valid still: Job shop, for instance, offers economics that fit for low volume non-standardized products, whereas continuous flow - at another end of spectrum - fits highly standardized, commodity products with high volumes.

Second essential manufacturing perspective from supply chain differentiation point of view is dimensioning of manufacturing: How to manage capacity as such, and in particular excess
capacity for flexibility. Fisher (1997) sees excess capacity as an alternative hedging mechanism, in addition to inventories. Product assembly and configuration capacity (in conjunction to OPP located upstream, and manufacturing postponement strategy) is widely recognized as a differentiating factor, which can provide agility and speed of delivery when needed (e.g. Childerhouse et al., 2002; Heikkilä, 2002; Wheelwright and Hayes, 1984). Excess capacity can be, however, seen in different ways, just like inventories. Following the lean manufacturing paradigm, excess capacity is considered as a form of muda – waste, whereas in agility paradigm it is a source of flexibility, a critical factor enabling agile operations (Naylor et al., 1999). Choice of paradigm matters, obviously, and should consequently determine e.g. control mechanism and scheduling principles of manufacturing activities, as well as key performance indicators (Naylor et al., 1999).

2.1.4. Differentiating planning

An important source or form of supply chain differentiation is planning differentiation according to demand features. The purpose in selecting planning features for products is to ensure good quality planning result and to use resources efficiently (Kaipia and Holmström, 2007). One way to determine planning approach is to align information sharing practice along the required flexibility in supply chains, and adjusting planning to support these features of the supply chain (Kaipia, 2007). This approach suggests that planning process needs to fit to the required flexibility in the supply chain. Flexible operations should be supported with frequent and reactive planning practices that capture information quickly. If execution flexibility is low, it can be supported with more stable planning.

The efficiency of planning collaboration was highlighted in a survey among 169 US, Canadian and Western European companies. Integrating suppliers into the planning process was associated with significantly improved supplier quality, delivery performance, responsiveness and inventory turnover. The most important factors to improve decision making in collaborative relationships was trust and information accuracy, which include correctness, easiness to use, compatibility across users, and timeliness (Petersen et al. 2005).

2.2. Treating upstream operations in supply chain literature

By definition, supply chains include all activities involved in sourcing and procurement, conversion, demand creation and fulfillment, and all logistics activities (Mentzer et al., 2008). Looking at supplier base management from the perspective of overall supply chain differentiation, needs for alignment and fit are recognized to certain extent. Fisher (1997) sees a difference in supplier selection between innovative and functional supply chains: Where in functional supply chains suppliers should be selected based on cost and quality, in innovative supply chains the criteria should be speed, flexibility, and quality.

Lee (2004) supports the perspective of Fisher, and highlights additionally the criticality of supplier selection from the point of view of adaptability. Complementary suppliers are necessary to ensure adaptability, and in complex cases vendors should be found close to main markets (Lee, 2004).

2.2.1. Purchasing portfolio approach

To better understand purchasing problems and to differentiate purchasing strategies, the use of portfolio approaches has grown (Gelderman, 2003; Van Weele, 2005). These models (Kraljic, 1983; Olsen and Ellram, 1997; Bensaou, 1999) aim to 1) analyse products and classify them into four groups according to two dimensions, 2) analyse of required supplier relationships to
deliver the products in each category, 3) develop action plans in order to bridge the gap between current and required supplier relationships (Gelderman 2003). In the original Kraljic matrix the classification dimensions are profit impact and supply risk (Kraljic 1983). In later work these dimensions have been named differently (for example by Olsen and Ellram (1997) ‘strategic importance’ and ‘complexity of the supply market’), but there are no principal differences with the original Kraljic approach (Gelderman, 2003).

