

DEMAND-SUPPLY INTERFACE: A SYSTEMATIC REVIEW OF LITERATURE

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ABSTRACT

Increasingly researchers are advocating the need of integration between the demand and supply value chains. The motive behind it is the creation of supply chains capable of delivering superior value propositions to each type of customer served by the company. While the concept of demand-supply integration is relatively new, many researchers have studied the interface between internal departments or functions and explored how they can align their efforts. We therefore conducted a systemic literature review of the papers that studied the interface between at least one demand-oriented and one supply-oriented function. The focus was to understand how the knowledge of inter-functional interaction management could be used to understand the main managerial challenges in the integration of supply and demand value chains. The analysis of 76 papers showed that interdepartmental integration has two main dimensions: cooperation and collaboration. We also identified the factors that drive functions to work together, how this can be achieved and the conditions that make its implementation smoother. These findings were then used to expand the idea of demand-supply integration and grounded reflections on the concept from both a marketing and an operations management perspective. This research could interest researchers and practitioners willing to adopt such strategy.

Keywords: Demand Supply Chains, Interfaces, Systematic bibliographic review, Marketing & Operations Perspectives

Track: Supply Chain Management and Purchasing

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INTRODUCTION

Today more than ever “sensing the market”, the capability of interpreting, identifying and acting innovative opportunities in markets before than others, becomes crucial for firms (Mason, 2012). As emphasised by those positions that consider markets not just as static and pre-defined realms, but dynamically and actively shaped by firms (Araujo, 2007; Geiger, Kjellberg and Spencer, 2012), the “market sensing” competence is not only about abstract/learning abilities; rather it is intertwined with enactment and organisational skills (Foley and Fahy, 2004). In line with the understanding that “market sensing” is a “performed interpretation” of markets, recent studies converge recognising that, to face global and complex competition and deliver superior value to customers, organisational integration between the demand and supply chain is particularly relevant (Rainbird, 2004; Jüttner et al., 2007; Piercy, 2009; Esper et al., 2010). The concept of demand-chain management (DCM) has then been proposed and can be seen as “a new business model aimed at creating value in today’s marketplace, and combining the strengths of marketing and supply chain competencies” (Jüttner et al., 2007, p. 377).

Many advantages of the demand-chain management and of the integration in the demand-supply chain have been pointed out. On a knowledge management perspective (Esper et al., 2010), for instance, integrating demand focused (effectiveness) and supply focused (efficiency) processes generate higher inter-functional interaction, higher levels of collaboration and market knowledge sharing sustaining superior value creation (Esper et al., 2010; Pagano, 2009). On a supply chain view, even if conflicts between demand- and supply-oriented functions exist, they are not necessarily dysfunctional; on the contrary, they can be a source of dynamism for the firm (Rainbird, 2004). Moreover, from a market network perspective, the demand-supply integration goes beyond the internal boundaries of the firm and should involve those outside-in and inside-out activities that are crucial to shape customer value.

Despite the interest in the relatively new concept of DCM and the emphasis on the benefits of its adoption, little attention has been devoted so far to the managerial challenges of implementing the supply-demand chain integration. The existing literature that has investigated the interfaces occurring between the two value chains focuses mainly on dyadic relationships, but does not deal with the issues associated with the integration of all the areas responsible for supply and demand functions. For instance, driven by the seminal paper of Shapiro (1977), many researchers in the operations management field have explored the aspects that characterize the marketing-manufacturing interfaces. Parente (1998) offers a review of this branch of the literature. Similarly, in the marketing field, many papers followed Ruekert and Walker (1987) and explored how marketing interacts with other functions, like R&D, logistics, engineering and quality management.

However, the implementation of a DCM would imply a broader look at the whole value chain and at the management of many and diverse kinds of interfaces - such as those of different processes, teams and chain structural configurations (Jüttner et al., 2007). As such, further

understanding on the critical aspects of the supply-demand interface management is still needed. Against this background, our attempt is to clarify the meaning of “managing the demand chain”. It is worth noting that, although aware of the important and growing relevance of integration issues, our main focus is not on the management of the “organisational integration”; rather it is on the management of different “touch points” between the demand and supply chain. Organizational integration is seen as a relevant issue in this context. Thus, our aim can be summed up in the following main research question:

RQ: What are the main managerial challenges in managing the demand-supply chain interfaces?

In order to provide an answer to this question we decided to refer to existing knowledge on the concept of “interface” resultant from studies that focus on dyadic relationships between areas responsible for demand and supply activities. We therefore carried out a systematic literature review of the papers that study different levels of the demand-supply chain encounters and map the different issues emerging from the interfacing of the two chains. The systematic literature review method, originated in medical science and widely applied in management studies (Cook et al. 1997; Tranfield et al. 2003), helped us obtain a detailed view of the specific demand-supply interfaces so far analysed in marketing and operations literature and, consequently, assemble from these studies the main evidences linked to the critical issues associated with managing these demand-supply chain interfaces.

Embracing in our examination any kind of supply-demand interaction explored in literature, by “interface” we meant the point of encounter between dispersed organizations, work teams, activities and subjects. The papers selected in a structured, transparent, and reproducible manner were reviewed applying an analysis grid to explore the main cases and concepts associated with the notion of “interfaces” and the focal suggestions to deal with their management. Based on the findings, a framework to explain the management of inter-functional interfaces was proposed and used to analyse the idea of integration between the supply and demand functions. Combined, our findings and insights suggest the challenges and opportunities associated with a wider internal and external integration. The remainder of this paper is organized as follows. In the next section, the method used to select, sort and analyse the papers is presented. Next, we show the findings and discussion themes based on the available literature on the supply-demand interface. In the final section conclusions and suggestions for future research are proposed.

RESEARCH METHOD

Our research for relevant papers was guided by the willingness of focussing on the management of the demand-supply touch-points as a crucial issue to sustain demand-supply integration. In this way, we looked for paper that explored the interface between areas in charge of at least one supply and one demand function. We did not consider the vast supply chain integration literature, which focuses mainly on how firms can integrate either with suppliers or with customers or with both (Frohlich and Westbrook, 2001). This literature reveals a lot about integration issues, but does not address specifically the demand/supply interfaces internal to the company. Our search for papers specifically dealing with the “interface” problematic areas was conducted in four well-established databases: EBSCO, PROQUEST, Emerald and Science Direct. Because the general

terms “demand” and “supply” provided very high return of papers and low relevance, after few preliminary researches in the databases, we assumed that the “Marketing” and “Sales” functions would represent the demand side, while the operations management functions represented the supply side. The first search term used was “interface and marketing and operations”. Then, we carried similar searches with the words “sales” instead of “marketing” and “purchasing”, “manufacturing”, “production”, “logistics” or “supply chain” instead of “operations”. These search terms cover the main functions responsible for the demand and supply sides. The search was limited to the title and abstract of the papers. Only full-text papers in English that had been published in peer reviewed management journals with impact factor were selected. No time frame restrictions were set to obtain a historic view of the field.

