This is the accepted version of a paper presented at *International Conference on Flexible Automation and Intelligent Manufacturing, Skövde, June 30th – July 2nd, 2008*.

Citation for the original published paper:


N.B. When citing this work, cite the original published paper.

Permanent link to this version:
http://urn.kb.se/resolve?urn=urn:nbn:se:hj:diva-20845
Integration and Formalization of Strategic Product Development and Commercialization in a Manufacturing Company – A Challenge for Supply Chain Management

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ABSTRACT

The last decades a new type of business environments has evolved characterized by rapid and volatile demand changes, short product life cycles, and high levels of customized products. The competitiveness of a business in these environments is mostly determined by its responsiveness. This is characterized by the ability to quickly scale up or down the production volume, the presence of an innovative and fast product development, and a quick incorporation of consumer requirements into the product development. This paper employs a descriptive case study approach to illustrate how product development and commercialization can be integrated into a product management flow to realize innovative and faster product development. Case study findings reveal that the case company has during a five year period increased the number of successful product introductions. Furthermore, the studied approach proves to be successful in this mature business environment where it is essential to develop products based on the consumer need and behaviour and to differentiate the product assortment. Based on our case study we also recognize that the product management flow does not concern supply chain management (SCM) to some extent in the case company – this indicates that further development is needed in SCM applications to support product life-cycle based managerial processes.

1. INTRODUCTION

Supply chains are supposed to satisfy the demand of customers or groups of customers, i.e. market segments [1]. This implies that the nature of markets – or business environments – is the point of departure in Supply Chain Management (SCM). One of the important business processes in SCM is product development [2-4], without new products, market acceptance and value added packages, an efficient supply chain is worthless, producing the wrong products efficiently. Final product markets are always in a constant state of change and adaptation. This implies that business models that have served us well in the past are at great risk not to serve us even moderately in the nearby future [5]. During the last decades a new type of business environments – characterised by rapid and volatile demand changes, short product life cycles, and high levels of customized products – have evolved [6].

In this new business environment innovative and fast product development is extremely important. Shorter product life cycles, more rapidly emerging products obsolete, and the increasing intensity of global competition have driven firms to strive for a more rapid introduction of new products [7]. The ability to reduce cycle time in new product development and commercialization is increasingly viewed as a key to innovation success and profitability [8-11]. First-to-market products may command higher initial prices and then gain a dominant market share and customer loyalty [12]. Significant cost benefits can also accrue from compressing the new product development process [12]. Shorter product life cycles also implies that the product development process needs to be integrated with sales in order to successfully introduce products on the market and to ensure that the product assortment is updated accordingly to product life cycles and that obsolete products are properly out-phased [13].

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Nowadays product development is also required to focus on customer needs rather than only on technology improvements. This implies that successful product development requires profound knowledge of customers and their needs. Many companies wish or claim to be customer oriented, however, customer-driven product development is a demanding and difficult task [14]. The voice of the customer must be taken into account in all the phases of product development, both in definition and design phases [15]. In this paper we use a descriptive case study approach to illustrate how product development and commercialization can be integrated into a customer-oriented product management flow to realize an innovative, predictable, and effective product development. Our aim in this research work is in the understanding of how product development and product life-cycles are connected into SCM. Instead of using a SCM perspective, we try to outline how the product development and commercialization is being executed in an international manufacturing company, which is operating in white goods business. So, our research work is mostly descriptive, and aims to shed more light on how SCM and a formalized new product development could be connected. The research question is: “What effect will new requirements of a new product development process have on SCM?”

This paper is structured as follows: First we present a literature review of the product development process in Section 2. Thereafter, Section 3 presents and discusses research approach and data collection. Section 4 presents case study findings. In the Final section research is discussed and concluded, and further research avenues are proposed.

2. LITERATURE REVIEW

Supply chain management is increasingly being recognized as the integration of key business processes across the supply chain [2]. One of these important business processes is product development and commercialization [3]. The Product Development and Commercialization (PDC) process provides the structure for developing and bringing to market new products at best jointly with customers and suppliers [13]. Effective implementation of the process not only enables management to coordinate the efficient flow of new products across the supply chain, but also assists to support ramp-up of manufacturing, logistics, marketing and other related activities to support the commercialization of the product.

