The influence of supplier partnership in the new product development process: a literature review

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Abstract

From the literature review of studies addressing issues related to the participation and influence of suppliers in the new product development process, several key themes which affect the issue under study are identified and detailed, highlighting the factors that contribute to the better or worse performance of these partnerships. The intention is to clarify the main problems and the main issues that have guided research concerning this specific and important form of collaboration. This study is, as such, a synthesis of the literature. The main research themes that were identified related to supplier involvement in NPD are the choice of the supplier, the quality of the partnership and the issue of integration. This study also presents the main proposals, extracted from the literature, for lines of future research.

Keywords: new product development; supplier involvement; relationship with the supplier; supply chain.

Article Classification: Literature review

1. Introduction

The supplier involvement and influence in the development of new products have brought benefits that are recognised as an important source of innovation (Smals and Smits, 2012). In this context, efforts have been made to show how companies can incorporate the perspective of a vendor in new product technology decisions, and consequent development of more successful products (He et al, 2014). Supplier involvement can happen at several stages or in several activities of the enterprise. The collaboration of suppliers that begins at the stage of product conceptualization, and which implies an higher degree of involvement, in terms of product development is known as the "early involvement of suppliers" (ESI) (LaBahn and Krapfel, 2000).

The literature reports various ways in which companies can improve their competitive advantage, by working with suppliers to identify the impact of their involvement in the development process and in production improvement (Feng et al, 2010). Generating competitive advantage through collaboration and supplier involvement in new product development (NPD) requires that the company will build and maintain appropriate procedures and routines, and that it will work with suppliers who have complementary expertise and capabilities in product development projects (Wagner and Hoegl, 2006).

A total of 38 studies that addressed aspects of supplier performance in new product development and its influence on these results are analysed. The studies were previously selected amongst a larger number, and they were the result of a selection based on a number of criteria of relevance and quality. The main objective of the paper and the underlying research, is, on the one hand, the description of the main issues/problems related to the collaboration process, and, on the other hand, the identification of generalisations concerning the participation of suppliers in the new product development process and their contributions, showing the favourable points and the difficulties encountered by the companies involved in this process. The main contribution of this article to the knowledge of this subject focuses on compiling a synthesis that identifies the most important factors concerning the involvement of suppliers.

The paper is structured as follows: section 2, which is the following section, presents the basic setting and rationale, including advantages and disadvantages, for the supplier involvement in NPD. Section 3 identifies in detail the major research themes that this phenomena triggers. The final section presents a list of selected papers that provide a very concise overview of the concerns and points of view of the researchers in this area, and a concise list of future lines of research proposed by the literature.

2. The rationale for supplier involvement

2.1 The influence of the supplier in the new product development.

Supplier involvement and its influence on the development of new products have brought benefits that are recognised as an important source of innovation. This relationship can reduce overall costs and create synergies based on resources developed collaboratively, and a particular form of collaboration is the involvement of suppliers in the new product development (Smals and Smits, 2012).

Developing new products is one of the critical processes by which firms maintain or even increase their competitive advantage. And, in this context, a considerable effort has been made on showing how companies can incorporate the perspective of a vendor in new product technology decisions, and involve or integrate the supplier in the supply chain. The integration of the supplier has received significant attention in efforts to develop new products (He et al, 2014).

As shown in Figure 1 (Petersen et al, 2005) there are at least five stages in which the supplier may be involved in the development of new products.