In the second stage of the papers selection procedure, the abstracts of these papers were carefully examined to identify the articles that were about the interfaces between supply and demand oriented functions. When it was not possible to assess if the paper fitted the scope of the study just based on the abstract, the introduction and the literature review were also analysed. In the following stage, the references of the papers were scanned to identify other relevant references; this snowball procedure was repeated until no more relevant papers were found. At the end of this stage, we counted with 122 papers.

In the sequence, the authors, guided by the research question identified above, jointly defined a set of criteria constituting a classification grid for the review. To assure the consistency of the papers’ classification process, the two authors used a first version of the grid to classify the same ten papers. We then compared and discussed the results of the analysis and made some improvements to obtain a final version of the grid (Tables 1 and 2). Some general characteristics of the papers were registered (Table 1) such as the year of publication, the type of journal (marketing, operations or management focused), the main object of the study, the theory of reference (if any), the methodology (quantitative, qualitative, or conceptual), the industry and country of the empirical analysis (if any).

Table 1 - Analysis grid: example of the general information collected for each paper

Name	Year	Type of journal	Object of study	Methodology	Theory of reference	Industry	Country
Shapiro_1977	1977	Managerial	Reasons and possible solutions to Marketing-manufacturing conflict	Conceptual	Na	Na	Na

More detailed information on the content of the papers was collected (Table 2) in particular with reference to the study of the interfaces: we listed the specific type of interface analysed and the level of analysis adopted (process, project, inter-personal, cross-functional, inter-firm), we looked for the meanings associated to the concept of “interface” in the papers, we reported the measures adopted and the motivations, limiting and enabling factors, moderators and effects of the interface management.

Table 2 - Analysis grid: example of the information collected on the interfaces theme for each paper

Type of interface	Level of analysis	Interface (Interface-related) concept	Measures	Motivations	Limiting factors	Enabling factors	Moderators	Effects
Marketing - Manufacturing	Inter functional	Cooperation (each function fills its role without hamper other functions' activities)			Evaluation and reward, Inherent complexity, Orientation and experience, Cultural differences, Many functions involved External turbulences, Technological change, Automatisation, Capital constraints, Company size	Managerial initiatives to connect functions to corporate strategy Use hybrid measures Facilitate people encounter		Company prosperity

From there, the 112 remaining papers were divided in two sets and each researcher classified 56 papers. During the classification process, we further eliminated 46 papers. This occurred either because the paper was not specifically about any supply-demand interface or because it did not specifically cover how the two areas interrelated. The final classification grid contained data on 76 papers (Appendix A), which covered some aspect of at least one supply-demand interface. We then proceeded to the data analysis.

Four analyses were conducted. The first one aimed at getting an overview of the literature to understand the main features of the papers published. Graphs and tables were created to identify the amount of papers published on the subject per time period, to discover the different methodological perspectives adopted to study the demand-supply interfaces, to uncover the main supply-demand interfaces studied and to explore in which type of settings research on interfaces has been conducted (e.g. country, industry). The second analysis focused on identifying the different dimensions of the “interface” concept. In the sequence, we explored the factors that enabled or hindered the interactions between the areas working together at the interface and the contextual factors, e.g. cultural or environmental issues that influenced the interaction between the parties. The final analysis consisted in evaluating the possible performance outcomes of the interactive efforts at the interfaces and the factors that moderated these relationships. In all the analyses, we compared results across the different interfaces mapped to understand how, if at all, our findings changed depending on the interface being analysed.

A FIRST LOOK AT THE LITERATURE

The historical distribution of articles in the last forty years shows an increasing interest on “interfaces” in Operations, Marketing and Management literature, especially in the last decade (Fig. 1). This growth in number of publications is also due to the fact that two special issues have been devoted to the theme in the last years (*Journal of Operations Management*, n. 20, 2002; *Industrial Marketing Management*, n. 38, 2009).

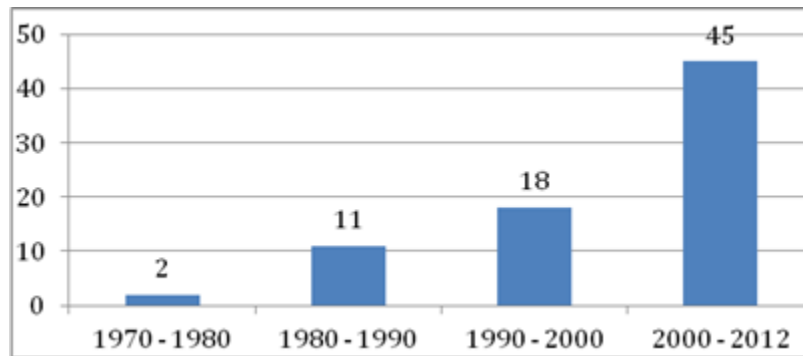


Figure 1 - Distribution of articles by decades.

Although the attention on “interfaces” is equally distributed since the beginning across Marketing, Operations and Management journals, each stream of literature has privileged the exploration of different specific interfaces: in the managerial studies the “Marketing-Manufacturing” interface is mainly focused (Shapiro, 1977; Eliashberg and Steinberg, 1987; Chan et al., 1992; De Ruyter and Wetzels, 2000; Balasubramanian and Bhardwaj, 2004); studies published in operations journals similarly concern the “Marketing-Manufacturing” interface but also examine the “Marketing-Logistics” (Lynagh and Poist, 1984; Langley and Holcomb, 1992; Murphy and Poist, 1996; Mollenkopf et al., 2000; Ellinger, 2000; Gimenez and Ventura, 2005) and the more general “Marketing-Operations” interface (Sawhney and Piper, 2002; Boyer and Hult, 2005); in marketing journals the supply-demand interfaces most debated are “Marketing-R&D” (Dunn and Harnden, 1975; Souder, 1981; Gupta et al., 1985; Gupta et al., 1986; Song and Thieme, 2006), “Marketing-Supply Chain” (Jüttner et al., 2007) and “Marketing –Purchasing” (Sheth et al., 2009; Ivens et al., 2009; Bals et al., 2009; Guercini and Runfola, 2011; Smirnova et al., 2011). Despite these differences a common trend is a department-level analysis, internal to a single company, and an examination of a dyadic interface constituted by two departments, one marketing- based and one operations-based. Only seven articles over 76 analysed adopt a triadic perspective and only six articles also involve players external to the focal company (Fig. 2).