The benefit – and a source of criticism – of portfolio models is that it simplifies a complex situation. Portfolio approach is used as a strategic tool to analyze and classify items and to create purchasing strategies for each group. Portfolio models share items into four classes, and in a typical firm each of these class is large and requires further analyses. For example Olsen and Ellram (1997) suggest that portfolio models should be used in parallel with other methods. For example Dubois and Pedersen (2002) present a comparative study on portfolio approach and industrial network approaches. Their study widens the view of traditional portfolio approaches, and it is evident that network models and portfolio models are not exclusive, but rather complementary. The change of focus from products and firms to relationships and networks entails more complex and challenging analyses.

Also Kraljic supports this view by emphasizing that the matrix indeed is a tool for management (Usherwood and Russill, 2008). These comments indicate that portfolio approaches do not provide adequate support for daily business situations, but serve as a strategic tool.

### 2.2.2. Aligning integration mechanisms to purchasing categories

Purchasing category refers to a group of similar purchasing items for special business activities in a firm (Trautmann et al, forthcoming). It is notable that purchasing portfolio literature uses a very different way of defining categories than what is suggested in this definition of purchasing categories. Purchasing category management is commonly practiced in industrial firms (Heikkilä and Kaipia, 2009). Forming groups of purchase items and basing purchasing management and organisation on these groups aims to gain benefits for the company, for example in the form of gaining volumes and negotiation power, and process, resource and knowledge usage benefits. This practice is not new, but a recent phenomenon is that companies are systematically analyzing all of their costs spent, not just direct purchases, on purchasing and forming purchasing categories covering the whole purchasing spend.

An information processing perspective to category management is taken by Trautmann et al. (forthcoming), who study management of 12 categories in three firms in order to understand the use of integration mechanisms among geographically dispersed purchasing units. Their conclusion is that the type of uncertainty in each category varies and requires different integration mechanisms. According to the writers, due to the simultaneous existence of these differences across categories in the same company, there is a need for simultaneous use of different integration mechanisms even within the same firm. To manage categories efficiently, different information processing capacities and organizational designs are needed.

Similar conclusions are presented by Das et al. (forthcoming) based on a survey on the efficiency of integration mechanisms. The results from over 300 respondents indicate that the ideal profile of supplier integration practices depend on industry, product life cycle, and production strategy. They also study the impact on internal and external integration on performance, and note that the timing of these affects the benefits of integration.
2.2.3. Supplier relationships

A general opinion seems to be that suppliers and supplier relationships should not be treated in a homogenous manner (Van Weele, 2005), (Dyer et al. 1998). For example, supplier and customer relationships are discussed as an integration continuum by Spekman et al. (1998). Their model suggests stages how supplier may develop into a partner. In the first stage, the relationship is based on price negotiations and an adversarial relationship. In the ‘cooperation stage’, long-term contracts are established, and the number of suppliers is actively reduced. In ‘coordination’, the next stage, information linkages enable wider and more routine information exchange. In most supply chains, all key supplier and customer relationships have achieved cooperation or coordination stages in their integration efforts.

Hines et al. (2000, p. 320-322) present another example of coordination stages. They present a coordination framework for supplier development consisting of four phases. The first phase is labelled ‘no-coherent strategy’, when price is the primary buying criterion, and companies are not cooperating, nor developing a common way of working. ‘Piecemeal coordination’, the second phase, describes a situation where departments or instances are functioning with the relevant department in the supplier company. The third phase, ‘systematic coordination’, occurs when companies are working proactively to eliminate waste. ‘Network coordination’, the fourth phase, is realised if companies are developing methods and procedures to maximise benefit along the total supply network.

Dyer et al. study buyer-supplier relationships in automotive industry (Dyer et al. 1998). They also conclude, that rather than employing a one-size-fits-all strategy, from should segment their suppliers into strategic partners and durable arm´s-length suppliers in order to allocate resources appropriately to each group to maximize effectiveness and minimize administrative costs (Dyer et al. 1998).

