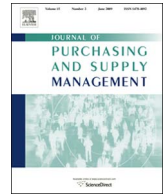




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Building manufacturing flexibility with strategic suppliers and contingent effect of product dynamism on customer satisfaction

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ABSTRACT

A critical capability sought by an increasing number of firms is manufacturing flexibility, because it allows to effectively respond to dynamic markets. Grounded upon a supply chain perspective, this paper aims to assess antecedents of manufacturing flexibility that stem from the upstream relationships with strategic suppliers. Additionally, it is one of the first to analyze the contingent effect of product dynamism on the impact of manufacturing flexibility on downstream customer satisfaction. We apply structural equation modeling to a sample of 155 companies in order to analyze our hypotheses. Results strongly indicate that buyer-supplier collaboration facilitates inter-organizational learning that in turn allows organizations to develop manufacturing flexibility and increase customer satisfaction. Approaching manufacturing flexibility from a broader supply chain view thus pays off. Moreover, we apply multi-group confirmatory factor analysis to explore the contingent effect of product dynamism on the relationship between manufacturing flexibility and customer satisfaction. Results suggest a stronger impact of manufacturing flexibility on performance in the context of higher product dynamism in companies' customer markets, confirming the importance of a contingency view to flexibility.

1. Introduction

Manufacturing flexibility is seen as a key characteristic of successful firms (Scherrer-Rathje et al., 2014). Several factors help explain the increasing importance of manufacturing flexibility, such as product proliferation, massive customization strategies, or the enormous increase in online retail. Currently, we face a move to an “on demand” economy based on shorter lead times, exemplified in extremis by new initiatives such as Amazon's “one-hour delivery” (Wired, 2015), and shorter development periods, exemplified by Apple's recent launch of the iPhone 6 (Reuters, 2015).

Although the concept of manufacturing flexibility is not new, we have recently seen an increasing number of empirical studies on this issue (Mendes and Machado, 2015; Mishra et al., 2014; Ojha et al., 2015; Pérez Pérez et al., 2016; Tamayo-Torres et al., 2014; Urtasun-Alonso et al., 2014). Nevertheless, antecedents that could hinder or leverage manufacturing flexibility remain underdeveloped in the literature, for example antecedents related to upstream relationships with selected suppliers (Mishra et al., 2014; Pérez Pérez et al., 2016). Critical resources may span firm boundaries and be embedded in buyer-supplier relationships (Dyer and Singh, 1998). Inter-organizational learning in

that regard allows an organization to identify external knowledge and convert it into value for the customer (Lane et al., 2006). In other words, inter-organizational learning allows a buyer to identify relevant suppliers' knowledge and convert that into an adapted offer to downstream customers (Sáenz et al., 2014). However, previous studies lack empirical evidence measuring the extent to which inter-organization learning contributes to manufacturing flexibility (Mishra et al., 2014).

A second research gap is the influence of buyer-supplier collaboration on manufacturing flexibility. Although integration with suppliers has been often mentioned as contributing to manufacturing flexibility, empirical studies on this issue are rare (Mishra et al., 2014; Zhang et al., 2003). For example, the contrast between relational and arm's length approaches to suppliers, although largely discussed in the supply chain management literature (Mahapatra et al., 2012), has received much less attention in flexibility studies. This is relevant, because flexibility strategies do not exist on a vacuum: instead, they interact with supply policies. The firm can work in concert with strategic suppliers to deliver value to the market (Cousins and Spekman, 2003). But, it is not clear how and to what extent buyer-supplier collaboration facilitates the development of manufacturing flexibility.

A supply chain perspective on manufacturing flexibility involves not

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only the appreciation of the impact of upstream relationships with strategic suppliers but also the effect of flexibility on downstream outcomes. A key outcome in that regard is customer satisfaction (Zhang et al., 2003). With rare exceptions (e.g. Camisón and Villar Lopez, 2010), current literature on flexibility has neglected the impact on customer satisfaction and rather focused on broader performance measures (Pérez Pérez et al., 2016). This is a critical issue, since the combination of customers' and other stakeholders' actions and decisions ultimately drive a firm's financial performance.

A final research gap concerns the relationship between product characteristics and flexibility. Although flexibility is often associated with innovative products (Fisher, 1997) or dynamic environments (Fine, 1998), there is scarce empirical evidence (Gligor et al., 2015; Tamayo-Torres et al., 2014). Actually, recent studies suggest that flexibility may also be important to less dynamic products (Blome et al., 2013). Many sectors traditionally associated with functional products (e.g., the chemical industry) are facing pressures to increase their flexibility (ICIS, 2015).

Summarizing, this paper aims to empirically analyze the key antecedents of manufacturing flexibility that stem from upstream relationships with suppliers. In addition, we aim at providing empirical evidence on the effect of flexibility on downstream customer satisfaction, as well as the moderating role of product dynamism in such relationship.