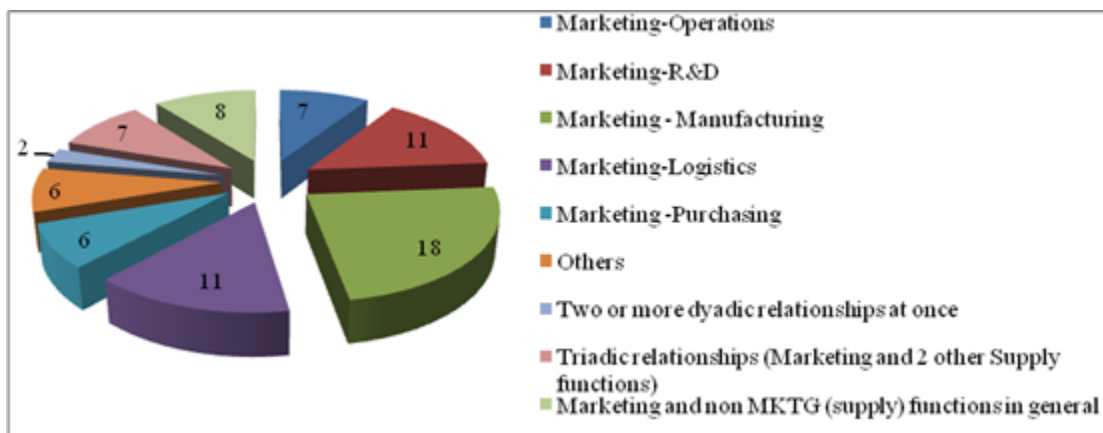


Figure 2 - Distribution of articles by type of interface focused.

Regarding the object of the study, though the main focus in the articles is on interface, the latter is differently associated to other relevant subjects. A recurrent theme relates to the organizational policies required to support integration and solve conflicts. Souder (1981), for instance, provide a set of possible managerial solutions to reduce R&D/Marketing disharmony; Calantone et al., (2002), investigating on the marketing-manufacturing interface, revealed that marketing knowledge of manufacturing and its credible communication will result in better relationships and functional relationships; in the same vein Song et al., (2010) examine the effect of senior management policies on the effectiveness of the marketing–manufacturing interface.

Other papers link the discourse on interface to a strategic necessity for integration required to face present competitive contexts and increase firm performance (Hausman et al., 2002; Sheth et al., 2009; Piercy, 2009). In many studies, integration is invoked in the context of its beneficial effects to specific areas, especially for the success of New Product Development (NPD) projects (Dunn and Harnden, 1975; Son et al., 2010; Zhang et al., 2011; Brettel et al., 2011) but also to improve distribution processes, Supply Chain Management (SCM) (Min and Mentzer, 2000; Gimenez, 2006), and increase customer value (Jüttner et al., 2007; Mollenkopf et al., 2011). These differences do not result into a multiplicity of interface concepts, on the contrary all the studies refer to the same general problem, which is simply viewed from different angles and contextualised in many situations. An additional feature associated to the set of articles is the prevalence of empirical and quantitative studies (Figure 3) along with the lack of a clear reference to a sound theoretical framework in almost half of the contributions considered in this review.

Moreover, as further discussed later, most of the works, which refer to a theoretical framework draw on the Contingency Theory (e.g. Lawrence and Lorsch, 1967; Thompson, 1967) or on its subsequent developments, such as the Configuration Theory (Mintzberg, 1979) and the Resource Dependency Theory (Pfeffer and Salancik, 1978). Other theories are only occasionally used, as in the case of the Cumulative Capability Theory (Ferdows and De Meyer, 1990), the Resource Based View (Penrose, 1959) or Slater's (1997) Customer Value-Based theory. Lastly, most of the empirical studies have been conducted in US and European countries (Fig. 4) with little attention to the emergent economies, which are still enormously involved in complex and global supply chains.

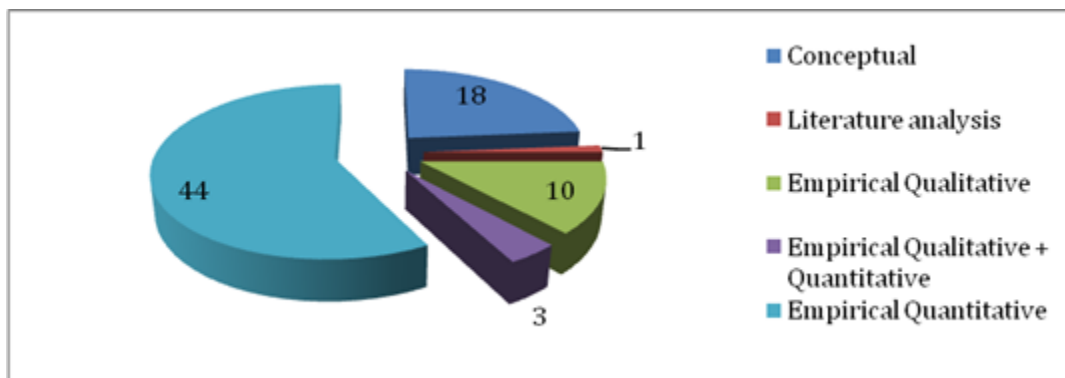


Figure 3 - Distribution of articles by type of research.