All authors agree that integration improves supply chain performance, but implementing such a relationship is a challenge. Integrative linkages require trust, commitment, and resources and capabilities that are not always possible to allocate to a specific supply chain relationship. Therefore, not all relationships target the highest level of integration, but rather need to find an appropriate level to ensure an efficient supply chain. Most contemporary relationships are at the transactional or information-sharing levels.

2.3. Summary of literature findings

Common to most of the perspectives studied in this literature survey, is recognition of the importance of collaborative relationships, in order to ensure shared plans (Lee 2004), supplier involvement in product design (Childerhouse et al. 2002) and process integration (Naylor et al. 1999).

Looking at the literature originating around the function of sourcing and procurement, the agenda is strikingly different. Differentiation of approaches is one of the leading themes in
supplier relationship management, highlighting that not all suppliers are to be dealt with in the same way (Gelderman and Van Weele, 2005). However, we observe that the differentiation is understood to have a completely different meaning, compared to what is discussed in e.g. supply chain management literature.

According to the dominant views in sourcing and procurement field, differentiation should take place either between categories, based on dimensions of various portfolio models (Kraljic 1983, Bensaou 1999, Olsen and Ellram 1997), or suppliers, or through various types of buyer/supplier relationships (e.g. Dyer et al. 1988, Harland and Knight, 2001, Gelderman and Van Weele 2005, Hald et al., 2008). Guidelines for selecting alternative ways of organizing operative management of material supply and inbound material flow are discussed in few cases only. In the same way, alignment of operative processes which link buyer and supplier in a particular business context, are discussed separately from purchasing.

3. RESEARCH DESIGN

3.1. Methodology

This research is an inductive case study research. The rationale for a case study is the depth of data that needed to be studied to understand the phenomenon, differentiating in supply chain upstream operations. Case study offers a way to investigate a broad range of data that was needed to discover the factors that affect the use of different coordination mechanisms.

The case company is a large globally operating electronics manufacturer. The company has manufacturing plants in Europe, Asia and the US, which mainly manufacture to order. The Company sources globally, and in many cases the suppliers are global players in their field. The product is delivered to customer sites and assembled. The complexity in the business comes from the wide variety of products, where the size and configuration of the delivery varies. Furthermore, the uncertainty in business has increased: due to intensive competition, agreements with customers are closed close to delivery, and long-term customer agreements and orders do not exist any more. This requires a good planning process with abundant information to survive the delivery challenge. This reflects strongly in upstream operations, because the planning process is not able to improve the inaccuracies in customer data quality, and it affects the information for suppliers.

In the case, three supplier relationships were selected for investigation. We wanted to cover all inbound logistics models, and different purchasing practices, which would not have been possible if only one or two suppliers were considered. Another rationale for selecting three suppliers was that three supplier relationships, instead of for example 7-10, is a quantity that can be investigated in-depth, when considering the significant complexity of the case company.

Another rationale for selecting these suppliers was that to study differentiation, we needed to have such relationships that have parallel, differentiated operational models in place. Therefore three relatively large strategic suppliers were selected. In addition the selected suppliers differ from each others by the nature of product they deliver and by the role they are keeping in the supply chain.

All selected suppliers were strategic suppliers, based on the classification developed by Kraljic (1983). First supplier, Supplier 1, is a component supplier. The second supplier, Supplier 2, is a contract manufacturer, and the third, Supplier 3, is a provider of a complementary OEM product, a ready end product and an essential part of a total system
provided by the case company. Supplier 1 has a high technological capability and the ability to develop both products and processes with the case company. Supplier 2 acts as a capacity provider, and also collaborates in product development. Supplier 3 is a global OEM company.

Purpose of the case study is 1) to identify the use of integration mechanisms in three supplier relationships, and 2) to identify the factors in the relationships that differentiate the use of integration mechanisms.

3.2. Data collection

Main data collection method was structured interviews. Before going into the interviews, one large meeting was organized where 6 persons responsible for the three supplier relationships, and 3 persons from a global procurement organization were interviewed. The purpose of this meeting was to give basic information on the suppliers for the researchers and to act as a kick off for data collection. Altogether 7 researchers took part in the data collection.