Developing products rapidly and moving them into the marketplace efficiently is important for long-term corporate success [16]. In many markets, 40 percent or more of revenues come from products introduced in the prior year [17]. The ability to reduce the time-to-market is key to innovation success and profitability [12] as well as the most critical objective of the process [18]. As product life cycles shorten, the right products must be developed and successfully launched in ever shorter time frames in order to remain competitive [19] and achieve differentiation in market place. One stream of product development research consists of analytic models to determine the trade-off between overall product quality and time-to-market [see e.g. 26-29]. Another stream of research has focused on identifying specific mechanisms whereby a firm can improve the new product development process [see e.g. 30-34].

While a considerable body of research has focused on the time-to-market and process improvement problems in isolation, consideration of both design and production (or logistics) decisions to support bringing new products to market has remained relatively unexplored [20]. In their review of the product development literature, Krishnan and Ulrich [21] comment that the literature addressing production ramp-up and product-design decision-making is relatively sparse, though notable exceptions exist [see e.g. 22-25]. For example, Bayus [25] formulates a dynamic model of innovation whereby investments in both product and process are considered.

Numerous researchers have proposed product development models with 5 to 10 phases for product development [see e.g. 35-38]. In their review of the product development literature, Karkkainen [14] argue that the product development process consists of three interconnected phases: (1) strategic planning, (2) customer need assessment, and (3) product development [see e.g. 14]. The objective with the strategic planning is to ensure clear identification and prioritization of different product development areas by set specific goals for product development. The goals define the starting point for customer need assessment and product development [14]. The strategic planning builds on current business strategies (e.g. product innovation strategy and brand and design strategy). The purpose is to have clear goals known before initiating the customer need assessment and product development phases to avoid the danger of performing wrong activities [14]. All the people involved in the development activities need to understand the goals clearly and similarly and to keep them in mind during the whole development process. The objective with the customer need assessment is to clarify customers’ needs as well as the competitive situation for the company [14]. Customer-driven product development requires proper customer need assessment. Need assessment is a systematic activity of gathering and clarifying customer needs, determining product characteristics based on the clarified needs and ensuring that all the important needs will be fulfilled [14]. Careful, systematic need assessment
helps to focus development efforts and reduce the need for future design changes. Many commonly used need assessment methods have originated from statistics and market research. Urban and Hauser [35] describe how different market research methods can be utilized in product development. In spite of the importance of need assessment for product development, need assessment is often implemented in an unsystematic and unorganized way in companies [14]. This is partly a consequence of a lack of proper tools and lack of information about how to use them. According to Holt et al. [39] methods for need assessment are poorly developed compared to more technical tools for product design.

3. RESEARCH APPROACH AND DATA COLLECTION

In this paper we use a descriptive case study approach to illustrate how product development and commercialization can be integrated – into a product management flow – to realize innovative and faster product development. It is an embedded case study from the Swedish appliance industry [40], and the case company is Electrolux. Empirical data were collected from several types of sources to enhance understanding by examining the research object from various perspectives. The study builds on primary data based on in-depth interview with a key person representing customer innovation program in the case company. In addition a number of industry reports were examined in order to get information on both the industry and case company backgrounds. Furthermore a vast amount of PR-material (e.g. press releases, annual reports presentations produced by the company) was also included. The collected data has been analyzed primarily using the principles of pattern-matching and explanation-building [41].

4. CASE STUDY: ELECTROLUX

Electrolux is a global leader in home appliances and appliances for professional use. They sell more than 40 million products every year to consumers and professionals in 150 countries. The largest markets are in Europe and North America and the strongest market position is in Europe. In 2006, they had sales of SEK 104 billion and 59,500 employees [42]. The product range includes refrigerators, dishwashers, washing machines, vacuum cleaners and cookers. The products are sold under several brands – such as Electrolux, AEG-Electrolux, Zanussi, Eureka and Frigidaire – but the major share of products is sold under the Electrolux brand.