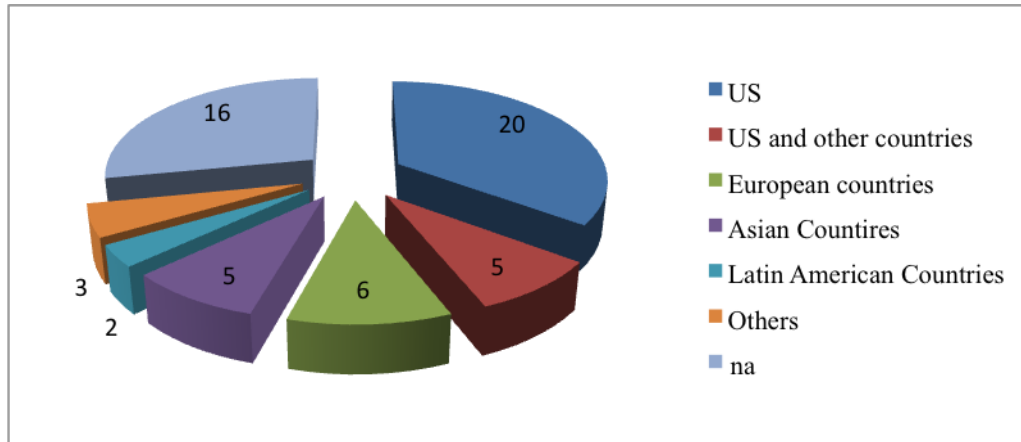


Figure 4 - Distribution of articles by countries.

REASONS AND CONCEPTS

The *raison d'être* for approaching the study of a supply-demand interface is taken for granted in most of the researches reviewed as it arises from the natural colliding objectives driving the two chains. Consistently with the theories evoked, the additional concern is related to the changes occurring in the environment external to the company, which requires a corresponding change and adaptation inside the organization (Piercy, 2009; Sheth et al., 2009). The imperatives for organizations of being increasingly innovative, traceable, adaptive and faster are anchored in dramatic market changes. The technology and reverse marketing have led to shorter than ever life-cycles, while the uncertainty is extremely higher due to the global dimension of competition, sourcing and demand (Park et al., 2011). Against this scenario, a supply-demand integration is invoked as a solution, not only involving manufacturing activities (where it is helped by automation) but also intangible productive processes integrated in response to the prevailing “solution oriented” and “built to order” views.

Given this background, what does exactly mean managing the supply-demand interface toward a more integrated modality? What are the salient aspects for managing the supply-demand interface considering the integrating priority? Aiming to answer this question we have mapped the different concepts provided in the literature in relation to the concept of S-D interface and the need for its integration. Different terms and concepts are used in literature to signify and objectify what an “integrated interface” is. Going through these definitions we identified five main constituent concepts: Interaction, Exchange, Coordination, Bi-directional relationship and Cooperation.

A first necessary condition to the existence of an integrated interface is the presence of interaction between the parts. With the term “interaction” we refer here to the opportunities of simple encounter between the two sides. Maltz and Kohli (2000), for instance, refer to physical proximity as one of the possible integrating mechanisms to reduce manifest conflict behaviour between functions, underlying that also the likeability of entering in contact with the counterpart is a prerequisite for integration. Similarly, Menon et al. (1997) indicate connectedness (i.e. “the extent of interaction between individuals”, p. 188) as positively affecting interdepartmental

interactions. In the same vein Bals et al. (2009) include in the concept of interaction many examples of contact and conversations (e.g. committees, e-mails, meetings, phone conversations). All these practices are not considered for the quality or the content of the communication established but just as clues signalling “moments of touch”. To this aspect also refer those measures of the integration such as the frequency of communications (Brettel et al. 2011; Hutt, 1995) or the absence of noise/obstacles in it the information transference (DeRuyter and Wetzel, 2000). In a sentence, according to the literature, the more likely, frequent and numerous the contacts, the higher the possibility of integrating the S-D interface.

Establishing a contact, however, only represents a first step toward the integration; a second dimension that we found among the different meanings attributed to the concept of an “integrated interface” is the exchange which can deal with the interchange of resources (Park et al., 2011; Ruekert and Walker, 1987; Hutt, 1995) and/or information (Park et al. 2011; Hutt, 1995; Ellinger et al., 2000; Guercini and Runfola, 2011; Brettel et al., 2011). Another aspect that associates diverse definitions of integration is the coordination, which responds to the exigency of reducing dependences or differences especially between the diverse processes involving the interface (Gupta et al., 1986; Gattiker, 2007; Cooper and Budd, 2007).

Two other concepts emerged from the analysis of the interpretations given to an integrated interface: a mutual attitude and the collaboration. We found the importance of a bi-directional relationship to increase the integration of the interface in many studies. According to Fischer et al. (1997) the reciprocity of communication for mutual adjustments increases the interfunctional integration between marketing and engineering functions; analogously interdepartmental integration is sustained by mutual understanding, share, visions and goals (Kahn; 1996). Finally, collaboration emerges as another possible characteristic of an integrated interface. Using the term “collaboration” scholars generally mean putting together at the same place and time efforts and actions to realise an activity. A case in point often cited in the studies analysed is the team work (Ellinger et al., 2000; Maltz and Kohli, 2000; Shaw et al., 2003).

The five dimensions depicted are reported (Table 1) following a sequence: in the first situation, the interface is coincident with the mere encounter between the parts; in the second case, there is an exchange of information or resources; in the third concept, due to interdependences and differences, the two entities line up; in the fourth case, a bi-directional engagement is established. In the final situation, the parts build together their opinions, share decisions, elaborate projects, and work together in a reciprocal respect and positive attitude. The five concepts seem to refer to two more general dimensions one of coordination and another of cooperation. In the first three cases, which are more closely associated with the idea of coordination, each of the entities interfacing has a highly independent identity and even maintaining contacts with the others keeps its own separate objectives: the efforts made to meet, exchange and line up are merely functional to the achievement of particular aims. In the last two concepts, on the other hand, we identified the notion of “mutuality” and the idea of a common space, which encloses common information, representations, tools, objectives and actions. They represent the idea of cooperation. These two dimensions combined represent the broader idea of integration. Looking through the papers, it emerges that the importance of the coordination dimension is more highlighted in operations papers, while the cooperation dimension is more explored in the marketing papers.

