Product Development Process Managing in Supply Chain

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Abstract: Today, businesses depend on strategic relations with their customers and suppliers to create value to develop product and to obtain better market-share. Designing products to match the processes and supply chains, processes to match product platforms and supply chains, and supply chains to match the product platforms and process are the ingredients in today's fast developing markets. If this co-design is done well up front with sufficient focus product development process managing, product will cost much less overall and the time-to-market will decrease substantially. However, the evidence supporting supplier integration is to less clear than evidence on the positive contribution of customer integration in product development process. Considering this problem, the purpose of the present paper is to supply a path aiming to identify managing techniques and practice for the involvement of suppliers in PDP. A model for product development process managing in supply chain was proposed. The model focuses on the following factors: outsourcing process, involving supplier into PDP, knowledge management and design considerations.

Keywords: Product development process, supply chain, outsourcing process

1 Introduction

This paper is introduced in the context of a study on the relations between the supply chain and product design. The importance of beginning the study of supply chains in product development process (PDP) is mainly because it is at this product of lifecycle phase that the decisions responsible for 80% (eighty percent) of a product's final costs are made [6,15].

In recent years a large number of papers have been published emphasizing the effects of the suppliers' participation in PDP, stating the benefits and drawbacks of the suppliers' involvement [1, 2, 3, 4, 7, 9, 10]. One of the main drivers behind involvement suppliers early in the in the PDP is to gain better leverage of supplier's technical capabilities and expertise to improve product development

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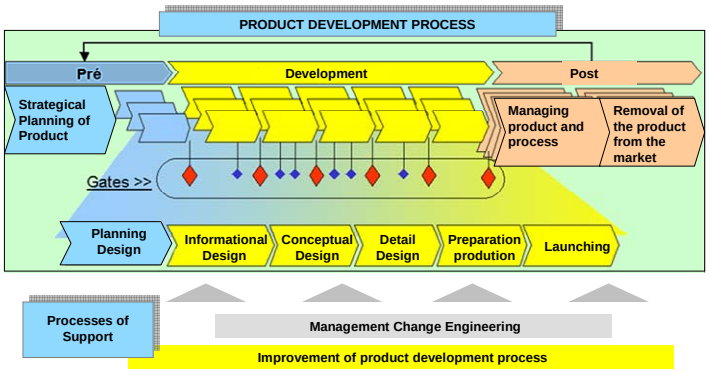
efficiency and effectiveness [19]. Using supplier's knowledge and expertise to complement internal capabilities reduce concept-to-customer cycle time, costs, quality problems and improved the overall design effort [14]. However, suppliers into PDP can introduce new problems: risk of losing proprietary knowledge, hollowing out internal competencies, eased accessibility for competitors to copy or acquire key technologies, increased dependence on strategic suppliers, and increased standardization of components through specified interfaces [10]. The supplier involvement into PDP increases complexity of activity management.

In this context, this article aims to present a four-stage model for the involvement of suppliers in the PDP process. It also presents a case study of suppliers' involvement with PDP in a company in the tile ceramic sector.

2 Supply Chain Management and Product Development Process

Supply Chain Management (SCM) refers to management between companies by means of their business processes; where they seek to maximize potential synergy, reduce waste, increase efficiency and the effectiveness of business processes, with the objective of adding value for the clients and stakeholders, making the supply chain more competitive.[6, 8]. Initially, the business processes were regarded as a way of integrating companies' corporative functions. Presently, companies seek to structure activities between the different members of a supply chain through the business processes, so as to make them manageable in the long run [8].

The PDP is one of business process of SCM [6, 8]. PDP involves technical and management aspects, in which an organization transforms market and technical possibility opportunities into information for the production of a commercial product. This process includes the development of a new product in a way that is coherent with the product's lifecycle, which starts with its planning and ends when it is discarded or taken off the market [15]. Aiming to supply a common reference, a holistic vision of the product development process, leveling knowledge within the different knowledge areas, a reference model for PDP was proposed, it is illustrated in Picture 1.

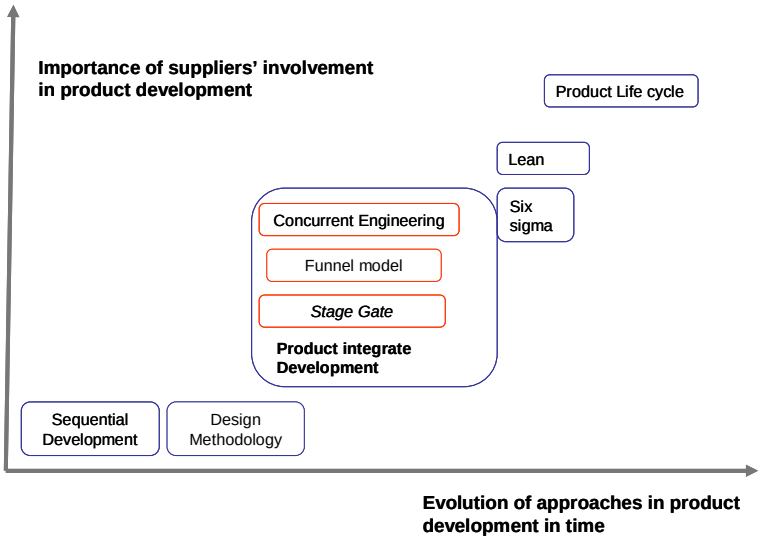


Picture 1 – Reference model for product development process. Source: [15]

