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Information sharing for sales and operations planning: Contextualized solutions and mechanisms

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ABSTRACT

We develop actionable design propositions for collaborative sales and operations planning (S&OP) based on the observation of contexts in which benefits are generated — or are absent — from retail information sharing. An information sharing pilot project in a real-life setting of two product manufacturers and one retailer was designed. The project resulted in one manufacturer, serving a retailer from its local factory, developing a process for collaborative S&OP, while the other manufacturer serving a retailer from more distant regional factories abandoned the process. The evaluation of the outcomes experienced by the two manufacturers allows us to examine contexts in fine-grained detail and explain why introducing information sharing in the S&OP processes produce — or fail to produce — benefits. The paper contributes to the supply chain information sharing literature by presenting a field tested and evolved S&OP design for non-standard demand situations, and by a contextual analysis of the mechanisms that produce the benefits of retailer collaboration and information sharing in the S&OP process.

1. Introduction

Even though successful case examples show that information sharing can be very valuable in sales and operations planning (Ghemawat and Nueno, 2003; Fisher and Raman, 1996), the operations and supply chain management literature recognizes that achieving the benefits may be challenging (Simchi-Levi and Zhao, 2003; Thomé et al., 2012; Tuomikangas and Kaipia, 2014). In this paper we design and evaluate an information sharing intervention in the field to identify the fine-grained contextual differences that affect achievable benefits, and assess the attractiveness of introducing collaborative S&OP.

A hallmark of S&OP is its ability for formalized planning and data management to enhance both intra- and inter-organizational integration (Oliva and Watson, 2011; Singhal and Singhal, 2007). In the S&OP literature, demand planning in general and accurate forecasting in particular are essential elements (Ivert and Jonsson, 2010; Nakano, 2009; Oliva and Watson, 2011) of enabling integrated planning. We know from previous research that collaborative S&OP using downstream sales data is potentially beneficial in situations of unknown or uncertain demand, such as product introductions or promotions (Alftan et al., 2015; Cachon and Fisher, 2000; Lehtonen et al., 2005; Ramanathan and Muyldermans, 2010; Ramanathan, 2012). Nevertheless, modelling research has concentrated on situations in which demand is either stationary or follows a well-defined pattern (Aviv, 2001; Cachon and Fisher, 2000; Gavirneni et al., 1999; Simchi-Levi and Zhao, 2003). In addition to the well-known descriptive cases such as Zara or Sport Obermeyer (Ghemawat and Nueno, 2003; Fisher and Raman, 1996), the numerous model-based analyses, and the rare controlled experiments (Tokar et al., 2011), this domain of academic research needs fine-grained design-oriented contributions on the design and effects of information sharing in real-life product introductions and promotions.

Design science research in the social domain and management aims to bridge the practice-academia divide through the development of actionable knowledge grounded in the empirical evaluation of how designs work in the field (cf., Holloway et al., 2016). This paper presents a solution design for information sharing in a collaborative S&OP process and evaluates how it can be effectively introduced in the real-life settings of two manufacturers for special demand situations. Point-of-sales (PoS) information sharing is too

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expensive to be used across the board and is potentially useful only in demand situations where conventional demand planning is inadequate, like in product introductions, promotions, and seasonal peaks. We find that for such situations it is effective not to use a standard procedure, rather to design procedures that are focused on the specific situation at hand, taking into account both demand uncertainty and supply responsiveness. Product introductions and promotions are often planned well before the action, and our proposal is that, in planning the introduction or promotion, one needs to decide whether sales information sharing is to be used and, if so, what the S&OP procedures are precisely, both in terms of how to determine the demand and how to adjust operations.

We report design science research addressing the field problem of introducing supply chain collaboration in S&OP. In so doing, we present findings from a longitudinal case study of collaborative S&OP in new product introductions. Hence, we combine a longitudinal case study approach with a design science approach (Holmström et al., 2009). Along with the case study, we participate in the design of a collaborative product introduction process and then observe (Näslund, 2002) what two supplier companies actually do in collaboration with a retail chain. The collaboration is based on the retailer giving the supplier timely access to retailer point-of-sales data during product introductions. A longitudinal approach to design science research makes it possible to investigate intervention designs in action and on a detailed level. We evaluate the results the two suppliers attain from their engagement in collaborative product introductions and identify how situational factors affect achievable outcomes.