COORDINATION			COOPERATION	
Interaction	Exchange	Coordination	Bi-directional relationship	Collaboration
<p><i>Communication practices</i> (e.g. frequency, formal/informal, difficulties encountered)</p> <p><i>Structural elements</i> (e.g. physical proximity/connectedness)</p> <p><i>Physical encounters</i> (e.g. frequency of meetings)</p>	<p><i>Exchange of information</i></p> <p><i>Exchange of resources</i> (e.g. frequency of the exchange, amount of resources exchanged, quality of resources exchanged)</p>	<p>Line up due to:</p> <p><i>Interdependencies</i> (<u>linearity</u> of processes, physical movements, information flows, decision making flows and <u>simultaneity</u> of projects /interests)</p> <p><i>Differences</i> (in processes and practices/representations/ aims)</p>	<p><i>Direction/reciprocity:</i></p> <p>Bidirectional communication</p> <p>Consultation</p> <p>Discussing and inform the other</p> <p>Mutual adjustment</p> <p>Mutual commitment (need to give to the other information or explanations)</p> <p>Perception of the other party sophistication and capabilities</p> <p>Coerciveness of influence attempts</p> <p>Both parties perceive high level of satisfaction</p> <p><i>Relationship quality:</i> assesses the strength of the relationship</p>	<p><i>Sharing/joint – together and at the same time</i></p> <p><i>Resources</i> (information and other material - e.g. technological platform , people - and psychological - e.g. effort - resources)</p> <p><i>Representations and values of the present</i> (mutual understanding/technical knowledge/degree of consensus on decision problems, culture)</p> <p><i>Representations of the future</i> (Goals/vision/program)</p> <p><i>Ownership of Decisions</i></p> <p><i>Tasks /actions/implementations</i></p> <p>Responsibility for outputs</p> <p><i>Attitudes</i></p> <p>Respect - Trust – Appreciation - Stress on Informal aspects</p> <p><i>Behaviours</i></p> <p>Conflicts</p>

Table 3 - The five concepts related to interface

A CONCEPTUAL MODEL TO UNDERSTAND INTEGRATION

Integration effort, concretised in the five aspects and two dimensions summarised above, was a recurrent topic in the papers analysed and represented the main challenge pinpointed by authors in any kind of supply-demand interface investigated. Independently of the type of interface and of the reason for its existence, the work teams operating at the interface need to integrate their efforts to achieve the desired outcomes (Lawrence and Lorsch, 1967), i.e. they need to coordinate their activities and cooperate.

An important result of our analysis, indeed, is that the need for coordination and cooperation (i.e. integration) were equally evoked across the many diverse types of interfaces analysed. Authors have explored the drivers and modes of integration as well as the factors that enable integration (i.e. cooperation and coordination) between work teams and the relationship between integration and performance. Based on these ideas, we propose a model to represent the integration between functional areas that have an interface (Figure 5). Considering that our analysis did not reveal any significant differences when we looked at how concepts and ideas varied across the different interfaces analysed, we believe that this model applies to understand any of the supply-demand interface of interest.

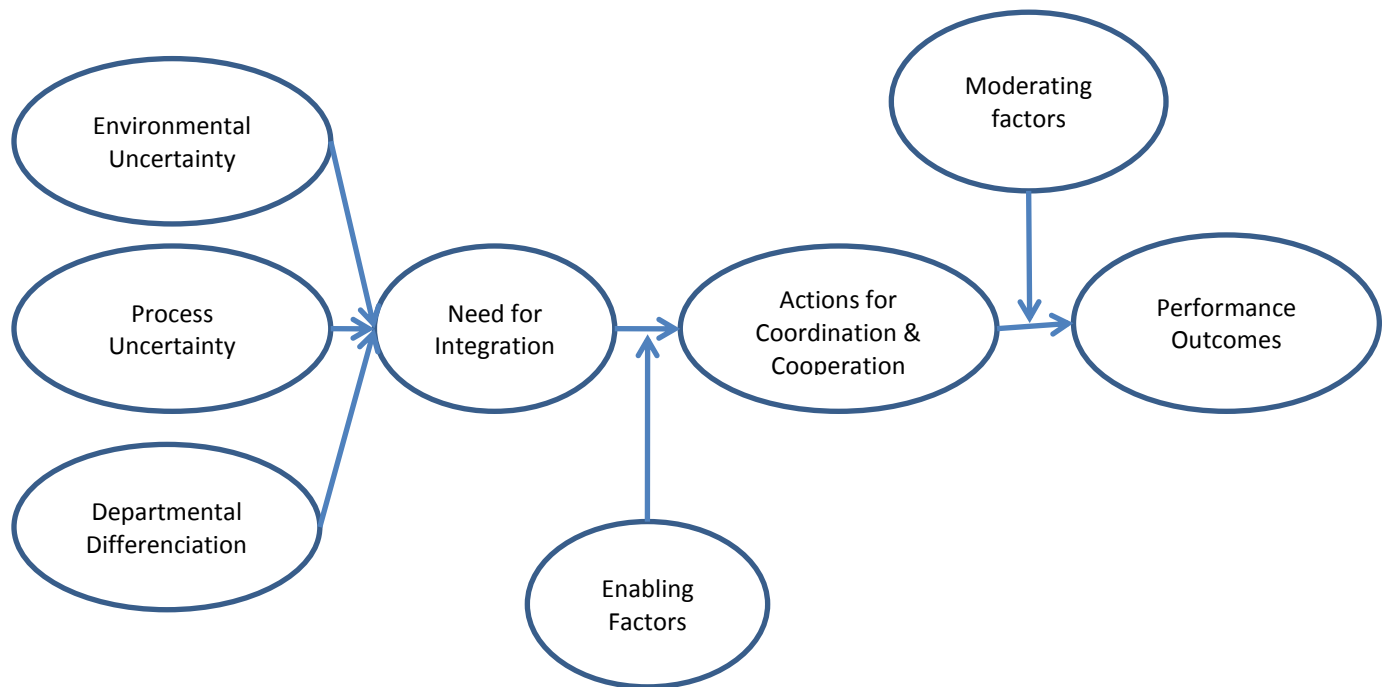


Figure 5 – A conceptual model of integration at interfaces

The model proposes that process uncertainty, environmental uncertainty and differences between functions are at the base of a need to “line up” and manage somehow the supply-demand interface. If processes are difficult to manage and work teams depend on each other to control the workflow, supply-demand interfaces need to be managed more closely. Additionally, a

Careful interface management is needed when functions have different orientations, cultural backgrounds, and working structures and when markets have uncertain demand patterns and are dynamic. Combined these three factors create the need for integration and, therefore, for the implementation of coordination and cooperation actions. Different internal characteristics of companies and efforts they make enable a smoother implementation of these actions. Finally, actions to increase inter-functional cooperation and coordination can lead to positive outcomes for the areas and the companies, but there are some contextual factors that moderate these relationships. Next, each of these relationships is explored in more details.

The need for integration

In reviewing the papers, it was possible to classify the enablers of and the limitations to integration in three classes: process uncertainty, environmental uncertainty and inter-functional differences. A closer look at these factors indicated that they are the issues that lead people at interfaces to work together. The first two categories refer to issues that render processes more difficult to manage and, therefore, people cannot easily control them without coordination. The last one refers to intrinsic differences between functional areas, which make the cooperation between them difficult. Many authors used contingency theory (e.g. Lawrence and Lorsch, 1967; Thompson, 1967) as the main theoretical background, and this is probably the reason for the identification of these three categories.