The paper is structured as follows. In the next section we review briefly the existing literature on manufacturing flexibility, the expected impact on customer satisfaction, the expected moderating impact of product dynamism, and the nature of the selected antecedents. This analysis allows us to develop a theoretical framework and corresponding hypotheses. The research methodology is subsequently explained, including the sample characteristics, data collection and measurement scales, and the structural equations method used to analyze the data. We then present and discuss the main results derived from the empirical analysis. Finally, we suggest managerial implications as well as future research directions.

2. Conceptual framework and hypothesis development

2.1. Overview of the conceptual framework

Companies are aware of the importance of aligning their efforts with supply chain partners in order to address market dynamism. Such alignment facilitates the development of capabilities to better meet customer demands (Vickery et al., 1999). More precisely, careful management of supplier relationships allows the development of flexibility capabilities (Jack and Raturi, 2002; Oke, 2005). In this study, we develop and test a conceptual framework that simultaneously addresses antecedents to manufacturing flexibility and a key outcome of manufacturing flexibility. The former relate to upstream relationships with strategic suppliers and the latter to the downstream customer output.

Buyer-supplier relationships host interfirm resources and routines such as knowledge-sharing processes (Dyer and Singh, 1998). The inter-organizational learning that takes place between buyers and suppliers has been mentioned repeatedly as a vital antecedent to the development of flexibility (Santos-Vijande et al., 2012; Zhang et al., 2003). Buyer-supplier relationships are characterized by different degrees of collaboration. Higher degrees of collaboration are typically associated to higher degrees of inter-organizational learning (Yan and Dooley, 2014). There are also studies that draw a direct impact from collaboration on manufacturing flexibility (Kähkönen and Lintukangas, 2012).

At the downstream side (customer outcome) we focus on customer satisfaction to complement the literature that focusses on more general measures. Based on contingency theory arguments, we posit that the effect of manufacturing flexibility on customer satisfaction depends on product characteristics. More specifically, we posit that this

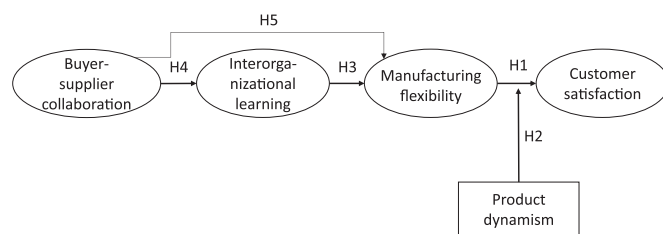


Fig. 1. Conceptual framework.

relationship is moderated by product dynamism. Accordingly, we propose a conceptual framework, which is depicted in Fig. 1. In the next sections, we develop each of our research hypotheses.

2.2. Manufacturing flexibility

Upton (1994), (1995) considered flexibility as the ability to increase the range of products available, improving a firm's ability to respond quickly and achieving good performance over this wide range of products. This ability is critical in the context of rapidly-changing environments, where customers continuously change habits and preferences. Through the development of flexibility capabilities, firms seek to build enduring sources of competitive advantage. Nevertheless, several strategic factors need to be considered before planning and implementing manufacturing flexibility (Chang et al., 2003; Suarez et al., 1996). For example, firms should not be viewed as a portfolio of assets and isolated businesses, but as a set of mechanisms by which new skills are selected and built (Teece et al., 1997). This process should involve external actors, notably suppliers (Zhang et al., 2003).

Saleh et al. (2009), in a literature review on manufacturing flexibility, pointed out the difficulty of measuring this construct, due to its multidimensional nature. In this study, we adopt the manufacturing flexibility items from Suarez et al. (1996), who define four first-order flexibility dimensions, i.e. those that directly affect the competitive position of a firm in the market, and that are readily perceived by the customers: mix, volume, new product and delivery time. Most of the other "lower-order" flexibility types proposed in the literature express their competitive effect through one or more of the first-order flexibility types (Suarez et al., 1996).

In particular, we adapt Suarez's flexibility types to a buyer-supplier perspective. This can be justified from the fact that a detailed analysis of more than 100 studies suggests that a firm's manufacturing flexibility is heavily affected by the external environment (Mishra et al., 2014). Indeed, flexibility can be seen as the result of a system of supply chain actors (Seebacher and Winkler, 2013; Vickery et al., 1999). This is in line with recent studies that remark the critical role of suppliers in the development of flexibility (Aissa Fantazy et al., 2009; Arawati, 2011; Blome et al., 2014). For example, Manders et al. (2016), in a recent empirical study in the fast-moving consumer goods industry, found that flexibility predominantly affects the dyadic relationships in a supply chain.

Most studies relating flexibility and performance are focused on internal or financial measures of performance (e.g. Arawati, 2011; Martínez Sánchez and Pérez Pérez, 2005; Merschmann and Thonemann, 2011; Nair, 2005). However, other researchers argue that flexibility should be analyzed from a customer-centered perspective (Lummus et al., 2005; Vickery et al., 1999), such as customer satisfaction (Camisón and Villar Lopez, 2010). Thus, we believe the outcome of flexibility should be analyzed with respect to the extent to which they add value to the customer. In the next section, we review the customer satisfaction implications of flexibility.

2.3. Customer satisfaction

Customer satisfaction has been analyzed extensively in several

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