3 Assessment of the supplier's involvement into PDP by product development management approaches

The product development management is divided nine approaches [15], they are: sequential or traditional, design methodology, simultaneous engineering, funnel model, stage-gates, lean, design for six sigma (DFSS), maturity model and product lifecycle management (PLM).

Picture 2 illustrates the relation of importance of the suppliers' involvement in PDP with the evolution of approaches in product development management. The simultaneous engineering, Lean, and PLM approaches emphasize the suppliers' involvement in the initial development phases as practice for becoming successful in product development in collaborative project environments.



Picture 2 - Relation between the importance of suppliers' involvement and evolution of product development approaches.

Motivation for supplier integration into PDP due to the possibility of product innovation is a critical process, which requires a long term strategic partnership between those involved. However, [14] points out that these rely on a long term relationship policy or the establishment of alliances for the development of both products and PDP managerial aspects.

Among the articles studied, of those presenting the greatest contributions to decision making related to supplier involvement with PDP, the [5] model applied by [11, 12] stood out for approaching the greatest number of decision-making factors. This model presents the unfolding of activities from the strategic to the operational level, to decide what kind of relationship to have with the supplier and when to involve the supplier in PDP. However, the model focuses on technical information systemization, putting temporarily aside aspects related to process management.

Concerning the evaluation of papers on supplier involvement with PDP, reports on how to involve the supplier with PDP are rare. In addition, many of these practices are already in use after the product design phases, during production.

There is a lack of papers that deal with the implementation of supplier involvement with PDP, of methods and tools to aid in this involvement. Literature focuses a lot on reporting what is being done, hardly approaching how to do it.

According to the concepts of practicing ESI, suppliers would be involved in the informational and conceptual project phases. However, cultural, economic and environmental aspects, and the market dynamics, show that such practice cannot always be implemented as commended by the Japanese.

4. Integration of outsourcing process into PDP

The outsourcing is a set of products and services used by a company (i. e a supply chain) which is provided by another company in a collaborative and independent relationship. [13]. However, there are few works which show the outsourcing as a process. In [18] the outsourcing process has four stages: motivation, making decision, implementation and managing. Based in study of literature it was possible detail the phases of the outsourcing process, shown [18], and identified activities, methods and technical need for involvement of suppliers in to PDP [16].

5 Model for Supplier Involvement in PDP

Based on the studies supplier involvement in PDP, integrating of outsourcing process in to PDP [16], and the PDP reference model proposed by [15], a model for the supplier involvement in PDP process is presented in Picture 3, as a means for supplier involvement in PDP.

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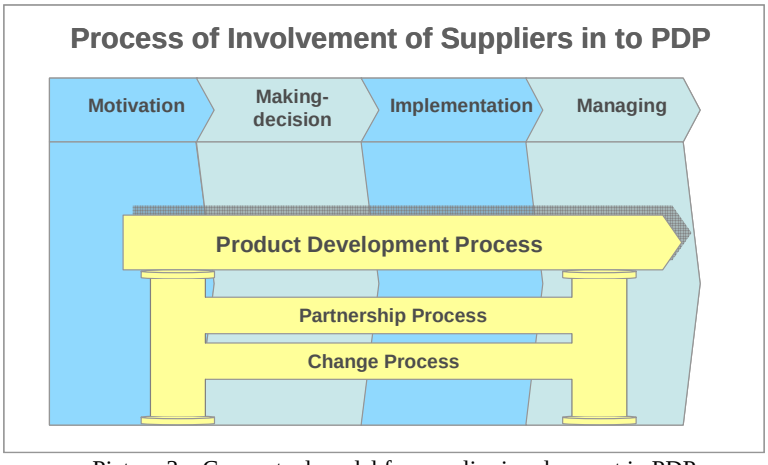

Picture 3 – Conceptual model for supplier involvement in PDP.

The process of supplier involvement in PDP is divided in 4 stages: motivation, decision making, implementation, and management. Partnership and change processes form two pillars for performing activities.

The company's internal and external connectivity are inserted in the model's stages. In this paper connectivity is understood as information technology resources, like the ones that allow real time connections, computer to computer, increasing companies' efficiency. By means of reduction of time and routines necessary for performing an activity. It involves the integration of the information flow with the supply chain to create value for the final client. Considering a (individual) company, included in the network are the suppliers (upstream) and the distribution channel (downstream). The internal suppliers of the same company are included as well.

