Customer-driven Product Development

A Demand Chain Management perspective

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ABSTRACT

Demand chain management is a research area of increasing attention. It is the undertaking of reacting to customer requirements through a responsive chain going from customers through a focal company towards raw material distributors. With faster growing markets and increasing competition, companies look for new ways to gain competitive advantage. In competitive markets there is a tendency of shorter product life cycles, and thus a competitive factor is to keep at pace with the market or even driving the market by developing new products. This research study seeks to investigate Customer-driven Product Development (CDPD) from a demand chain management perspective. CDPD is the counterpart to typical research and development processes, which has no direct customer involvement. The proposition is that letting customers initiate and participate in the product development process will be a competitive factor by enhancing customer value and strengthening ties to customers, which increases loyalty to the company in competitive markets. CDPD is investigated through an explorative research design in a dyadic case study including a global industrial company and its customers. The study provides an insight into a new area of new product development and demand chain management, including the customer in the case study, which is rare in related research.

Purpose of this paper

To investigate customer-driven product development the first phase of an industrial product life cycle, the development phase, from a demand chain management perspective.

Design/methodology/approach

The paper is based on a structured review study and a dyadic single case study. A global industrial manufacturing company is used as the focal case company. The phenomenon that this study seeks to describe is the customer-driven product development process, which is an inter-organizational and intra-organizational process.

Findings

It is established that customer driven product development enhances customer value and loyalty towards the company. The customer driven process turns out to be complex to manage in practice involving a complex entangled net of factors. An overview of the main issues in this instance of demand chain management is presented.

Research limitations/implications (if applicable)

Since the research findings are based on a dyadic single case study, customer-driven product development should be investigated in larger samples and other country and industrial settings to develop a basis for generalizability.

Practical implications (if applicable)

Practitioners can be inspired by the study to develop demand management for customer-driven product development in their respective organizations.

What is original/value of paper

Providing insights into customer demand for new products by increased understanding of the customer-driven product development.

Keywords: Demand Chain Management, New Product Development, Customer Driven Product Development, Dyadic case study, Customer Integration.

1. Introduction

Research within Supply Chain Management (SCM) has evolved from logistics research by incorporating the view of managing business processes from raw material to end customer from a focal company in the supply chain (Lambert and Cooper 2000; Canever, Hans C. M. Van Trijp et al. 2008). The next evolutionary step of understanding is demand chain management in which the focus is shifted from supply to a demand view, with the customer as the focal point rather than the company (Childerhouse, Aitken et al. 2002; Heikkilä 2002; Jüttner, Christopher et al. 2006). In competitive markets it is essential for a supply chain to have a short-timed and efficient respond to market changes (Chen and Paulraj 2004). It is also essential to keep introducing new competitive products, to keep at pace with the market change rate (Krishnan and Ulrich 2001). Customer demand for new products is viewed as a special instance of demand chain management, which has so far not been investigated from a Demand Chain Management (DCM) perspective. Traditionally new product development has been viewed as a process initiated by the focal company, when in fact there are various examples of product development being driven by customer requests (Souder 1997; Cristiano 2000; Gofman and Moskowitz 2009; Wang, Fang et al. 2009). Within Engineer To Order (ETO) companies the customers are also drivers of the product development process (Kumar and Wellbrock 2009), however ETO companies products do not follow a traditional product life cycle since all products are developed from individual customer requests. This research study is concerned with companies whose products follow a more traditional life cycle and where customer demand for new products can be used to feed into the product life cycle.

Managing customer demands for new product development and the connected collaborative product development process is named ‘Customer-driven Product Development’ (CDPD). This phenomenon has not been investigated before in New Product Development (NPD) or SCM related research streams. In this paper the phenomenon is investigated from a demand chain management perspective and the objective is to understand how companies can increase customer orientation by managing customer demands for new products and to develop an understanding of the complexity of the cross-organizational process. The objective raises the research question: What is the customer-driven product development process and what complexity is involved in managing the process?

First, a review of existing literature concerned with closely related research is presented including on demand chain management, new product development, and connected research streams. The review will lead to propositions on the relevance of the presented concept. Afterwards the phenomenon is investigated in an explorative in-depth dyadic case study. Finally the developed concept and the case study findings are discussed.