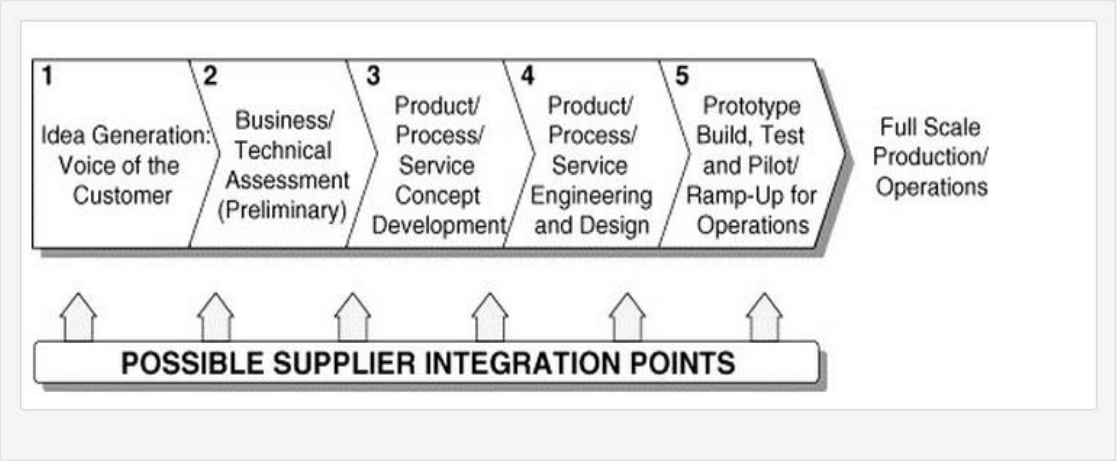

Figure 1: Possible supplier integration points (Source: Petersen et al, 2005)

Supplier collaboration can start at an early stage of product conceptualization, and this case is known as the Early Supplier Involvement (ESI). Early involvement of a supplier is a major strategic decision, because it requires a significant commitment of resources, opportunity costs of care and foreshadows the future of the business relationship (LaBahn and Krapfel, 2000).

A supplier involvement in the new product introduction can reduce the complexity of the development processes and avoids the problems that arise by ignoring restrictions related to the supplier manufacturing technologies (Walter, 2003). Besides this advantage, the participation of the supplier allows both parties to communicate more effectively resulting in shorter product development cycles and reduced acquisition costs (Humphreys et al, 2004).

The knowledge required by the products and services provided by a company is not fully available from within the company, and studies suggest that the company should integrate and use the additional knowledge, added to the skills that suppliers have, to increase their competitive advantage. The literature also mentions several ways in which companies can improve their competitive advantage by working with

suppliers, where we can examine impacts of supplier involvement in the development and improvement of production processes (Feng et al, 2010).

Thus, generating competitive advantage through collaboration and supplier involvement in NPD, at whatever stage it is, requires that the company will build and maintain appropriate procedures and routines, and that it will work with suppliers who have complementary expertise and capabilities in product development projects (Wagner and Hoegl, 2006).

The collaborations should be supported with substantial investments by both parties. Financial and non-financial investments are necessary, including time, money, training, technology updates, among other resources. The time and effort required to achieve mutual collaborative relationships should not be underestimated. In this perspective, the needs, capacities and development of suppliers should be considered and incorporated into the strategic planning of the company (Cao et al, 2010), with a view to establishing a strategic and lasting interaction between company and the supplier.

2.2 Partnerships in new product development: advantages and disadvantages

In general, the literature points to the success of partnerships between suppliers in the new product introduction process. However, despite positive results in respect to the supplier involvement in new product development (LaBahn and Krapfel, 2000; Walter, 2003; Humphreys et al, 2004), some authors show unfavourable points to this early involvement, and empirical studies have found no positive relationships, or even showed negative effects of supplier involvement on performance results.

2.2.1. Advantages of supplier involvement in the new product development process

Companies face highly competitive environments where technological changes are pushing quality improvements and cost optimization processes, but also increase the dependence of companies on the providers in terms of technology, leading to the involvement of suppliers as sources of innovation in product development processes (Wagner and Hoegl, 2006).

In short, we may say that the benefits of involving suppliers in NPD include: reducing development costs, resulting from the initial availability of prototypes, the consistency between the design and capabilities of the supplier, and consequent optimization in engineering design; possible improvements in product quality; reduction of the overall development time due to the early identification of technical problems of the supplier; valuation of the innovation process, improving the transfer of knowledge among supplier's engineers and technical personnel; improvement in the financial performance of the manufacturer (Najafi Tavani et al, 2013).

Overall, a positive assessment is made of supplier involvement in the new product development process, as well as the need to develop the supplier relationship. The adaptation process identifies the critical role of trust in the formation of co-participation, risk and reward sharing, agreement on performance measurement, top management commitment and confidence in the ability of the supplier (Johnsen, 2009).