Certain process characteristics create the need to integrate areas across interfaces. Based in many instances on the work of Thompson (1967), some authors have proposed that the interdependency between functions, i.e. the extent to which one work team depends on the other to execute its tasks (Thompson, 1967), is a key driver of coordination between the parties (Menon et al., 1997; Oliva and Watson, 2011; Ruekert and Walker, 1987). The need for coordination also increases when the activities they execute requires the exchange of knowledge, are more variable and uncertain and have outcomes difficult to predict (Griffin and Hauser, 1996; Ruekert and Walker, 1987). Authors also mentioned that environmental uncertainty, resultant of constant changes in customers' demands and demand fluctuation, of demand uncertainty and capacity constraints, and of market turbulence also increases the need for the functions to work together (Cooper and Budd, 2007; Gupta et al., 1986; Cantalone et al., 2002, Mollenkopf et al., 2011; O'Leary and Flores, 2002). This happens because changes in the demand patterns, the need for constant innovation and the lack of resources to meet these market demands require firms' employees to face challenges together.

The other category is based on the work of Lawrence and Lorsch (1967). It refers mainly to the differences between departments, which hinder their interaction and collaboration. Authors mention many differences between functions like work orientations (structured like in manufacturing or flexible like in new product development), cultures, priorities, languages, goals, norms, reward systems, thoughts of the world and structures (Fischer and Maltz, 1997; Gimenez and Ventura, 2005; Griffin and Hauser, 1996; Hutt, 1995; Jüttner et al., 2007; Shapiro, 1997). This caused people in the different areas to think in different ways and value some things over others. This leads different work teams to isolate themselves, think in terms of "them versus us", and try to maintain their functional power. The communication between them can also be difficult, as they use different terms, IT systems, and types of information (Ellinger and Keller,

2006). Combined process uncertainty, environmental uncertainty and inter-functional differences create the need to integrate the people working at the interfaces and the processes they are in charge of.

Actions to Stimulate Integration

The analysis also pointed that there are many mechanisms to stimulate a close integration between the areas. Their aim is to solve the problems caused by process uncertainty, environmental uncertainty and inter-functional differences. Some mechanisms are better suited to coordinate the execution of processes. Others are better to make people in different functions collaborate and work together. Again, the comparison of these actions across the interfaces suggests that they can be used to manage any interface.

The actions to stimulate process coordination involve the use of meetings, cross-functional teams, committees and other communication methods, e.g. documents, systems, emails, phone calls (Balls et al., 2009; Brettel et al., 2011; Ellinger, 2000; Ellinger et al., 2000; Gimenez, 2006; Gimenez and Ventura, 2005; Gutpa and Wilemon, 1988; Hutt, 2005; Hahn, 1996). They increase the exchange of information and knowledge between the parties. In this way, both sides can share their needs and explain what they from the other. There is also the opportunity for mutual adjustment, if any point is not clear, and development of an understanding of the limitations of the other function (Fischer and Maltz, 1997). In addition, the areas can solve problems and conflicts together and, in this way, reach better solutions than it would be possible if they were working alone (Ruekert and Walker, 1987). These actions are taken to guarantee that processes will run as smoothly as possible.

Actions for cooperation, on the other hand, are taken to stimulate the creation of a unified identity between the people in different work teams. The creation of joint goals and reward systems was widely cited in the papers (Brettel et al., 2011; Hutt, 1995). Authors also suggested the use of socialization programmes and informal encounters in order to stimulate respect, empathy, trust and commitment between the employees (DeRuyter and Wetzels, 2000; Soulder, 1981; Shaw et al., 2003). The idea is to make individuals become friends and aware that they should work together. In this way, they can also develop a sense of mutual achievement and take mutual responsibility for failure.

Enabling Factors

Our analysis also revealed some factors that enable a smoother implementation of actions for coordination and cooperation. They relate to the situation and characteristics of the firms. For example, areas that have a commitment and cooperative philosophy tend to implement coordination and cooperation actions more easily (Murphy and Poist, 1994). Since the implementation of these action demands parties to dedicate time and other resources to the interaction and to coordination of activities, both sides must be committed to the implementation of the practices and believe in the benefits that will result from it. Managerial support is also an important enabler (Murphy and Poist, 1994; Mollenkopf et al., 2011; Song et al., 1997; Song et al., 2011). The support and encouragement from the higher administrative levels is import, because they can guarantee that resources will be allocated to the integration strategies. Authors

suggested that top management can stimulate partnering strategies between work teams and should participate in and supervise the implementation of integration strategies. The implementation of these actions is also easier when teams are co-located, since it is easier for them to hold meetings and informal conversations, to socialize and to develop an identity with each other. Finally, firms can use information and communication technology to facilitate the communication between the interacting parties (Hutt, 1995). Combined these factors enable an easier implementation of coordination and cooperation actions.

The Relationship to Performance

The final stage of the analysis consisted in evaluating the performance implications of the integration between functions. It seems that bringing them together can improve the performance of functional areas, of the relationship between them and of the firm. In all the three types of performance measures used, authors identified factors that moderate the relationship between the implementation of coordination and cooperation actions and the performance benefits they can yield.

According to some authors, the implementation of the before mentioned actions can improve the performance of the R&D process, of the supply chain and bring additional benefits for customers (e.g. Green et al. 2012; Griffin and Hauser, 1996; Mollenkopf et al., 2011). It can improve the outcomes of the new product and service development process by reducing time to market (Griffin and Hauser, 1996, Swink and Song, 2007), helping items to be developed within budget (Brettel et al., 2011), increasing success rates and product performance (Song et al., 1997; Song et al., 2011), and expanding products' market penetration (Park et al., 2011). When it comes to the operations side of it, researchers showed that integration between the parties can reduce process costs and inventories (Green et al., 2012) whilst increase the flexibility of the operation (Juttner et al., 2007), the accuracy of the forecasts, the service levels offered to customers (Baratt and Baratt, 2011), and the speed of delivery (Sawhney and Piper, 2002). The implementation of such actions can also increase customers' satisfaction, the value they see in acquiring the product or service and their repurchase intentions (Boyer and Hult, 2005; Mollenkopf et al., 2011; Parente et al., 2002). The moderating variables identified for these relationships were: the speed of market changes, the complexity of environment in which firms operate, firms' culture, and the dependency the areas have on each other's resources (Balls et al., 2009; Chan et al., 1992; Gattiker, 2007; Menon et al., 1997; Ruekert and Walker, 1987; Song et al., 1997; Song et al., 2011).