2. An overview of the literature

To investigate Customer-driven Product Development (CDPD) it is necessary to identify the related streams of research. The subject is cross-disciplinary integrating the two main research streams of supply chain management and new product development. Within these research

streams only literature concerned with customer-orientation or customer integration is relevant. A structured literature review was conducted to explore the existing knowledge and identify potential research gaps. First the top 20 supply chain management journals where reviewed (Charvet, Cooper et al. 2008; Arlbjørn, de Haas et al. 2011). The only addition to the top 20 was the Journal of Product Innovation Management, which is still in the top 40 of SCM-journals (Charvet, Cooper et al. 2008). The journal was included since it is concerned specifically with managing product innovation. The SCM journal review was focused on identifying papers including customer collaboration and product development. To ensure including all relevant articles, the search was on 'customer' AND 'product' in all text except the full text. The search through the papers gave a total of 1030 hits. Through reviewing the subjects in headline and abstracts excluding irrelevant subjects based on predefined criteria, the number of papers where reduced to a total of 95 papers. Additionally a structured database search in five databases within social sciences was conducted[1]. Four identified facets where used in the thesauruses of search engines to identify other terminology of the same facet. For instance product development equals product innovation, customer-centric also includes customer-oriented, and demand management is part of supply chain management. In this way a search string was developed. The final additional number of papers found in the entire database search was 48, giving a total of 143 articles. The review created an interesting body of knowledge for understanding how customers are viewed and integrated in product development and supply chain management. In this paper only a small sample of this information, which is related to customer-driven product development from a demand chain management perspective is presented.

First, research on New Product Development (NPD) is presented in relation to customer integration followed by a new perspective on customer needs as the starting point of joint product development. Afterwards the developing research stream of Demand Chain Management (DCM) is introduced including the main framework of the research study. Finally the term 'customer-driven product development' is introduced creating the basis for the following explorative case study.

2.1. Customer integration in New Product Development

From a classical life cycle perspective, product development is the first phase of the product life cycle (Rink and Swan 1979). Developing products can be based on an evolution of former products, that have reached a later step in their life cycle, or it can be development of entire new products and/or product types. A model of the product life cycle is depicted in Figure 1.

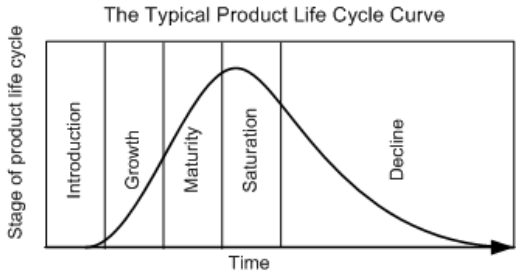

Figure 1 The classical product life cycle (Rink and Swan 1979).

[1] EBSCO Business Source Premier, Emerald, Scopus, Proquest Academic Research Library, and DADS Academic Search Premier

It is important to maintain the product portfolio by frequently introducing new products (Rink and Swan 1979; Whitley 2005). The rate at which new products must be introduced depends on the product lifetimes in the given marked. Existing products will eventually be out-dated reaching the declining phase, and if new products are not introduced before this happens, the company will cease to be competitive and loose market shares (Krishnan and Ulrich 2001; Whitley 2005).

According to Childerhouse, Aitken et al. (2002) there are different demand chain strategies, which are necessary in different product life cycle stages. In the introduction phase of a new product, the strategy is design and build. It requires a close collaboration with customers and market knowledge. To qualify for orders in this phase it is necessary to match customer expectations on product quality, lead time, cost and design. An order in the product development stage is won by the company having the best design capability. In the growth and decline stages, material resource planning is the preferred strategy. Cost quality and lead time are order qualifiers and the service level is the order winner at these stages. In the mature stage, kanban is the preferred strategy. Cost is the order winning factor at this stage as well as in the following stage, which is the saturation phase. (Childerhouse, Aitken et al. 2002)

In this research study the strategy of the introduction stage is of interest. This stage is becoming increasingly important for many companies, which are experiencing shorter product life cycles and increasing customer demands in global markets, for instance in the mobile or fashion industry, where a product's life time is only six months or even shorter (Jacobs 2006; Collin 2009). Companies which do not have the ability to develop new competitive products within the timeframe will lose market shares. The ability to compete in these markets is dependent on a responsive demand chain especially in the introduction phase.