With a vision based on strategic resources, it is argued that involving suppliers in NPD involves the combination of buyer and supplier resources in R&D and the operation of joint capabilities through strategic integration of buyer-seller relationship. This relationship of involvement can be beneficial when the supplier is involved early in the development process, instead of working independently when it comes to the time to put new products on the market, and also on the product quality, on development cost and on product cost (Wagner and Hoegl, 2006).

Collaborating with suppliers helps companies expand their organizational boundaries, which creates competitive advantage that is realised by reducing the life cycle of the product, by the increase in the number of new product launches and by the introduction of the most up to date or more suitable technology for new products (Najafi Tavani et al, 2013).

The collaboration between partners in the supply chain are not merely transactions; it seizes on the sharing of information and on knowledge creation for sustainable competitive advantage (Cao et al, 2010).

2.2.2. Limitations to the supplier integration and partnership in the new product development process

A body of research based on marketing investigated the involvement of suppliers from a vendor perspective, where these have revealed a number of concerns, such as the exploitation by the power of the customer and the unwillingness of the supplier as a partner of the customer during the NPD. There is also evidence that suggests that the powerful customers abuse their power and advantages and behave opportunistically, which can ruin the trust that is an essential ingredient in the design of supplier involvement (Johnsen, 2009).

Despite the importance of this relationship, many managers, as well as other researchers, view the procedures for integrating suppliers into NPD projects as a "black box". Research suggests that participation of these external constituents is important, but that many processes associated with the integration of third parties (suppliers) are still poorly defined (Petersen et al, 2005).

Another limiting factor is the form of collaboration between companies, which can be defined as a relational system in which two or more parties gather resources, in order to meet the goals that they could not answer individually. In relations between companies that adopt horizontal collaboration, and where the supplier adopts horizontal collaboration, he does not have the freedom to make decisions on bids, and only the manufacturer can decide to send order requests to another provider (Chan and Prakash, 2012).

Some studies suggest that the practice of establishing a connection with vendor-supplier (i.e., encouraging suppliers to communicate, coordinate and mutually adjust) has no effect on the efficiency of product development (Wagner, 2012). They also report negative effects of supplier integration and conclude that "assigning more responsibilities to suppliers in product development can have a negative effect on the organisation's ability to offer new products and features, and can lead to deterioration of innovativeness of products" (Wagner, 2012). More intensive involvement of suppliers in product development can have the opposite effect of what is intended, or may result in increased product and development costs, worsen the performance of the product and increased development time (Wagner and Hoegl, 2006).

3. The major research themes identified in the review

This section presents the main themes and results extracted from the literature review that was performed. The main research themes are identified and detailed.

The main schools that address the issue of supplier involvement in NPD are related to the field of organizational behaviour, the management area, particularly in industrial management, the marketing area and the area of technology management.

In very concise terms we can say that the main themes related to supplier involvement in NPD are the choice of the supplier, the quality of the partnership and the issue of integration. The criteria for choosing the supplier emerge as a concern that gives rise to various evaluation models. The quality of the partnership seems to be closely associated with two parameters: trust and mutual learning. The integration is seen as an aspect that contributes to the effectiveness of the partnership. Other topics addressed include the issues of supplier development and supplier contribution to the overall competitiveness of the partnership. Below, each of these themes will be referred to.

3.1 The choice of the supplier

The question of the choice of the supplier is a widely discussed issue (Ma and Yu, 2013) and the choice of the supplier seems to be linked mainly to the cost structure. Some authors (Kuei et al, 2011) suggest

that the company should demonstrate concern for their workforce throughout the global supply chain and with its immediate environment. Johnsen (2009) suggests that the involvement of the provider requires customers to qualify and evaluate the supplier's capabilities.

3.2 The supplier involvement by trust

The trust factor arises recurrently as paramount to obtain a commitment and involvement of the supplier (Walter, 2003; Humphreys et al, 2004; Lai and Yang, 2009), and acquiring and providing significant value through better management of supplier relationships (Lawson et al, 2009). Trust can contribute positively but also negatively to enhance the power of incidental learning through the modification of organizational attributes (Knoppen et al, 2010), in order to improve the fit with the trading partner. Fawcett et al (2012) argue that trust can be used to improve collaboration capabilities, proposing a maturity framework that provides the basis for the evaluation of projects and relationship risk.