Other authors have evaluated how the implementation of these actions can contribute to a closer relationship between the areas. Most of the authors that investigated this issue were able to confirm that actions for coordination and for cooperation yield the benefits expected. Authors identified that they improve the relationship between the parties (Ellinger, 2000; Rainbird, 2004), increase the feeling that the relationship is worthy (Ellinger et al., 2000), smooth the communication flows (Fischer and Maltz, 1997), and make the parties more responsive to the other function's requests and expectations (Hutt, 1995). The only moderating variable identified for these relationships was the level of functional identification of individuals with their work team (Fischer and Maltz, 1997).

Lastly, authors were able to verify a positive relationship between the implementation of actions for coordination and cooperation and the performance of the firm. Apparently, integration can increase returns on investments (Brettel et al., 2011; O’Leary and Flores, 2002, Song et al., 1997; Song et al., 2011), returns on sales, returns on assets (Song et al., 1997; Song et al., 2011), market share (Brettel et al., 2011; Lai et al., 2012), sales revenues (Park et al., 2011), companies’ prosperity (Shapiro, 1977), and profits (Hausman et al., 2002). It can also reduce costs and time to breakeven (Brettel et al., 2011). The authors that considered the moderating variables of this relationship pointed that the intensity of the relationship can vary depending on the firm size (Paiva, 2010), on the type of strategy adopted (O’Leary and Flores, 2002) and on the level of internal conflict the firm needs to manage (Song et al., 1997; Song et al., 2011). Although studies looked at many dimension of performance, it is clear that the implementation of cooperation and coordination mechanisms can bring benefits for the parties engaging in such efforts and, ultimately, for the firms.

DISCUSSION

Supply-Demand Integration: Moving Beyond the Dyadic perspective

A key result of our analysis is the limited angle of analysis of supply-demand interfaces mainly studied from a company-inside and dyadic view, with few exceptions of reference to a triadic interface (Fitzsimmons et al. 1991; Griffin and Hauser, 1992; Kahn 1996; Song et al. 1997; Mukhopadhyay and Gupta, 1998; Barratt and Barratt, 2011; Brettel et al., 2011) or to the context external to the company (Rainbird, 2004; Jüttner et al., 2006; Jüttner et al., 2007; Piercy, 2009; Barratt and Barratt, 2011; Gimenez and Ventura, 2005).

This prevalent approach appears to us a critical element hampering further developments in the field, especially considering the emergent interest on the demand-chain concept. The demand-chain, indeed, should be approached from a relationship and chain perspective (Mason et al., 2006), zooming out the company, which simply represents a node. A wider network perspective, moreover, permits to consider other typologies of interfaces not included in our review, constituted by multiple actors and spanning the company boundaries. Finally, the network perspective leads to a dynamic monitoring of the demand-supply interfaces (Choi et al. 2001), which could provide new insights on the way to sustain and manage them along different phases of their evolution.

The model proposed in this paper can help in this sense. It is reasonable to assume that the findings on why and how to achieve integration between two functional areas could be extended to the integration between the areas responsible for the supply- and demand- related activities. We would however expect that the complexity to implement integration actions would increase considerably, as the integration would be multilateral. Also, if integration between two internal functional areas can have positive performance outcomes, then the companies capable of integrating the supply- and demand- oriented areas will also accrue many benefits. In this way, the model could serve as a guideline.

The Market-Driven Organization: A learning-network perspective

According to our analysis one of the major elements hampering further developments in the literature on demand-supply interfaces is the weak and limited theoretical field of reference, a part from the Contingency Theory. Drawing on the main results and gaps identified in the literature analysis, we propose in this section some theoretical frameworks, which can possibly increase our understanding of supply-demand interfaces and contribute to the development of the emergent “demand-chain” concept.

The twofold conceptualization identified in the literature analysed, differentiating between coordination and cooperation, bonds the theme of interfaces with the organizational learning literature where the same distinction has been already debated. Dillenbourg et al. (1996), refer to two distinct concepts of “cooperation” and “collaboration”, as identified by Roschelle & Teasley (1995). It is initially said that the two notions mainly differs in the fact that in cooperation the activity is accomplished through the division of labour among participants, each one responsible for a portion of it, whereas collaboration implicates the reciprocal commitment of members in a harmonised attempt to jointly solve the problem. Afterward the authors specify that what changes, is the way in which the work distribution is organised: *“in cooperation, the task is split (hierarchically) into independent subtasks; in collaboration, cognitive processes may be (heterarchically) divided into intertwined layers. In cooperation, coordination is only required when assembling partial results, while collaboration is a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem”* (Dillenbourg et al. 1996, p. 2)

We suggest here that the connection between demand-supply chain interfaces and the learning theory would need further exploration. We find an evidence of the potential fruitful insights of this linkage in the words of Dodgson (1993: 378): *“the need to learn is the requirement for adaptation and improved efficiency in times of change”*. The two exigencies, adaptation and efficiency, correspond to the main demand and supply chain objectives, and to the contending “market-driven” versus “efficiency-driven” representations of the firm traced in Marketing and Operations views.

The learning perspective is also linked to the “market sensing” or “market orientation” that is at the bases of the demand-chain concept inspiring this paper. “Market sensing” was defined in a seminal paper (Day, 1994) as the organizational capability to learn about the market and diffuse this knowledge to be acted across spanning processes inside the firm. A similar definition has been provided by Narver and Slater (1990), who defined market orientation as a threefold concept composed by the customer orientation, the competitor orientation and the inter-functional coordination. Also Kohli & Jaworski (1990), discussing the market orientation construct recognised that the interdepartmental dynamics have “a key role in influencing the dissemination of and responsiveness to market intelligence” (p. 15). To sum up the market orientation, which inspires the idea of merging the demand and supply chain in a value catalyst generator, depends on a learning capability (sense-making) but needs coordination and cooperation to be implemented (to spread the market knowledge and enact it in spanning processes). This has been pointed also by Jüttner et al. (2007), who stated that *“more research is needed which looks at how companies can translate their market sensing skills and the ability to develop new customer value propositions into structural adaptation requirements for the supply chain”*, consisting in the integration of processes, structures and workers (p. 387).