New Product Development (NPD) is a research stream, which has primarily focused on improving product development through process and project models, cross-functional collaboration, decision support and IT (Cooper 1996; Krishnan and Ulrich 2001; Shum and Lin 2007; Kumar and Wellbrock 2009). Within NPD literature there has been increasing focus on including customers into the NPD process. The research topics include buyer-supplier relationships in NPD (Corner 1997; Bensaou 1999; Knudsen 2007; Terpend, Tyler et al. 2008; Hald, Cordón et al. 2009), customer integration (Koufteros, Vonderembse et al. 2005; Sandmeier 2008; Koufteros, Rawski et al. 2010) and collaborative product development (Littler and Leverick 1995; Simatupang and Sridharan 2002; Bonner and Walker 2004; Tan and Tracey 2007; Mishra and Shah 2009; Wang, Fang et al. 2009). By far the dominant research method within these topics is quantitative research studies testing different hypothesis on relations between product development including customers and positive impacts on key measures. From an overall point of view there has been found conclusive evidence that integrating customers in new product development has a positive effect on factors of competitive advantage. These measures are different positive gains for the focal company including product performance, market success, customer commitment, and customer perceived value, lead times, efficiency, and profitability (Koufteros, Vonderembse et al. 2005; Lee, Chen et al. 2008; Mishra and Shah 2009; Bonner 2010; Čater and Čater 2010; Franke and Schreier 2010). The emphasis so far has been on testing and proving the importance of customer integration in product development, but little has been written on how to do so in practice (Sandmeier 2008).

2.2. A new perspective on customer demand

Customer demand for products can be viewed as an information flow starting at the customer going upstream through the supply chain (Lambert and Cooper 2000; Mentzer, DeWitt et al. 2001). Traditional supply chain management research and recent research on the relation between NPD and SCM has a tendency to focus on how to most successfully direct downstream flow according to the upstream information flow (Croom 2000; Pero, Abdelkafi et al. 2010; Hilletofth and Eriksson 2011). Managing the upstream information flow has primarily deemed important within SCM literature when considering penetrations points, vendor managed inventory, electronic data integration and similar tools to understand and aid information flow to the right place in the supply chain (Lee and Billington 1992; Taylor 1999; Weber and Kantamneni 2002; Kauremaa, Småros et al. 2009). However focus has mainly been on how to manage the flow of information, which seems to be based on a common understanding of information as a consistent entity. Within the research streams of New Product Development (NPD), integrated product development, and customer-oriented product development, customer needs and customer value is handled in a similar way viewing the information from the customer as static. Customer information is collected in the first phase of the product development process and analysed through tools like QFD acting as basis for the product design/development/innovation process (Govers 1996; Yamashina, Ito et al. 2002; Piedras 2006).

In this research study another view on customer information is used, which changes the basic assumptions in the existing research streams of NPD and SCM. Customer needs for new products and customer value are viewed as unfixed and to some extend variables of external influence. This view is supported by Bonner (2010) proposing a view on collaborative product innovation as a learning process. When customers are actively engaged in a collaborative NPD process, customer needs and value is affected through interaction with the supplier and through learning in a joint problem-solving project. Especially when dealing with 'hard-to-articulate' knowledge, the collaborative approach is relevant to apply since the first assessment of customer needs is likely to be insufficient. When customers engage in buyer-supplier collaborative product development, it will have a positive effect on customer commitment and loyalty. (Bonner 2010).

Quantitative research studies have also indicated a significant relation between customer involvement in NPD and market success/performance (Mishra and Shah 2009; Koufteros, Rawski et al. 2010). Following this line of thinking, it is relevant to use customer demand to actively include customers in new product development thereby improving commitment, loyalty from the specific customer but also to improve general market success.

2.3. Demand Chain Management

Demand Chain Management (DCM) is a new concept, which has evolved from the supply chain management research stream (Heikkilä 2002; Sachan and Datta 2005). Demand chain management can be described as the opposite value chain of the supply chain. Within supply chain management focus is primarily directed at the downstream flow of products, increasing value down the chain through each link. Flow in the opposite direction can be regarded as the demand chain flowing information and funds upstream (Hoover, Eloranta et al. 2001).