The data collection focused on the following themes: planning processes, information sharing practices, supplier development and supplier integration. To ensure to cover the whole research area, we needed to interview a large group of people. Interviewees included persons who are mostly involved in buying (6 persons), supply chain planning (5), supplier development, quality and supplier integration (7), planning process development (3), and top management in procurement function (4). Altogether 28 interviews were carried out. The interviewees were located in four different countries in Asia, Europe and North America.

Three separate questionnaire forms were formulated. The need of three separate question sets comes from the global organization of the firm, which leads to distributed responsibilities and high level of specialization. To ensure that each interview focuses on each person’s specific expertise, we divided the research area into three parts: the first part targeted on daily operative tasks, and it was used with buyers and supply chain planners. The second part concentrated on supplier development and selection of collaborative modes and it was used with persons working with supply and supplier development and category management. The third part focused on broader perspective of overall strategy, and long-term directions in each supplier relationship. The questionnaires were tested with two persons in the case company and changes were made based on their comments.

Before the interview the questionnaire was sent to the respondents. In most interviews there were two interviewers and one respondent. In most cases, the interviews were made face-to-face, however seven interviews were made by phone due to location of the informants at other regions. Interviews were documented as memos, and, to ensure correctness, the interviewees were asked to check and correct the memos afterwards. Interviews were not recorded due to the strict confidence policy of the case company.

Additional information was collected via company web sites, other published material, and additional information requests.

3.3. Data analysis

In the data analysis the focus was in identifying differences in the operations between the three suppliers. In particular the sequence and depth of activities was studied. Internal integration efforts as well as external were studied, as suggested by Das et al. The interview memos were collected into a database.

Based on our literature review focusing on integration and coordination in purchasing and supply chain management, we identified approximately 50 parameters to use for profiling and
comparison of the three buyer-seller relationships. All collected information was summarized into excel-sheets using those parameters to formulate supplier profiles.

Our main focus in data analysis was to identify differences and similarities between the relationships, with purpose to create a logical profile of each of the relationships answering our original research question, on how a company can differentiate its supply management processes.

4. RESULTS

4.1. Description

In the case company planning process is a strictly standardized, company-wide monthly process, which captures customer information, and transforms the information in a structured way to supply plans for suppliers. However, the planning result is not always optimal and in 3 months forecast accuracy differs between 20 % to 80 % (MAPE = \[\frac{\sum \mid actual - plan \mid}{actual}\]). Reasons for these inaccuracies are, to name a few, inadequate customer data, uncertainty in business, long planning horizons and delays in planning process, and the required speed of deliveries.

All of the case suppliers are strategic suppliers for the case company. The monetary purchasing volume is relatively high in all three relationships, and all the suppliers operate globally, serving the manufacturing locations of the case company worldwide.

However, already from key figures certain differences in dynamics of the relationship can be observed. Most remarkable the difference is between Supplier 2, Contract manufacturer, and Supplier 3, OEM. The contract manufacturer supplies over 5500 different SKU:s, thousands of pieces a day, with a response time of few days, whereas the OEM supplies standard configurations and only 600-1000 units annually. The key figures of each relationship are listed in Table 1.

<table>
<thead>
<tr>
<th>Volume</th>
<th>Supplier 1</th>
<th>Supplier 2</th>
<th>Supplier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of supplier</td>
<td>Component supplier</td>
<td>Contract manufacturer</td>
<td>OEM</td>
</tr>
<tr>
<td># of items</td>
<td>500 SKU:s</td>
<td>5500 SKU:s</td>
<td>standard configurations, 600-1000 units annually</td>
</tr>
<tr>
<td>Purchases of total spend %</td>
<td>1,6</td>
<td>2,6</td>
<td>0,8</td>
</tr>
<tr>
<td>Purchasing order lines</td>
<td>Thousands / year</td>
<td>Over 10000 /year</td>
<td>appr. 500-1000 /year</td>
</tr>
<tr>
<td>Relationship coverage</td>
<td>global</td>
<td>global</td>
<td>global</td>
</tr>
</tbody>
</table>