Within the structure of the concept of trust Su et al (2008) identified organizational behaviour as a factor that can interfere with the proper development of the partnership between the parties. Jap (2001) suggests that competitive advantages can also be corroded over time by suspicions of opportunistic behaviour that arise in the course of the relationship.

3.3 Mutual learning

Cheung et al (2010) conceptualize in their results the learning relationship as a joint activity in which buyers and suppliers strive to create more value together than they would individually. The results achieved by Lin and Hsia (2011) show that the development of basic skills is an iterative, repeating cycle, and that these resources should be improved through continuous learning.

3.4 The relationship and integration with supplier

Srinivasan et al (2011) confirm that unified partnerships can lead to better coordination and information sharing between partners and can mitigate some of the risks and uncertainty of demand and lead the Supply Chain Purchasing (SCP) to superior results. Zhao et al (2011) provide some guidelines for managers to direct their actions to achieve a better external integration because, according to Shi and Liao (2012) the capitalization of resources requires the integration of business process and team work.

According to Walter (2003), managers act as promoters of the business relationship and have a positive influence on supplier involvement in NPD. Devaraj et al (2007) argue that the integration of the client by itself does not directly affect the operating performance and should be implemented along with the integration of vendor, so that its full potential can be realized. Other authors (Zhao and Shi, 2011) indicate that for the sake of comparison of the total profit, the supply chain integration overcomes outsourcing for most cases, especially when the number of suppliers is complementary. Based on previous studies, Flynn et al (2010) suggest that the best approach to Supply Chain Integration is to begin to develop internal capabilities integration and then to build capacity for external integration with customers and suppliers.

3.5 Technological resources and support partnerships

The use of technological resources is found to support the partnership of suppliers and purchasing department in new product development. This characteristic tends to be evidenced (Spralls et al, 2011) and it is important to develop the ability to effectively implement the technologies of e-business in supply chain. Companies should realise the benefits of new technologies for e-Business (Devaraj et al, 2007) and their potential for the integration of the supplier. Studies by Lai and Chen (2009) provide several implications for the management of e-business, so that the results can be used as an indicator of the e-business/success future effectiveness.

3.6 Performance and Partnership

Humphreys et al (2004) conclude that the development of suppliers can be positively associated with performance improvement between buyer and supplier. Fynes et al (2004) suggest that, building upon the relations of the supply chain, suppliers can improve the performance of the supply chain itself, and that effort should be considered as an investment that generates future revenue potential. Su et al (2008) show that the existing partnership influences the decision concerning the development of the commercial relationship, and that the quality of the relationship can be used to predict the behaviour of suppliers and manufacturers.

Srinivasan et al (2011) conclude that the ideal situation would be that partners in the supply chain evolve from a formal contractual relationship to a more relational form of governance, where trust in relational governance creates value and superior performance. Yusuf et al (2004) discussed the nature of a supply chain where some attributes and capabilities are explored, such as cost and quality. The prevailing conclusion is that the involvement of suppliers in the new product development can lead to numerous benefits (Schoenherr et al, 2012; Smals and Smits, 2012; Najafi Tavani et al, 2013), such as a reduction in costs and development times, improvements in quality and delivery of innovative technologies.

3.7. Supplier Development

Initiatives of Supplier Development are usually necessary in the management of relationships pertaining to important suppliers. It is defined as a long-term effort of cooperation on a company to improve the technical ability of its suppliers, to generate increases in quality and cost reductions, with a view to continuous improvement. The success of supplier development depends on both: the buyer and seller (Nagati and Rebolledo, 2013).

The literature generally supports the notion that supplier development plays a key role in driving performance improvement in purchasing, and strategically contributes to the overall effectiveness of the organization. Therefore, there is a growing interest in supplier development and in the relationship between supplier and company, which is mainly driven by the expectation of the purchaser to improve supplier performance and, thus, enhance competitive advantage (Li et al, 2012).

The nature of business relationships between vendor and company are often established at the beginning of a new product development process, a phase where critical decisions are made, not only with regard to the functionality of the product regarding the customer, but also related to the packaging, logistics channels, source materials, as well as the selection of process technology which will provide the end user the desired functionality (Petersen et al, 2005).

Thus, the importance of supplier development in support of a company's operational strategy helps to ensure that the performance and capabilities of suppliers meet the needs and requirements of a buying firm. The expectation of the purchaser to improve supplier performance also represents the direct involvement of a buyer on supplier development (Humphreys et al, 2004).