Recently it has been acknowledged that managing the demand chain can be viewed as a separate discipline involving both logistics and marketing management (Childerhouse, Aitken et al. 2002; Jüttner, Christopher et al. 2006; Hilletofth, Ericsson et al. 2009). DCM as a research stream is still in its early phase, and there are still various definitions and debates on the differences between DCM and SCM. Some researchers argue, that demand chain

management is a discipline within supply chain management (Jüttner, Christopher et al. 2010), like in popular framework by Lambert and Cooper (2000) where demand management is one of eight key SCM cross-organizational business processes (Lambert and Cooper 2000). Others however argue that DCM is something else and more than SCM including understanding of customer demand, which has not been part of SCM. '*Additionally DCM is concerned with the integration of more processes and activities than is the case with SCM concept, such as sales, marketing and product management*'(Canever, Hans C. M. Van Trijp et al. 2008). The definition of DCM used in this paper is that demand chain management is: understanding and integration of customer value as the focal point in key business processes throughout the supply chain. DCM has been identified as a cross managerial challenge involving marketing and supply chain management in interaction with the market (Hilletofth, Ericsson et al. 2009). A framework matching this definition is depicted in Figure 2.

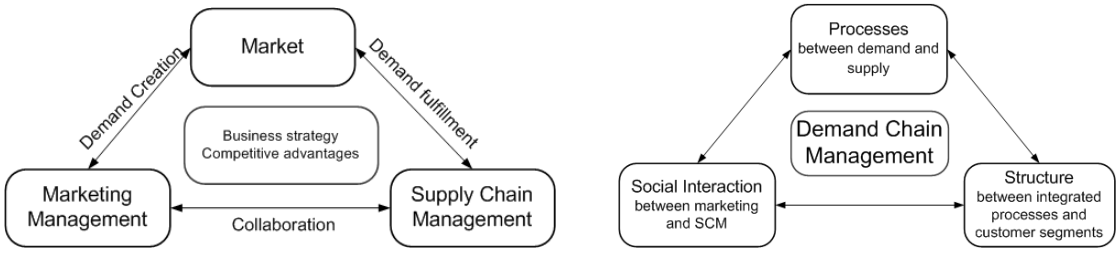

Figure 2: Demand chain management frameworks (Hilletofth, Ericsson et al. 2009) and (Jüttner, Christopher et al. 2006) respectively.

DCM is combining the managerial areas of marketing and logistics for increased competitiveness. Most companies today do not have this integration but some in highly competitive markets have recently started to coordinate across the traditional managerial boundaries. (Hilletofth, Ericsson et al. 2009)

Another framework on DCM developed by Jüttner, Christopher et al. (2006) presents a similar collaboration between marketing and supply chain managers. This framework is differently focused on the managerial factors of the focal company and has not included the market as a factor. Instead the factors identified for DCM are managing the integrated processes between demand and supply, managing the structure between the processes and customer segments and social interaction between the marketing and SCM employees (see Figure 2). Both frameworks on DCM seem to include relevant elements. The framework by Jüttner, Christopher et al. (2006) is developed through workshops with marketing and SCM representatives whereas the framework by Hilletofth, Ericsson et al. (2009) is developed through the researches own reasoning based on previous research. None of the frameworks have been empirically tested through hypothetical-deductive studies.

The research stream of DCM has so far not considered managing demand for new products. This special instance of DCM is viewed as highly important in the light of increasing demands and shortened product life cycles. In this paper the elements from both frameworks will be used to explore the nature of customer-driven product development. In practice this is done by adding the market factor presented in the first framework (here labelled Customers) as a fourth element in the DCM-framework. The framework used in this study is presented in Figure 3.

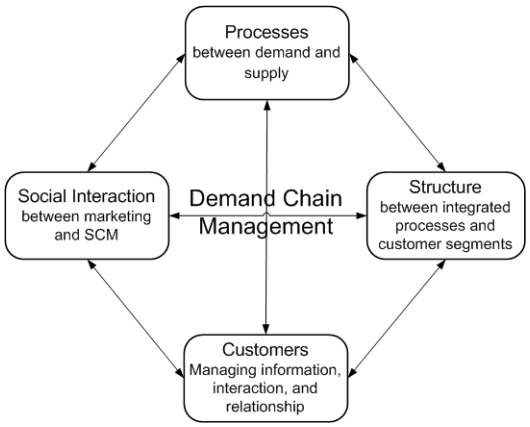

Figure 3 Demand Chain Management Framework including customers.

This new model is a general framework for DCM based on the two previous frameworks. In this research study it is used to investigate Customer-driven Product Development (CDPD), which is an instance of demand management when customer's demand new products from a focal company.