Table 1: Key figures of the three buyer-supplier relationships

When we consider the power-dependency situation in the relationships, the differences between the suppliers become evident. In the relationship with Supplier 1 there is a strong dependency particularly for customized components. When the case company decides to develop and source a certain component from Supplier 1, the parties are practically tied to each other throughout the whole life time of the end product, for the coming 10 to 15 years. As there are hundreds of such components in different life cycle phases, in practice the companies are highly dependent on each other, even through both companies are having business areas outside this relationship. In the interviews the supplier was described as ‘willing and fast to implement changes’, ‘able to deliver technologically advanced products’, ‘able to offer several logistics models’ and ‘has a strong e-commerce capability’.

Supplier 2 is one of the largest suppliers for the case company. It has several plants located near case company plants that serve as manufacturing capacity and capacity buffer for the case
company. However, having ‘company-dedicated plants’ is an undesired and risky situation from the case company perspective; it is actively ensuring that none of the Supplier 2 plants are too dependent on the case company. The companies are in a deep cooperation relationship also in product development, design, and new product introduction (NPI) activities, and the supplier acts as a pilot supplier in many development projects. The supplier is flexible and is able to deliver changing volumes; typical variation between months may be from -70 % to +150 % of average load. In the interviews this supplier was described as ‘flexible’, ‘easy to do business with’ and ‘willing to cooperate and implement changes in the business models’.

In the relationship with Supplier 3, the dependency is lowest. The Supplier 3 is considered as the technological leader in its field. In theory the case company has alternative sources; but customers, who are concerned of life time cost of the solutions as well as technological quality, are asking for products from the Supplier 3. For the supplier, case company purchasing volume is relatively low, compared to total sales of the supplier. The comments used to describe this supplier were ‘not easy to change practices due to inflexible business agreement’, ‘buying has become more complex due to different practices and terms in supplier plants’ and ‘quality of operations is on an average level’.

<table>
<thead>
<tr>
<th>Relative power/dependency</th>
<th>Supplier 1</th>
<th>Supplier 2</th>
<th>Supplier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position as a supplier</td>
<td>Strategic</td>
<td>Strategic</td>
<td>Strategic</td>
</tr>
<tr>
<td>Case company position as a customer</td>
<td>Strategic</td>
<td>Partner</td>
<td>Average</td>
</tr>
<tr>
<td>Role of the supplier</td>
<td>Component supplier, technology partner</td>
<td>Contract manufacturer, capacity provider</td>
<td>OEM, manufacturer of a complementary solution component (ready end product)</td>
</tr>
<tr>
<td>Single source</td>
<td>Custom components are single source</td>
<td>Single source; dual source (parallel to own capacity)</td>
<td>Typically single source</td>
</tr>
<tr>
<td>Availability of alternative sources</td>
<td>No; strong dependency through product architecture</td>
<td>Yes</td>
<td>Yes, but customers asking Supplier 3 products</td>
</tr>
<tr>
<td>Switching cost</td>
<td>High</td>
<td>Average</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 2: Comparison of relative power/dependency in the relationships.