4. A synthesis of results

In the following Table 1, some of the main results regarding the influence of the supplier in the development of new products, as well as other factors that contribute to a better partnership between the company and the supplier, are considered. The table presents selected studies that, in our view, were the ones that fulfilled in a more complete manner, our criteria of relevance and quality regarding the approach to the issue that is addressed in the article. The table intends also to provide the reader with a very concise overview of how the main concerns and approaches are effectively embraced and treated by the researchers in the field.

Table1: Results concerning the influence of the supplier in the development of new products

Author (Year)	Characteristics and contributions of studies
Jap (2001)	The research represents an incremental step towards a better understanding of the complex phenomenon of creating joint competitive advantages in current industrial supply relations.
Walter (2003)	The study provides good support for the hypothesis that the supplier involvement in customer NPD is driven by the commitment and trust of a supplier.
Yusuf et al (2004)	This article discussed the nature of an agile supply chain and explored some of their attributes and abilities that include Internet-based collaboration, a significant amount of sales volume and profit for the virtual business, open leverage capabilities within the networks companies and production rather than outsourcing, and marketing alliances.
Petersen et al (2005)	The results provide additional support, based on previous literature, concerning the value of supplier involvement in new product development process. The study provides strong support for the belief that the entry of a carefully selected supplier facilitates better decision making by the project development team.
Wagner and Hoegl (2006)	High quality collaboration between buyers and suppliers in NPD can only be achieved if the supplier is open and prepared to face the pre-established challenges.
Devaraj et al (2007)	The ability to e-Business is not directly linked to operational performance; However, integration is mediated by production information, which is related to the operating performance.
Su et al (2008)	In the field of relationship management of the chain in terms of theory development and managerial implications, the implication for suppliers is that they need to be early and quickly involved in the design of the product / process and quality planning.
Johnsen (2009)	Supplier involvement requires customers to qualify and evaluate the supplier's capabilities. The relationship with suppliers requires attention so that benefits of supplier involvement materialize: trust takes a long time to develop, but it takes only an instant of opportunistic behaviour to destroy it.
Feng et al (2010)	The study contributes to understand external engagement and integration, besides testing the impact of the involvement of the customer, as well as the impact of the engagement of the supplier at the same time.
Flynn et al (2010)	Internal integration is the basis for integration of customer and supplier. This suggests that the best approach for SCI is to begin to develop internal capabilities integration and then to build capacity for external integration with customers and suppliers.
Wu and Barnes (2011)	Existing research models proposed decision-making concerning the final stage of supplier selection, but very few works have considered the steps that precede or follow this phase. The success of any supply chain (...) is strongly dependent on its construction and selection of partners becomes a crucial issue.
Das (2011)	The introduction of a procedure for supplier membership based on QMS, to ensure quality input for the production and the development of a process to ensure the quality of the final product at the point of shipment.
Lin and Hsia (2011)	The development of basic skills is an iterative, repeating cycle, and these resources should be improved through continuous learning. Companies need to develop a strategic long-term focus by applying all their skills.
Fawcett et al (2012)	The study of trust and collaborative supply chain innovation was subdivided in two ways: the elaboration of the nature of trust, demonstrating when and how trust can be harnessed as a weapon, and the collaborative maturity framework that provides the basis for project evaluation and relationship risk.

Smals and Smits (2012)	Innovation oriented relations are more than a collection of serial transactions, requiring the commitment of both parties and matching of strategies. Value creation to the benefit of supplier is, in part, within the sphere of influence of the purchaser, with an option to share knowledge and skills with suppliers.
Yu and Ma S. (2013)	The effect of sequences of decision on investment, price and profits of the integrated supply chain, of the manufacturer and supplier of quality products, helps to find the dominant strategy from the point of view of each company.
He et al (2014)	The results suggest that integration of suppliers and client integration must be emphasized simultaneously in the development of new products. Managers can also adopt practices of supplier integration in the first place because these practices will enhance the integration of the customer in order to improve the performance of the new product.