2.4. Customer-driven Product Development

A few studies claim to have been investigating the phenomena of Customer-driven Product Development (CDPD) (Souder 1997; Cristiano 2000). However the study by Cristiano (2000) is concerned with including the customer through Quality Function Deployment (QFD), which is not actively engaging the customer in the process and the study by Souder (1997) is concerned only with small entrepreneurial companies in New Zealand and their customers. Based on this it is found necessary to develop a clear definition on CDPD. Customer-driven product development is defined as; new product development initiated by customer demand for new products, which involves the customer actively throughout the product development process and ends with market launch. This paper is based on a contingent approach on industrial B2B relationships where existing and new customers request for new products implicating both radical and incremental innovation and inter-organizational collaboration between sales/marketing and operations department. The focal manufacturer is in this research study considered to be a Manufacture To Order (MTO) or Manufacture To Stock (MTS) company, relying primarily on demand management on products in later life cycle stages, where customer-driven product development is a potential source of new products to feed into the existing product portfolio (Childerhouse, Aitken et al. 2002). Engineer To Order (ETO) companies rely completely on customer demand for new products and includes different contingent factors than investigated here (Kumar and Wellbrock 2009).

3. The Case Study

The methodology used to investigate customer-driven product development is an explorative dyadic single case study and the method is semi-structured and unstructured interviews (Gray 2004). The purpose is to develop an in depth understanding of the elements in the case (Yin 1994). The interview study is supported by unobtrusive data from the company, including power points, e-mail-threads, and documents with formal information concerning the process. To increase validity of the study triangulation of data has been applied whenever possible (Yin 1994). In addition to the inter-organizational perspective, two customers are also

interviewed to cover the DCM perspectives towards first tier customers creating a dyadic case study. The time frame is cross-sectional (Gray 2004).

The case company is a global industrial production company producing high-quality industrial products to B2B manufacturing customers. The company focus on developing long term relationships with their customers through close interaction, high quality in products and service, and a high level of trust. The organization is a typical machine bureaucracy structure with functional silos (Mintzberg 1989). The functions of interest in this study have been identified as the operations department (including technical service, engineering, and department managers) and sales (including management, coordination, and sales representatives from local departments). Persons from all participating areas in the Customer-driven Product Development (CDPD) process have been interviewed. In total 12 in-depth interviews were conducted including two cross departmental group interviews. The purpose was to develop an in depth understanding of CDPD both from a dyadic point of view. This study is only concerned with the upstream demand management part of the process, and thus the downstream process has been omitted. Considerations of the supply chain for the product is considered to be a relevant part of the product development decisions (Pero, Abdelkafi et al. 2010; Stavrulaki and Davis 2010), but the actual setup is regarded as part of the subsequent steps in the product life cycle (Childerhouse, Aitken et al. 2002).

The two customers interviewed in this study are medium and large industrial companies, with a long history in collaborating with the focal company. These companies were chosen for the study because they have both recently and previously been requesting for new products at the focal company. However since the customers have been through the process, they do not represent customers who have been rejected with product requests, which is a relevant limitation to the study. Validity of the research study is perceived to be high due to the depth of insight into the company and triangulation of data. The purpose is to provide an in-depth understanding of customer-driven product development as a demand chain process and generalizability has been deprioritized for an in-depth study of the phenomenon.

4. Results

The results provide insight into the four identified components of Demand Chain Management (DCM): Process, configuration, social interaction and customers (see Figure 3).

Process

The Customer-driven Product Development (CDPD) process proved to be an interesting and complex process to investigate. Formally on paper the process seems simple. Customers demand new products or changes in existing products, and the company decides if they wish to meet the demand or decline, and if accepted the product is developed. A simplistic overview of the process is presented in Figure 4.

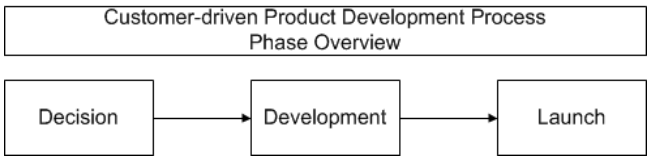

Figure 4 Overview of phases in the CDPD process.

