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Review

Collaborative forecasting in the food supply chain: A conceptual framework

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ABSTRACT

This paper develops a conceptual framework for factors involved in collaborative forecasting in food supply chains. Although the existing literature has analyzed many theoretical perspectives in relation to collaborative forecasting in the food supply chain, there is a scarcity of research examining how manufacturers and retailers conduct long-term and accurate collaborative forecasting for seasonal, perishable, promotional, and newly launched products. In the proposed framework, we focus on the collaborative forecasts of manufacturers and retailers. Through a systematic review of the literature, we have identified trends, gaps and areas for future research involving partners' integration, information sharing and forecasting process in the supply chain. The review reveals that partners' integration is a key requirement for collaborative forecasting while type and quality of information shared are critical for forecasts. Moreover, forecasting strategies of manufacturers and retailers play a pivotal role for consensus forecasts while the role of forecast horizon and frequency should not be neglected. Finally, the impact of forecasters is critical in addition to group forecasting techniques applied to generate consensus forecasts in collaborative forecasting. Ten propositions are developed for empirical testing. The proposed framework may serve as a guide for practitioners when initiating and conducting long-term collaborative forecasting partnerships. The research is limited to examining the manufacturer–retailer dyadic collaboration, and focuses on specific food product categories.

Contents

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1. Introduction

Supply Chain Management (SCM) has attracted large interest from academics and practitioners over the past years (Christopher, 2005). Equally, the Food Supply Chain (FSC) distinguishes itself from other supply chains due to its purpose to "guarantee the provision of safe and healthy products that are fully traceable from farm to fork" (Bourlakis and Weightman, 2004, p. 2). The FSC has been the focus of a plethora of research papers including work, inter alia, related to crops (Ahumada and Villalobos, 2009), fruit, flowers and vegetables (Shukla and Jharkharia, 2013). In relation to collaboration in that chain, past studies have looked into promotions (Ramanathan, 2012; Ramanathan and Muyldermans, 2010), long-term partnerships (Ramanathan and Gunasekaran, 2012), demand management (Adebanjo, 2009; Taylor, 2006) or forecasting methods through experimental analysis (Ali et al., 2009; Alon et al., 2001).

However, a key concern in the FSC is the short shelf life of perishable and seasonal products where substantial effort is required to keep product freshness and shelf availability. The latter relies largely on FSC partners' forecasting and related practices on production, distribution and inventory management (Ahumada and Villalobos, 2009; Du et al., 2009). Managing product demand during promotions represents another challenge as promotions vary due to different duration and discounts offered which, in turn, create sales variability (Ramanathan and Muyldermans, 2010). At the same time, collaboratively forecasting for newly launched products is also difficult due to a lack of historical information and variation of consumer choices (Småros, 2003; Bitran and Mondschein, 1997). Småros (2007) has further emphasized the gap between theory and practice stressing the importance of collaborative forecasting of partners when using information for accurate forecasts.

The focus of this paper is on *collaborative forecasting*, the practice "in which the knowledge and information that exists internally and externally is brought together into a single, more accurate forecast that has the support of the entire supply chain" (Helms et al., 2000, p. 395). The reason for this focus is the challenges involved with accurate and long-term collaborative forecasting in the food supply chains. Some scholars stressed the dominance of retailers in collaborations (Aviv, 2007; Småros, 2007), whilst others considered the lack of trust and commitment between partners as reasons for poor collaborative forecasts (Vlachos and Bourlakis, 2006; Fliedner, 2006, 2003). In addition, manufacturers' lack of confidence in generating sales forecasts, long lead-times and production plans, as well as poor interdepartmental integration of partners are also identified as important barriers in collaborative forecasting (Småros, 2007; Taylor and Fearne, 2006; Helms et al., 2000). For time sensitive food products in particular, lack of information sharing among partners seems a major obstacle to generate collaborative forecasts (Zhou and Benton Jr., 2007; Taylor and Fearne, 2006). This issue is further exacerbated with retailers' poor forecasting process, reluctance and opportunistic behavior during information sharing (Taylor and Xiao, 2010; Taylor, 2006).

In essence, FSC is a suitable domain for Collaborative Planning, Forecasting and Replenishment (CPFR) that provides an excellent platform for partners in managing supply chain processes jointly, comparing sales and order forecasts, and taking timely decisions (Burnette, 2010; Ireland and Crum, 2005; Siefert, 2003). Whilst partners confront difficulties to integrate their information sharing and forecasting processes in the FSC, CPFR can support the joint management of promotions, the interdepartmental synchronization and the reduction of multiple departmental forecasts that cause internal and external conflicts (Barratt and Oliveira, 2001; Sherman, 1998). Moreover, it is a sustainable practice resulting in the reduction of inventory costs and waste of consumer goods during long-term partnerships (Lapide, 2010). The collaboration between Wal-Mart and P&G is a prime example where a joint development of forecasts and replenishment plans by these partners improved information sharing and reduced waste in the FSC (Attaran, 2004).

By considering partners' integration in the FSC as a ground for joint problem solving in terms of collaborative forecasting, this paper reviewed the literature on three major research themes, namely supply chain integration, information sharing and forecasting process. Therefore, we examined the body of literature on CPFR, information sharing and forecasting processes where there are major challenges between partners in collaborative forecasting. However, it is important to stress that this paper does not intend to review the body of literature on supply chain integration. Equally, we limited our review on the overlap between supply chain integration with collaborative forecasting, information sharing and forecasting process. This approach distinguishes the paper from other, relevant systematic reviews on supply chain integration (see for example, Fabbe-Costes and Jahre, 2008). Hence, we aim to close the gap between theory and practice in relation to collaborative forecasting and, subsequently, we formalized four research questions which capture the objectives of this paper.

The rest of the paper is organized as follows. Section 2 sets out the research objectives and formulates research questions. The review methodology is described in Section 3. The results of the review and the propositions are presented in Section 4. Section 5 discusses the results and presents the conceptual framework. Finally, Section 6 concludes the paper and identifies areas for future research.

2. Research questions and objectives

Many scholars argue that FSC partners have an unstructured information sharing process which causes complexities (Zhu et al., 2011; Chang et al., 2007; Zhou and Benton Jr., 2007; Chen et al., 2000). These complexities exacerbate information-related challenges in CPFR preventing long-term collaborative forecasting (Småros, 2007; Aviv, 2007). Thereby, a collaboratively integrated information sharing process could strengthen partners' information sharing internally and externally. To pursue such a process during collaboration, it is inevitable for partners to conduct Undistorted Information Sharing (UIS), and to sustain Agile Information Sharing (AIS) internally and externally. Here, the key reason is dealing with shortcomings when aiming to share the correct information (Zotteri et al., 2005) apart from partners' attitudes in relation to information sharing (e.g., lack of trust