### 4.2. Operative supply management processes

The conducted operative activities differ in frequency and depth. The differences can be seen in Table 3.
<table>
<thead>
<tr>
<th>Information processes</th>
<th>Supplier 1</th>
<th>Supplier 2</th>
<th>Supplier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td># of people involved</td>
<td>50-60</td>
<td>broad range of persons involved</td>
<td>Few, 6 buyers</td>
</tr>
<tr>
<td>Frequency of operative contact</td>
<td>Weekly/daily</td>
<td>Hourly / daily</td>
<td>weekly</td>
</tr>
<tr>
<td>Regular calls</td>
<td>Yes: follow-up calls for material availability twice a week</td>
<td>Yes: weekly calls for broad range of topics</td>
<td>Yes: Monthly/bi-weekly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planning processes</th>
<th>Supplier 1</th>
<th>Supplier 2</th>
<th>Supplier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-range planning</td>
<td>13 months forecast, monthly</td>
<td>13 months forecast, monthly</td>
<td>13 months forecast based on planning items, monthly</td>
</tr>
<tr>
<td>Short range planning</td>
<td>Weekly</td>
<td>Weekly manual updates for selected products</td>
<td>Monthly</td>
</tr>
<tr>
<td>Conference calls for planning review</td>
<td>Bi-weekly</td>
<td>Weekly</td>
<td>Monthly</td>
</tr>
<tr>
<td>Inventory level updates</td>
<td>Case company on monthly basis, supplier in consignment stock</td>
<td>Case company on weekly basis</td>
<td>Case company responsibility</td>
</tr>
<tr>
<td>Technologies in use</td>
<td>SAP, Rosettanet</td>
<td>SAP, Rosettanet, EDI</td>
<td>SAP, EDI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Execution</th>
<th>Supplier 1</th>
<th>Supplier 2</th>
<th>Supplier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchasing model</td>
<td>Classical purchasing, VMI, contract warehouse</td>
<td>Classical purchasing, VMI (one plant)</td>
<td>Classical purchasing</td>
</tr>
<tr>
<td>Logistics model</td>
<td>Contract warehousing, consignment stock at Case Company plants</td>
<td>Traditional fulfillment to Case Company plants, some consignment stock at Case Company plants</td>
<td>Direct to customer/site fulfillment</td>
</tr>
<tr>
<td>Demand Visibility</td>
<td>daily execution view</td>
<td>daily execution view</td>
<td>daily execution view</td>
</tr>
<tr>
<td>Inventory management</td>
<td>Supplier1 (consignment) and Case Company</td>
<td>Case Company</td>
<td>Case Company</td>
</tr>
<tr>
<td>Ordering</td>
<td>weekly / daily</td>
<td>daily</td>
<td>weekly</td>
</tr>
<tr>
<td>Joint problem solving (calls / emails)</td>
<td>Daily</td>
<td>Daily/Hourly</td>
<td>Daily/Weekly</td>
</tr>
<tr>
<td>Deliveries</td>
<td>Supplier determines</td>
<td>Daily, Case Company coordinates</td>
<td>Daily, Case Company coordinates</td>
</tr>
<tr>
<td>Delivery time</td>
<td>12-16 weeks</td>
<td>1 day-1week</td>
<td>3 weeks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance management</th>
<th>Supplier 1</th>
<th>Supplier 2</th>
<th>Supplier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint metrics in use</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Review methods</td>
<td>Regular discussions on KPI:s, Supplier 1 proactively proposing actions</td>
<td>Regular discussions and reviews, corrective actions</td>
<td>Monthly reviews</td>
</tr>
<tr>
<td>Actual performance</td>
<td>Short lead times, flexible</td>
<td>Flexible, very short LT:s</td>
<td>Inflexible contracts, long lead times</td>
</tr>
</tbody>
</table>

Table 3: Characteristics of the operative supply interfaces between the case company and the suppliers.

4.3. Framework

Based on our case analysis, it is possible to summarize the differentiation methods to a framework describing how the case company is differentiating the three supplier interfaces within the existing strategic supplier role and long-term relationship, focusing on the interaction with the suppliers on operative level. Through analysis of operative activities, and usage of supplier integration and development resources at the case company, we can identify
four generic processes linking the buyer and supplier, which are modifiable in a relatively modular way. The processes are:
- Communication processes
- Supply chain planning processes
- Fulfillment processes i.e. physical material flow including ordering, logistics and inventory management
- Performance management, including both KPI:s used, and the review methods and consequent improvement actions

How the differentiation takes place:
- **Configuration**: Selection of activities that are taking place at each of the four processes (yes/no decision, or selection of operative mode, e.g. VMI implementation vs classical purchasing)
- **Frequency**: Frequency of the selected activities (monthly / weekly / daily / hourly)
- **Depth**: One-directional i.e. based on “broadcasting of information”, or whether activities are truly collaborative – two-directional – involving multiple people throughout the both organizations, and oriented towards mutual actions as a result.