The first phase in the CDPD process is the decision phase. In this phase customer demand for new products are evaluated and accepted or rejected. When and if accepted the product is developed, quality tested, and placed into the company product portfolio in the ERP-system. Finally when the product is ready to be produced and placed in stock, it moves to the launch phase where the product is purchased by customers. In practice however, the process is far from simple. The decision phase is the first and most challenging step in the CDPD process. In this phase the process cuts across three organizational silos, working as communication barriers, which is critical when dealing with technically complex 'hard-to-articulate' knowledge (Un, Cuervo-Cazurra et al. 2010). The three silos are the customer, sales department (including both the local sales office and strategic sales development) and operations (including technical service and engineering departments). Typically the purchasing department is participating in the CDPD process from the customer side, but they can also include R&D and operations especially in later iterations of the process. The decision process involves stakeholders across the demand chain and has been identified as an iterative process rather than a linear which is depicted in Figure 5.

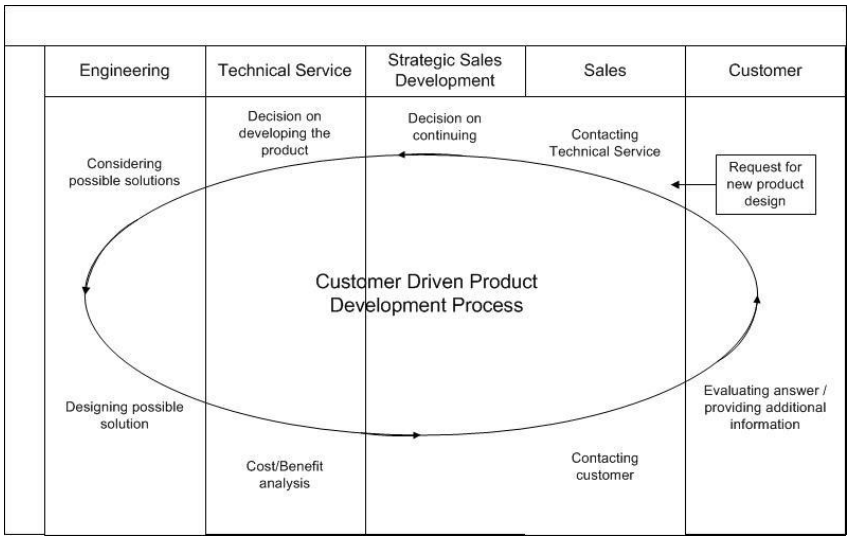

Figure 5 The customer-driven product development process decision phase.

The customer initially contacts their local sales department with a specific product development request. This request is evaluated and if reasonable the request is filed into a Customer Request Sheet (CRS). This sheet is emailed to the regional strategic sales development manager who decides if the sheet is relevant to be directed to technical service. Strategic sales development is an additional control unit, with the function of limiting the amount of irrelevant requests to technical service. Technical service has the decision power to accept or decline the requests. They do so through a cost/benefit analysis counting in various factors including sales possibilities for the product at global scale, possible price levels, probable production costs and strategic aspects, which are al complex by nature. This process is perceived as very challenging by the employees, and most often requires obtaining additional information than what is in the first CRS. The additional information is obtained from many different sources including engineering, customers, sales departments and marketing, which is why the process develops a cyclic nature. Engineering is the department with high level of technical knowledge. This department evaluates the technical aspects of the product requests, while technical service primarily evaluates the financial aspects. Approving a CRS will almost every time require several process loops before the final approval or rejection. By analysing email-threads it was found that communicating even simple product request questions through the chain could take weeks and even months. Questions about technical requirements and possible price per unit are not simple to answer and in many cases

generate counter questions, thus going back and forth. Sales employees expressed that many requests were so to speak 'lost in translation'.

The following stage of the CDPD process is when and if the CRS is approved. This phase is called the development phase. Technical service approves the CRS by creating a product number in the ERP-system, and initiating development of the product including quality testing, buying manufacturing equipment and components from distributors or increasing raw material stocks, reserving storage space in the Central Distribution Center (CDC) and production time in manufacturing. Until this phase the CDPD process has only been an expense in hours used by the involved stakeholders. The development phase includes a high level of variable and overhead costs, and thus it is essential that all CRS's reaching this phase will result in an actual purchase. Quality issues or design limitations can result in cancelling at the development stage however this is only in rare situations. In this phase, customers can be included in the product development process by sharing prototypes and joint problem solving in situations where technical service finds it appropriate. The customers interviewed have been engaged in the development process. This stage is perceived to be less ambiguous than the decision phase since customers at this stage are more directly involved in the process and product information is shared directly between technical staff from both organizations. Most commonly, product demand reaching this stage will continue on to the final launch. In the launch phase, the product is produced and shipped to the CDC awaiting customer orders. The customer then purchases their first order, and the product moves onto the next stage in its life cycle.