Table 2 summarizes the main proposals for lines of future research identified in this study. The table is structured according to four main groups or focus of research: the topic concerning the factors affecting collaboration and partnership, the issue of the nature and quality of the relationship, topics specific of the involvement in new product development and the research on supply chain as a whole, of which involvement on NPD is a part.

Table 2: Proposals for future research concerning supplier involvement in new product development

Topic	Authors	Research Proposal
Collaboration and partnership	LaBahn, Douglas W., Krapfel, Robert.(2000); Walter, A. (2003); Yusuf, Y. ., Gunasekaran, a, Adeleye, E. ., & Sivayoganathan, K. (2004); Wagner, S. M., & Hoegl, M. (2006); Devaraj, S., Krajewski, L., & Wei, J. (2007); Cheung, M.-S., Myers, M. B., & Mentzer, J. T.(2010); Srinivasan, M., Mukherjee, D., & Gaur, A. S. (2011).	Clarification of the factors affecting collaboration and partnership in order to obtain better results for the parties involved. Issues relating to dependence on suppliers, to what extent is beneficial (for the supplier) supplier involvement, and what specific factors may influence these partnerships.
Supplier relationship	Walter, A. (2003); Petersen, K. J., Handfield, R. B., & Ragatz, G. L.(2005); Su, Q., Song, Y., Li, Z., & Dang, J.(2008); Johnsen, Thomas E.(2009); Zhao, X., Huo, B., Selen, W., & Yeung, J. H. Y.(2011); Smals, R. G. M., & Smits, A. a. J.(2012); Schoenherr, T., Modi, S. B., Benton, W. C., Carter, C. R., Choi, T. Y., Larson, P. D., ... Wagner, S. M.(2012); Shi, X., & Liao, Z.(2012).	Research on the value of dynamic relationships, other features of the relationship, such as relational capital and inter organizational trust, evaluation of different cultures and characteristics of suppliers, the pursuit of constant improvement concerning the processes of relationship with suppliers.

Influence of the supplier in NPD	Wagner, S. M., & Hoegl, M. (2006); Cheung, M.-S., Myers, M. B., & Mentzer, J. T.(2010); He, Y., Keung Lai, K., Sun, H., & Chen, Y. (2014).	Clarification of questions such as "How do we get a good cooperation in NPD projects from suppliers?". Focused on the supplier involvement in the product development process, on the factors affecting this specific form of supplier involvement, and on the comparison of the effects of supplier and/or client integration in different stages of development of new products.
Supply chain	Devaraj, S., Krajewski, L., & Wei, J.(2007); Su, Q., Song, Y., Li, Z., & Dang, J.(2008); Cheung, M.-S., Myers, M. B., & Mentzer, J. T.(2010); Srinivasan, M., Mukherjee, D., & Gaur, A. S.(2011); Zhao, X., & Shi, C. (2011); Shi, X., & Liao, Z.(2012); Yu, J., & Ma, S.(2013); Cao, M., Vonderembse, M. A., & Zhang, Q.(2014); He, Y., Keung Lai, K., Sun, H., & Chen, Y.(2014).	Future research should address the question of how deep and necessary is the integration of the supplier. It is valuable for future research to be conducted from the perspective of the supplier, and compare the influence of different perspectives on cooperative strategy. Further research in an important subset of the possible variables in the light of increased competition in the supply chain. Investigate the effect of other types of supply chain risks on the quality of the partnership and SCP.

5. Conclusion

It became evident from the research done the importance of partnerships between suppliers and the company, in several areas where the parties involved can be compensated for achieving results (Smals and Smits, 2012), among which it is included the development of new products. The respective results are composed of tangible and intangible factors, emphasising trust, performance, involvement, partnership, relationship management, resource utilization, innovation of business and technology, management and strategy to suppliers (Shi and Liao, 2012; Walter, 2003; Humphreys et al, 2004; Wagner and Hoegl, 2006; Hsia and Lin 2011).

Regarding the advantage of supplier involvement in new product development, it can be seen from the studies that the level of involvement of a chosen supplier is an important strategic decision, because it requires a significant investment of resources, and monitoring and attendance opportunity costs, and may foreshadow the future of the business relationship (LaBahn and Krapfel, 2000).

The study is more an exercise on synthesis than on critique, so that it can serve as a source of research clarification and questioning involving the important issue of the influence of the supplier on new product development, and its determinants.

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