The Flexibility-Cost Trade-off: An OM perspective

Looking at demand-supply concept from an operations management perspective, it would be possible to assume that the close interaction between supply-oriented functions can increase the flexibility of operations. Areas can work out together how to deliver the different demands of each market segment serviced. The intensive communication allows every area to be informed of last minute changes and adjust accordingly. The link between the supply and demand areas also enables the operation to have more insights into customers' preferences and conditions and, as such, react accordingly. Operations flexibility to respond to customers' needs could then increase the value customers see in acquiring the offering and lead to more satisfied customers. Ultimately, this would increase firm' revenues and market share.

The flexibility of the operation, however, comes at a cost. Actions to promote integration have costs associated with them, specially more human-based mechanisms. For instance, individuals put their regular activities on hold to engage in meetings, committees or projects. They also have to prepare for these activities and may incur in travel costs. Besides the costs to implement these actions, companies may incur the costs of adopting new information and communication systems. Although ICT reduces the administrative costs of integration (Mortensen and Lemoine, 2008), they require significant investments in their implementation (Humphreys et al., 2006), to train employees to use these systems (Skjoett-Larsen et al., 2003) and to integrate new systems with the different software already in use in the firm (Giachetti, 2004). The literature also suggests that firms need to keep constant flows of investment to achieve higher integration levels (e.g. Flynn et al., 2010, Koufteros et al., 2010; Mishra and Shah, 2009). So, firms willing to deliver this flexibility need to consider that there are significant costs associated in the implementation of actions to integrate supply- and demand- oriented functions.

Therefore, companies should consider these costs in their decision to adopt supply-demand integration as a competitive strategy. Some customers may value the customization and flexibility the integration between internal supply and demand areas can render. They may also be willing to pay premium prices for these value propositions and, consequently, cover the costs of integration. In more competitive markets, customers' choice might not be so clear. Some might value flexibility and customization, but not welcome the additional costs that come along with it. Perhaps, in such cases, companies need to consider the cost-flexibility trade-off more closely. A good understanding of customers' preferences is fundamental in these cases. The demand-oriented functions should therefore try to identify this upfront and discuss with other areas the best strategy to pursue.

CONCLUSION AND FUTURE RESEARCH

The systematic review of the literature conducted in this work integrates the emergent academic stream of research on the "demand chain" concept and, at the same time, addresses a relevant theme for practitioners interested in adopting an integrative strategy. The focus of this paper was to understand how the knowledge of inter-functional integration could be used to understand the multiple touch points between the supply and demand value chains. The analysis of 76 papers showed that interdepartmental integration is fundamental for this purpose and suggests that

integration between these functions can be achieved through cooperation and collaboration. We also identified and summarised in a conceptual model the factors that drive functions to work together, how this can be achieved and the conditions that make its implementation smoother. These findings expand the idea of demand-supply integration and, thus, grounded reflections on the concept from both a marketing and an operations management perspective.

From the review of the bibliography we learned about how the interfacing occurs at an inter-departmental level, inside a single firm. However, drawing on the main contributions and limits identified in the literature and on the limitations of our own research, we propose some avenues for future researches and possible theoretical angles to adopt. To deepen the understanding of the interfacing problems and extend our comprehension to the demand-chain context, we suggest that new theoretical and methodological perspectives are needed. First, empirical studies could involve multiple interfaces instead of dyadic ones. Additionally, many insights would probably result from extending the level of analysis from inter-departmental to the inter-firms level and looking at the multiple interfaces between the departments of customers, suppliers and focal firms. Given the focus of our study, we did not look at the supply chain integration literature, but a similar study as this one could be conducted in this literature to further extend the understanding about multiple inter-firm interfaces. Moreover, especially in times of international spanning supply chains, other countries than US and Europe would be welcomed in the analysis. Also, considering the complexity and extent of possible sites of analysis, both qualitative and quantitative approaches are needed.

Supplementary area of analysis could be the sustainable demand chain, as it is highly concerned by the integration phenomenon of interest here (Mariadoss et al., 2011). Also services can represent another valuable field of research. It would also be interesting to explore interfaces and the concept of integration in companies providing “integrated solutions”. Firms in different markets and industries are increasingly supplying their customers with customized combinations of products and services to address their specific requirements (Nordin and Kowalkowski, 2010). Researchers interested on the provision of these so-called “solutions” point that, for various reasons, high cross-functional integration within the firm (Storbacka, 2011) and close interaction between the provider, the customer and their network of partners (Cova and Salle, 2008) are necessary conditions for offering successful solutions. As such, we could benefit from learning more on how these firms manage the interfaces between the activities executed by the different internal and external teams involved in the solution delivery process.

Furthermore, from a marketing standpoint, to enlarge the prevalent approach in existing literature, we suggest applying a learning-network perspective to future empirical studies. The learning perspective concurs with the coordination-cooperation framework and can support a deeper understanding of the market sensing process (at the bases of the demand-chain concept) and its implementation. The network perspective allows considering the entire supply and demand chain, including multiple customers and suppliers and interpreting the focal company as a simple node. The wider perspective permits to locate where interfaces would most represent an issue and to contemplate other typologies of interfaces to study, including those interfaces constituted by multiple actors and spanning the company boundaries. Finally, the network perspective leads to a dynamic monitoring of the demand-supply interfaces, which could provide

new insights about the ways to sustain and manage them along different phases of their evolution.

From an operations standpoint, other interrogations emerge. While it seems beneficial to achieve integration between the areas responsible for demand and supply functions, this can be a costly strategy. This raises the question of which companies could and should adopt this strategy? Also, due to the costs of integration, could some companies benefit more from just integrating some of their supply and demand functions? Future research could look in to these issues to further understand the cost-flexibility trade-off. Last, but not least, as any research also this work has its limits. The main one is that restraining our search to certain databases and to peer-reviewed journals with impact factor, we might have omitted some relevant knowledge. For this reason, we intend the suggestions provided in this section as merely indicative and not exhaustive.

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APPENDIX

List of articles analysed

- 1 Balasubramanian, S. and P. Bhardwaj (2004). "When Not All Conflict Is Bad: Manufacturing-Marketing Conflict and Strategic Incentive Design." *Management Science* 50(4): 489-502.
- 2 Bals, L., E. Hartmann, et al. (2009). "Barriers of purchasing departments' involvement in marketing service procurement." *Industrial Marketing Management* 38(8): 892-902.
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