The case company is nowadays working in an increasingly competitive industry characterized by intense competition, increased global product standardization, and shorter product life cycles. To survive in this new environment firms’ needs to create a truly consumer-driven organisation by focusing on consumer-oriented product development (to create an efficient and effective product flow), branding (to develop a strong global brand) and supply materials and products on demand (to create an efficient and effective demand flow). Thus, Electrolux has defined Brand, Product Flow, and Demand flow as their major business processes. All these processes are currently in-house but Electrolux regards the brand and product flow process as more important then the demand flow process, which in theory could be outsourced in the future. In order for this to happen, the brand needs to be strong and the product flow process needs to be very efficient and effective.

The case company have launched several cost reduction programs to free capital to invest in product development and in the Electrolux brand. Firstly, they have started a restructuring program in 2004 aimed at creating a competitive production structure in the long term. The costs of this program are estimated at approximately SEK 8 billion [42]. When it is completed in 2010, more than half of the products will originate from low-cost countries, and savings will amount to approximately SEK 3 billion annually from 2010 [42]. Secondly, the case company is implementing a global program for more efficient production, the Electrolux Manufacturing System (EMS). It is based on proven methods for improving production that have been developed both in-house and externally. EMS has been implemented with great success in plants that manufacture kitchen and laundry products. In 2007, it will be implemented in facilities for production of vacuum cleaners and professional products. Finally, Electrolux has started to purchase more materials from suppliers in low-cost countries in order to additionally reduce costs. Cost for purchased goods and services represents about 70% of cost of goods sold [42]. It is therefore obviously very critical to manage these costs in the most efficient way. The share of purchases from low-cost countries has risen from approximately 30 percent in 2004 to 40 percent in 2006 [42]. Another priority is to engage the purchasing function at an earlier phase of product development. In 2006, the case company achieved savings in purchasing of approximately SEK 1.9 billion [42]. In the next section the product flow process will be described in more detail.
4.1. THE PRODUCT FLOW PROCESS

Products are the very core of Electrolux business and success in this area is closely linked to the amount of resources as well as methods and tools to ensure that they develop the right products, based on consumer insight, to lowest possible cost at the right time. In order to realize this, the case company have developed a process for consumer-focused product development entitled Product Management Flow (PMF). PMF is a global and holistic process for managing products – from the cradle to the grave – and it describes all areas of creating and selling products. As the project director, Antony Ford puts it: “the PMF first identifies what kind of mines there exists and then in which mines the chance of finding diamonds are highest. Finally the diamonds are polished and put on the market.”

Identifying global consumer trends and segmenting consumers enables them to offer products with more relevant and attractive design, on the basis of fewer product platforms. The goal is to create products that are adapted to local needs together with products that can be sold world-wide on the basis of common global needs. Employees from many functions are involved, at this time there are no logisticians. Furthermore the PMF includes a structured working method, with check and decision points to make sure that no steps are omitted.

The PMF is run by the product line manager with support from the consumer innovation program. It was introduced in 2004 and over the next couple of years it will be implemented in all product lines. It consists of three sub-processes the: (1) strategic market plan, (2) product creation process, and (3) commercial launch process (Figure 1).

The objective with the strategic market plan is to ensure clear identification and prioritization of opportunity areas and express this in a strategic road map and a corresponding product generation plan. The strategic market plan is built on corporate prerequisites, e.g. product innovation strategy, brand and design strategy and global needs. The strategic market plan also includes well-defined tools that together with the above mentioned analysis allow the product line manager to set priorities and take strategic decisions and translate these into a strategic road map and a corresponding product generation plan. It ensures a good frontloading of the product development as well as ensures clear directions for product development and market communication. Examples of question that are interesting in this phase are: (1) ‘On which areas should we focus our innovation work?’, (2) ‘Which changes in consumer behaviour can create business opportunities?’, (3) ‘Where are the growth markets?’, and (4) ‘What can we do that our competitors have not done?’