Based on the study of the art of supplier involvement in PDP the implementation stage was divided in a quadrant square, illustrated in Picture 4

	Partnership Process	**Change Process**
Strategic Activities	1st Quadrant The main activities is this group involve the definition of guidelines for supplier involvement in PDP based on company strategies	2nd Quadrant The main activities is this group aim to define company structure to carry out the change process in the company to have supplier involvement in PDP.
Operational Activities	3rd Quadrant The main activities in this group involve the definition of technical activities for supplier involvement in PDP. The main characteristic is its focus on (technical) engineering activities for supplier involvement in PDP based on the established strategic activities.	4th Quadrant The main activities involved in this group are the definition of methods and tools for implementation of the change process in the company to supplier involvement in PDP.

Picture 4 – Conceptual model for implementation of supplier involvement in PDP.

The first quadrant focuses on strategy activities in the partnership process: the main activities in this group involve the definition of guidelines for supplier involvement in PDP based on company strategies.

The second quadrant focuses on strategy activities in the change process: the main activities involved in this group aim to define company structure to carry out the change process in the company to have supplier involvement in PDP.

The third quadrant focuses on operational activities in the partnership process: the main activities in this group involve the definition of technical activities for supplier involvement in PDP. Focus on (technical) engineering activities is the main characteristic for supplier involvement in PDP based on the established strategic activities.

The fourth quadrant focuses on operational activities in the change process: the main activities involved in this group are the definition of methods and tools for implementation of the change process in the company to supplier involvement in PDP.

6 Case Study of Supplier Involvement in PDP in a Company in the Tile Ceramic Sector

The company for the case study was selected as it is considered the tile ceramic benchmark in Brazil. However, due to an information confidentiality agreement, specifics on the company were omitted from this article.

The case study at the company involved a questionnaire preparation phase, interview preparation and execution phase, and data (the diagnosis) consolidation phase.

Company policy concerning supplier involvement in PDP is not to involve suppliers in strategic planning and conception of the product, in other words, a black box type relationship. Involvement in strategic planning or conception is done with international suppliers. The main reason claimed by the company is insecurity of information with national suppliers.

The main reasons for supplier involvement in PDP listed by the company are connected to short term advantages. However, when questioned on the main advantages of supplier involvement in PDP, the company associates advantages reached with long term objectives, with the: improvement of supplier technology access, contributions to product differentiation. This illustrates a contradiction between objectives concerning what is desired from the supplier and what the supplier will accomplish.

The organization has a formal model to make the decision on supplier involvement in PDP. Among the 27 decision making factors listed, 10 factors are used by the company for making the decision concerning supplier involvement in PDP.

The factors pointed out by the company as critical to supplier involvement in PDP are: essential competences; main technologies (product and equipment); supplier technological change rate; existing and future intellectual capital; supplier responsibility or risk level.

Geographical, location and information technology factors, which are pointed as of minor importance, and information technology are contradictory. Also to note are aspects regarding the way the company manages its supply chain. This reflects directly on company connectivity to its clients and suppliers.

The geographic location measures physical distance, information technology is manifested through resources that facilitate communication. Theoretically, one of the two factors would have an advantage over the other.

Concerning supplier involvement management, the company reports having a corporate strategy that evaluates how the supplier influences the organization’s manufacture, logistics, and marketing strategies.

Management of suppliers’ performance by means of indicators is only visible internally.

Concerning connectivity, one notices a decision on the part of the company for automatization of downstream processes of their chain, in other words, with links closer to the clients, whether through acquisition of new ERP modules, integration of these modules, development of intranet/extranet portals for internal and/or commercial partners use, among others.

But when questioned on computer-computer connectivity between the company and its suppliers and outsourced services, sharing and integrating common interest information, the grade given was 3 (three) on a scale of one to ten. The main obstacles identified by the company are: organizational culture; lack of knowledge on the benefits; human resources. An interesting fact is that there was no manifestation of obstacles of a financial nature, technical and technological aspects and/or company costs. This shows that the financial factor is not a drawback to implementation, but cultural points and management methods between the company and its suppliers are an obstacle to be overcome.

7 Conclusion and Future Work

It is believed that through the supplier involvement in PDP model, a basic conceptual structure has been generated that can help the connection between the supply chain management process and the product development management process.

Use of the model in the diagnosis of supplier involvement in PDP in a company in the ceramic sector showed that the model can be used as a foundation for building a managerial structure between PDP and SCM. After the diagnosis of the present situation, the next step with the company is to create the plan for supplier involvement in PDP, using the resulting model as a reference.

This model is part of an ongoing doctorate thesis entitled “the product development process as a business process for managing supply chains". The objective of this paper is within the theoretical realm: the possibility of there being a theoretical reference that supplies information on how to involve a supplier in PDP, in other words, building this reference is the main point of the ongoing study.

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