Summary of the modification at the case company is presented in Table 4.

<table>
<thead>
<tr>
<th>Process</th>
<th>Supplier 1</th>
<th>Supplier 2</th>
<th>Supplier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>systems + follow-up calls twice/week</td>
<td>systems / weekly calls + daily email communication</td>
<td>system-based, regular calls</td>
</tr>
<tr>
<td>Frequency</td>
<td>weekly/daily</td>
<td>daily/hourly</td>
<td>Bi-weekly calls</td>
</tr>
<tr>
<td>Depth</td>
<td>56-60 people involved, cross-functional</td>
<td>broad cross-functional involvement, dedicated people</td>
<td>A few contact points + account team</td>
</tr>
<tr>
<td>Planning</td>
<td>13-month forecast + demand visibility</td>
<td>13-month forecast + manual weekly updates + demand visibility</td>
<td>13 month forecast based on planning items</td>
</tr>
<tr>
<td>Frequency</td>
<td>weekly</td>
<td>weekly</td>
<td>monthly</td>
</tr>
<tr>
<td>Depth</td>
<td>Collaborative</td>
<td>Collaborative</td>
<td>One-directional</td>
</tr>
<tr>
<td>Fulfillment</td>
<td>classical purchasing, 3rd party WH, VMI</td>
<td>Classical purchasing, VMI</td>
<td>Direct delivery to customer</td>
</tr>
<tr>
<td>Frequency</td>
<td>no / weekly ordering, delivers weekly</td>
<td>daily ordering, daily buyer-coordinated deliveries</td>
<td>daily/weekly ordering and daily buyer-coordinated deliveries</td>
</tr>
<tr>
<td>Depth</td>
<td>collaborative management</td>
<td>collaborative management</td>
<td>customer specifies</td>
</tr>
<tr>
<td>Performance management</td>
<td>shared metrics</td>
<td>shared metrics</td>
<td>shared metrics</td>
</tr>
<tr>
<td>Frequency</td>
<td>regular discussions</td>
<td>regular discussions</td>
<td>monthly reviews</td>
</tr>
<tr>
<td>Depth</td>
<td>cross-functional involvement, supplier proposing actions</td>
<td>cross-functional involvement, corrective actions agreed</td>
<td>account team</td>
</tr>
</tbody>
</table>

Table 4: Summary of modifications in the case company relationships.

Most important finding from the case results is, that the case company clearly has a good ability to change the interface as needed in various means, and in rather modular way. In certain aspects the case company has made similar selections with suppliers 1 and 2, but differentiated for supplier 3. At the same time, all three are major strategic suppliers. If compared to a non-strategic supplier, difference would be even more significant. Information sharing tools are used to support the processes, for example EDI, or ERP systems with web-
based communication. The tools are however having a supporting role, they are enabling high frequency (even real-time) information sharing and global communication when necessary. The framework is illustrated below at Figure 1.

![Framework for differentiation of operative supply management interface](image)

By modifying these four processes the case company has created three different operative interfaces, adapting to operative business situation at each case.

5. DISCUSSION

Differentiation of manufacturing and supply chains has been researched and discussed in the literature. Discussion has centered around manufacturing capabilities (Hayes and Wheelwright, 1984), selection between lean and agile manufacturing paradigms (Naylor et al., 1999), and downstream supply chain structures (Fisher, 1997). This literature offers valuable viewpoints on how to reach fit between the requirements for the performance of the supply chain and the actual performance. However, upstream part of supply chain is mostly absent in this discussion.