The objective with the product creation process is to define and develop consumer relevant and innovative products addressing well-understood consumer needs. It involves four steps: (1) consumer opportunities, (2) concept development, (3) primary development, and (4) product development. During the consumer opportunity phase an understanding of consumer needs in prioritized areas is developed. The consumer understanding and insight is the foundation for a successful concept and product development, as well as for the commercial launch. Through the concept development phase a feasible product idea addressing the identified consumer needs is developed, with a distinct positioning, consumer value based pricing and a solid business case. The consumer opportunity and the concept development phases constitute what Electrolux calls the spark process (Figure 2). Project director, Antony Ford thinks that “Double Diamond” is illustrative name for the spark-process since it first goes wide then narrow, then wide and narrow again. It has always an anchor in the target group. The first activity in the spark-process is to identify consumer opportunities by exploring a chosen target group. The case company have developed a need based segment model based on the finding that all their customers purchase products according to four different underlying...
demand patterns. Nowadays products are developed to meet needs that have been identified within a specific target group within the segmentation model. When a consumer opportunity is identified the next step is to gather consumer insight regarding the identified opportunity. To gather consumer insights they use several techniques like observations, surveys and evaluations. However, they prefer observation because observed behaviour is richer then described behaviour. The case company are in touch with tens of thousands of consumers’ world-wide every year [42]. After some insights are identified the next step is to group them into a few product concepts. Some insights perhaps originates from the same problem or in some other way belongs together and therefore could be satisfied with the same solution. Next the identified product concepts are analysed and prioritized resulting in a winning product concept. Then different product prototypes are developed based on the product concept and later tested on the target group leading to a winning product idea/concept. Finally they make a decision regarding if the product idea/concept is good enough to continue with or not, and whether it should go to the primary and/or product development phase. All the activities in the spark process are conducted from a market strategic perspective and one important output is a business case describing how to ensure long-term profitability by answering the following questions: (1) ‘What to sell?’, (2) ‘Where to sell?’, and ‘How to sell?’.

In primary development technical solutions within targeted innovation themes are developed producing verified ideas or hardware solutions that can be applied to relevant concepts in product development. The objective of the product development phase is to cost efficiently specify, design and verify the product idea and prepare for launch on the market.

The objective of the commercial launch process is to ensure that developed products are properly introduced on the market with a consistent and consumer relevant message – as identified earlier during concept development – based on a true consumer needs or problems. Another objective of the commercial launch process is to ensure that the product assortment is updated accordingly to products life cycles and that obsolete products are properly out-phased. Both these objectives rely on a consistent follow-up period.

A considerable share of investment is devoted to the early phases of the PMF, prior to large investments in production, in order to ensure that the product is successful. The number of new products created through consumer-focused product development is increasing rapidly and leading to a better product offering, and thus to an increasing number of more successful launches [42]. During a five year period the case company have increased the number of successful product introductions from one per year to five per year. In 2006, products that had been launched during the two previous years accounted for more than 40 percent of sales [42]. The increased investment in product development based on consumer insight is thus generating positive results.

Since 2002, investments in product development have increased from approximately 1 percent of sales to 1.8 percent in 2006 [42]. At the same time, development has become more efficient through global cooperation and coordination of launches between different product categories. The focus is on developing products in profitable segments and high-growth areas, simultaneously making launches more accurate. It was interesting to note that
Electrolux’s new product development follows classical “closed and internally accomplished new product development process”, but this will most probably face challenges in the near future, since already nowadays leading international companies are forced to apply model of “open innovation” (like in Philips has demonstrated in Europe, see more [43-44]). This new approach in product development means that companies are trying to manage increasing product development expenditure (due to productivity concerns) with rigid in- and out-licensing as well as through strategic alliances and collaboration with other stakeholders (like universities, research institutes, communities etc.). Also mergers and acquisitions are one form of open innovation approach, e.g. Cisco is arguing to have substituted “research” with “acquisitions”, due to the reason that basic research is costly and contains great deal of uncertainty (e.g. dealt within [45-46]).