Through the analysis a mismatch was identified between the formalized product development process and the CDPD process in practice. The nature of the process derived through the interview studies proved to be different and much more complex than the formalized process on the intranet site of the company. The formalized process was a general stage-gate project model, omitting the actual cyclic nature of the process. The model did not include specification on the elements of the cost/benefit analysis and did actually not include customer integration in product development even though this was the general situation in practice.

Configuration

Configuration of the demand chain refers to the structure surrounding the demand chain processes. The organizational setting is relevant both in terms of the organizational silos but also global distribution of customers and sales departments adds complexity to the configuration. The three organizational silos include two within the focal company (as depicted in Figure 5); the sales organization, including local sales departments and strategic sales development, and the operations organization, which in the CDPD process include technical service and engineering. The third organizational silo structure is the customer. When using the term silo here, it is referring to that these organizations are managed separately, have separate strategies and Key Performance Indicators (KPIs), and that information is only partially shared between them. The boundary between sales and operations creates a silo structure, which is almost as immense as if these entities were separate companies. Operations do not share production costs with sales personnel, on the products they have to sell. They refuse to do so out of fear that sales will use the knowledge to sell products at too cheap a price. In the product request process, sales employees refer to the operations unit as 'a black hole'. *'You send the CRS in, just to check if it is possible to produce this item, and hear nothing for months and suddenly they send you an email that the product is now ready to be sold'*. The differing KPIs in sales and operations justify using the term organizational silos. The KPIs of technical service is the *profit* gained on the developed

products whereas sales are only rewarded for the *amount* of products sold regardless of the profitability. For the CDPD process this has now changed so that both sales and operations are rewarded for a high hit-rate (sold amount of developed new products) in addition to their individual KPIs. The company thereby hopes to establish a common goal for the two organizations.

Global physical distribution of the participants in the CDPD process is also an important structural factor, which influences the process. Technical Service (including engineering) has two physical departments both with offices in Denmark close to the company main headquarter. Sales have headquarters in Denmark, but with sales offices distributed at a global scale. The strategic sales development unit has 6 regional managers, dividing responsibility for managing the customer request sheets and relating questions from local sales departments around the world. Customers are also distributed globally. However one additional twist to add another level of complexity is that many customers are also global industries. A customer request from one location might potentially be a sales option to the same company in other regions. However these are under other sales departments and the local sales employee is only rewarded for the local purchase and has no benefit in developing a solution for the global customer. The customer request can come from the global company headquarters but most often the request is from the customer's local factory. The focal company does currently not investigate the buying potential of their global customers unless they are 'key accounts', which are handled by global key account managers. The global perspectives are an additional factor in the cost/benefit analysis and price calculation.

Social Interaction

Through the case study there was found a close connection between social interaction and physical location. Technical service and engineering have close social interaction both internally in their own departments and between them. They share two office locations at the manufacturing sites in Denmark. This affects their common language and understanding of situations, since they affect each other at a daily basis. They have a more informal tone and stand united in improving CDPD and the company in general. It is a different situation in the sales department, where there generally are looser social bonds. From sales headquarters to the local sales offices the tone is more informal. Between local sales offices and technical service it is even less. This affects communication as it is both more formal but also more difficult because the taxonomy is not shared. They view them as one entity calling them 'headquarters' and communication is in a formal business tone. Especially when communicating technical product details this is problematic combined with difference in technical knowledge. Sales employees of the focal company do have technical courses and backgrounds but not at the level as technical service and engineering. The strategic sales development managers' role is to ease communication between the two participating internal organizations. They are frequently visiting technical service departments and sales departments globally to create closer bonds and increased understanding between the organizations. They have been implemented during recent months and so far they have been able to improve the CDPD process by acting as a threshold for local sales offices and communication co-ordinators.