Our review of purchasing literature revealed that it is centered around portfolios (e.g. Kraljic, 1983) and supplier relationships, and that surprisingly few advice or guidelines is offered for companies on how to implement efficient and effective purchasing and supply management processes in a global business environment. Portfolio models propose that differentiation should take place between categories (Kraljic, 1983; Bensaou, 1999; Olsen and Ellram, 1997). A stream of literature discusses types of buyer/supplier relationships (e.g. Dyer et al., 1988; Harland and Knight, 2001; Gelderman and Van Weele, 2005; Hald et al., 2008).

One major question that has gained limited attention in literature is the customer orientation in procurement. On our perspective, the point of consumption, often manufacturing or installation activity, is the customer not only for suppliers, but also for procurement of a company. Practices developed for downstream – demand chain management approach (Heikkilä, 2002; Childerhouse, 2002) and OPP considerations – have not reached the upstream of a supply chain yet. We see an analogy here: Our framework suggests that supply also need to align to customer demand, which in our case is the manufacturing activity or, as for Supplier 3, end-customer demand.

The framework provides also an interesting perspective to the resource usage and effectiveness of purchasing activities of a global company. As was discussed e.g. by Choi & Krause (Choi & Krause, 2006), several authors earlier have offered definitions of complexity...
and identified its negative effects on performance. It is associated with the number of elements within the system and the degree to which these elements are differentiated, clearly indicating, that too much differentiation is not desirable. On the other hand, controlled differentiation through a limited set of standardized modular elements at a buyer-supplier interface can potentially offer a decent balance between global effectiveness, and performance through differentiation of activities within a relationship.

Our findings regarding the role of ICT systems seem to be in line with other studies on the field: As was recognized e.g. by Handfield & Nichols, while information systems are a key enabling factor that allows supply chains, they are not sufficient themselves to guarantee a capable supply base (Handfield & Nichols 2004). Our findings emphasize the role of systems as an enabling tool, allowing frequent, almost real-time interactions in a global environment. The process including information content and purpose, however, remain as the main issue.

6. CONCLUSIONS

The paper introduces a way to differentiate global purchasing and supply processes by developing an initial framework for further research and testing.

Three conclusions can be drawn from this study. First, it came evident from literature and from the case study that that differentiation of a supplier interface at operational level is highly relevant; different business situations require different supply management practices. According to the observations from the case, interaction in supplier relationships on operational level takes place in four processes: communication, planning, fulfilment and performance management. Second, these practices can be classified and systematically selected for each relationship. Purpose is to balance the usage of standardized and differentiated integration mechanisms for each type of relationship to ensure optimal resource usage. In the case company the need for systematic selection process is evident because complexity of global organization leads to highly specialized responsibilities, which requires explicit policies and guidelines regarding processes and ways of operations to ensure effectiveness and global consistency. Third, the analogy from demand chain management offers a valuable viewpoint when considering upstream operations in a supply chain.

The framework presented in this paper is the first attempt to find a systematic way to supply differentiation. In further research the framework needs to be more strongly tied to existing literature, and empirically validated. For empirical testing and generalization it is necessary to study more cases, and implement suggestions in the case company. Furthermore, aligning upstream operations according to demand deserves more empirical studies. One untouched area in this paper is how the four processes identified in this case study relate to supply chain management and supply management processes, i.e. by Lambert (Lambert 2005).

Our study has limitations. In our research only one case is studied. The paper analyzes opportunities for differentiation, and ends in suggestions how differentiation should be systematically implemented in the case company. How differentiation affects company performance, for example, was not studied in this paper. Also supplier point of view needs more attention. Next steps of this study is to discuss the processes and framework in relation to earlier literature, and to widen understanding of supply processes for example based on Hald et al:s (Hald et al. 2008) view on relationships.
REFERENCES