The paper is organized as follows. Following this introduction, we present a literature review on the benefits of information sharing in S&OP. The methodology section describes how we apply the design science approach in a longitudinal case study setting. The case description starts with the problem of product introductions in the case context and presents the process of collaborative S&OP developed to address the problem. Observing the different outcomes of introducing the same process for the two suppliers constitutes a field experiment. How the collaborative planning of product introductions was included in the S&OP process is described for one of the participating manufacturers. After that, the outcome evaluation is presented and design propositions are developed. To conclude, we relate our field tested design and propositions to previous research and present implications for research and practice concerning the contextual factors that influence the usefulness of information sharing in collaborative S&OP.

2. Literature review

2.1. The contingent value of information sharing in collaborative S&OP

Previous research on retail sales information sharing indicates a need for contextualized investigations of solution designs in action. The research literature is divergent, presenting both significant potential benefits, and a lack of benefits of collaborative S&OP. Sharing downstream information in the supply chain has been found to result in significant efficiency improvements (Baihaqi and Sohal, 2013; Fisher, 1997; Gavirneni et al., 1999; Lee et al., 2000; Williams and Waller, 2011; Zhou and Benton, 2007). However, research also suggests that not all situations and products benefit equally from shared demand data. When demand is predictable, the value of information sharing is low, and demand uncertainty can be managed with intelligent use of historical data (Cachon and Fisher, 2000; Raghunathan, 2001; Williams and Waller, 2011). On the other hand, research suggests that different products deserve a different use of demand data (Fisher et al., 1994; Fisher, 1997; Holmström et al., 2006). Collaboration intensity between suppliers and retailers (Nagashima et al., 2015) or with suppliers (Goh and Eldridge, 2015) increases forecast accuracy.

Model-based studies are not unequivocal in how benefits depend on the features of the model and the assumptions used (Aviv, 2001; Li et al., 2005). The problem context has typically been simplified to that of one supplier evaluating the benefits of accessing demand information from a single retailer (see, e.g., Aviv, 2001; Cachon and Fisher, 2000; Gavirneni et al., 1999; Simchi-Levi and Zhao, 2003; Zhao and Simchi-Levi, 2002). Lee et al. (2000) and Simchi-Levi and Zhao (2003) model the benefits of sharing information and suggest that information is valuable only if the system has the flexibility to respond. However, most studies assume that when companies have access to better demand, inventory, or process data in the supply chain, the operational performance of the chain improves (Barratt and Oke, 2007; Gavirneni et al., 1999; Nagashima et al., 2015) without considering that there may be contexts where benefits cannot be realized. In many studies, operational improvements such as more accurate forecasting (Weber and Kantamneni, 2002; Williams and Waller, 2011), lower inventory levels or costs (Wu and Cheng, 2008), shorter lead times and a reduced bullwhip effect (Agrawal et al., 2009; Croson and Donohue, 2003; Kelepouris et al., 2008), and reduced risk (Zhao et al., 2013) are found. Thus, information sharing in modelling studies recognize that information sharing does not lead directly to improved performance, but assume improved performance when information sharing is used in operational processes within and between the participating companies (Baihaqi and Sohal, 2013).

To sum up, research recognizes that the potential value of more accurate prediction of sales volumes through information sharing and collaboration for upstream supply chain partners is high. Specifically, a reduction in sales information lead times is seen to result in faster responses of supply to sales variations. Furthermore, there is recognition of the contingent nature of the benefits of a more collaborative S&OP process. Still, exactly when to expect benefits from sharing more up-to-date sales data among the supply chain partners, and through which mechanisms better information transforms to actual performance improvements in operations, remains a challenge for both research and practice.

2.2. Benefits in special situations: manufacturer's perspective

Examining when more collaborative S&OP becomes useful is a well-established research stream. Several authors suggest that improved retail promotions management based on collaborative action and shared information becomes beneficial when the demand factors are known (Alftan et al., 2015; Ramanathan and Muyldermans, 2010; Ramanathan, 2012). The simulation study conducted by Mason-Jones and Towill (1997) suggests that with a sudden step-change in demand, access to PoS data becomes most valuable to a manufacturer. Conversely, in their model-based study, Ferguson and Ketzenberg (2006) find that the value of information sharing in the retail replenishments of a perishable product depends on a combination of factors: demand is variable, the product is expensive, and the shelf-life is short.

On the basis of a survey with 125 respondents, Zhou and Benton (2007) conclude that supply chain dynamism, which they define as the pace of change of both products and processes, enhances the value of collaborative planning based on information sharing. Based on case studies, Alftan et al. (2015) and Dong et al. (2014b) emphasize that collaborative demand forecasting is needed as an exception management mechanism. Using simulation, Lehtonen et al. (2005) demonstrate the potential value of collaborative planning in product introductions, but do not elaborate on how to

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