5. DISCUSSION

Research shows that it is not enough to think about the customer, firms have to create a truly customer-driven organisation in order to survive in mature markets. This is achieved by focusing on customer-oriented product development (to create an efficient and effective product flow), branding (to develop a strong global brand) and supply materials and products on demand (to create an efficient and effective demand flow). An efficient SC producing the wrong products compared with actual customer demand will not be successful. In other words, firms need to be transformed from a too production-focused company to an innovative, market-driven company that develops and markets innovative products and services – based on extensive customer insight – that customers’ are willing to pay a premium for. For SCM this means that we should make shift from overall volumes and static observations into product life-cycle based management. Current methods need to be changed in this new environment, but there exist a great demand for workable applications. As a performance improvement challenge we see, how SCM and product development should be integrated in order to support these new demands.

Case study findings reveal that an integration of the product development and commercialization processes for a truly customer-oriented product management flow can facilitate an innovative and faster product development necessary in a mature business environment. Here it is essential to develop products based on customer needs and behaviour and differentiate the product assortment. The case company has during a five year period increased the number of successful product introductions from one per year to five per year. However, we could assume that increasing amounts of new product introductions and phase-outs of already being offered products increase the significance of SCM in the overall picture.

The product management flow highlights that successful product development requires a holistic view from strategy to product introduction. Furthermore it highlights that successful product development requires profound knowledge of customers and their needs. Many firms claim to be customer oriented, however customer-driven product development is a demanding and difficult task. The voice of the customer must be taken into account in all the phases of product development, both in definition and design phases.

The literature review highlights that the PMF process not only enables management to coordinate the efficient introduction and flow of new products across the supply chain, but could also support ramp-up of manufacturing, logistics, marketing and other related activities to support the commercialization of the product. The case study shows an applied example of integration between product development and commercialization, but no integration between product development and manufacturing or logistics. However, possible and crucial linkages between the PMF and manufacturing and logistics does exist. From our perspective where and how to sell products (output of spark process) is clearly connected to logistics and supply chain management. However, today these kinds of analysis are made by marketing people. If logisticians where involved the case company could probably define and develop more efficient and effective supply chain solutions faster, which would imply shorter time-to-market. Secondly, it is not only important to carefully specify, design and verify new products, but also the production and logistics systems or processes since some of the new products could require new systems or processes. To shorten the time-to-market manufacturing and logistics representatives should be involved early in the product development phase. Finally, to successfully launch new products on the market requires logistics capabilities. The commercial launch process ensures that the developed products are properly introduced on the market with a consistent and consumer relevant message; however, if not the right products are delivered in the right quantities, at the right place and time, in a cost-effective way, these properly introduced products are of little value.

Product innovation is critical for success in the marketplace which requires new product features based on consumer needs. Since many products are combinations of products and services companies are increasingly realising the service that their products bring, e.g. a car provides means of transportation and status. We argue that the idea of innovation being restricted to the products is unnecessarily limiting; it should also be applied in other
areas, such as e.g. customer service and logistics. Firms offer customers more than just a product, they offer a service. When gathering information regarding needs of new products or product features, firms also should collect information regarding service needs and they should consider integrating manufacturing and logistics in order to identify the most appropriate supply chain strategy for each customer or group of customers.

6. SUMMARY

In this paper we show how product development and commercialization can be integrated into a customer-oriented product management flow to realize innovative and faster product development. The studied approach has during a five year period increased the number of successful product introductions from one per year to five per year. Furthermore, the studied approach is successful in mature business environment – characterised by high market penetration – where it is essential to develop products based on customer needs and behaviour and differentiate the product assortment. One could argue that the performance of a company to supply and deliver products depends on several factors of which some are established in the product development process. An interesting aspect for further research is to study how logisticians can be involved in the product development processes. When SCM knowledge is increasingly needed in this process and at what moment the whole responsibility is handed to them? Or is logistics in this new environment just an outsourced task to be carried out by different actors?

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