The Customer perspective

Customers explain that they have a primary contact at the focal company acting as the project manager of their product requests. It takes around six months to a year for their product to be finally produced and available. Customers perceive this as a long lead time but generally worth the effort since they get their desired product. The customers' value that they can

influence the product portfolio and that their demands are taken serious. Through the process, customers have developed closer relationships to the focal company, and they are now less likely to move to another supplier because of the successful outcome of the CDPD process. This shows an interesting difference in opinions between the customers and the company. While company employees perceive the process to be problematic and challenging, customers view the process as a valuable asset and have no idea of the difficulties the process creates internally in the focal company. CDPD is perceived by customers as having changed over recent years. A few years back customers recall it as not being likely that product requests were accepted by the focal company, now however customers perceive the company as open to suggestions both in changing existing products and developing new products. They perceive the reason for the openness to be part of a new strategy in the focal company of being more open to market changes. This adds value to the customers and is from customers to be viewed as a competitive factor.

Hit-rate

An interesting viewpoint when having considered it to be valuable to customers is the internal value of the process. The CDPD turnover (called hit-rate) was recently evaluated by management, and it was discovered that about 40% of the developed products based on customer requests were never sold. Evidently somewhere in the process, something is causing that 40% of developed products do not match customer needs. This so called hit-rate should be 100% since the process is customer-driven. Reasons for the poor hit-rate were additionally analysed through the case study. The case study suggests that the main reason is lack of communication over the intra-organizational barrier between sales and technical service, primarily from technical service towards sales. Increasing communication in the decision phase, and only continuing after a final acceptance from customers should improve this source to the problem. However hit-rate is isolated not sufficient to sustain profit from CDPD. Further analysis of actual profit on finalized products is necessary.

5. Discussion and Conclusions

This research study has provided an in-depth understanding of Customer-driven Product Development (CDPD) process as an instance of demand management through a structured literature review and an explorative dyadic case study. Investigating the CDPD process as a demand management challenge has provided new insight into demand management in practice in industrial companies. The decision to accept or decline customer demands for new products requires detailed knowledge on technical details, production costs, market opportunities, customer information, and product strategies. In this case study there were no formalized procedure to do this, and thus the process was perceived as unstructured and inefficient by all stakeholders in the focal company. However this perspective was not shared by the customers who perceived the process to have increased loyalty and commitment to the focal company. It is an interesting insight gained from the dyadic case study, that customers perceive the process to be successful even though the focal company perceive it to be complex and unstructured. The viewpoint by the customers is supported by literature on customer involvement in product development. As described in sections 2.1 and 2.4 there is statistical evidence that including customers in product development increases loyalty, commitment, and market success.

It is not clear if there is a positive relation between CDPD and profitability for the focal company. The decision process is inconsistent and calls for structured demand management, which can increase profitability of the CDPD process. The process could be supported by IT-tools like product development platforms, decision support and other information sharing

systems (Xie, Xu et al. 2005; Jiao, Simpson et al. 2007). Successful CDPD is not only challenged by a complex decision process. It is further complicated by organizational, social and technical barriers decreasing and disturbing the flow of information. This includes differences in taxonomy, reward systems, social interaction and insight in the product development process. There is a clear need to develop a structured CDPD process, including the valuable elements of the existing process. A structured process must reduce complexity and support the entire process increasing the hit-rate to a 100%. Also a clear strategy on when to include customers directly in the development phase is necessary. Information on how many non-Engineer To Order (ETO) manufacturers that in fact experience customer demand for new product development has not been found through the literature review. However the guess is that most manufacturing companies to some extend handles such demand at least from their larger customers. In this case study the demand is solved as single incidents without any attention to the potential of structuring management for this type of demand. Demand management for new products can increase efficiency and profitability of the CDPD process while gaining valuable insight into the market transferring both technical and customer specific knowledge into the company and increase customer loyalty and commitment.

There seems to be a gap in demand management and product development research on how to handle customer demand for new products in B2B relationships. Prescriptive models are needed describing the specifics in the decision phase but also how to collaborate with customers in practice on customer-driven projects. This subject has been investigated but from the customer's side only (Johnsen and Ford 2007; Lee, Chen et al. 2008). Hence there is a need to investigate this instance of demand management in more depth and develop fitting prescriptive models.

This study was an explorative single dyadic case study, and thus quantitative research studies on the subject is necessary to develop basis for generalizability. However the contribution of this study is unique providing insight into a new area of demand chain management. The link between demand management and downstream supply chain management was omitted from the study even though this is a relevant area of research. The reason for this deliberate choice was to focus specifically on the complexity of the CDPD process. Hence further research on the relation between the CDPD process and downstream supply chain management is recommended.

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