Getting down to brass tacks: Is your organization really aligned?
Ullrich, Kristoph

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The growing complexity and number of challenges related to the effective and efficient management of global supply chains have increased the prominence and significance of SCOM in recent decades (Hendricks et al., 2014). Because firms such as Amazon.com, Inc. and Apple Inc. have been able to distinguish themselves from the marketplace by virtue of their superior SCOM, many other companies are following these examples and striving to improve their SCOM practices by adopting paradigms such as lean manufacturing, inventory pooling, and quick response (e.g., Rajagopalan and Malhotra, 2001; Chen et al., 2005, 2007; Van Mieghem and Allon, 2008). However, while putting their main focus on the cost efficiency aspect for improving supply chain performance, academicians and practitioners are forgetting that it is a firm’s ability to effectively respond to changes in demand or supply without stockpiling unnecessary inventory that must be complemented by cost-efficiency aspects to gain competitive advantage through SCOM (Lee, 2004). In addition to efficient operations, this requires a careful alignment of SCOM with other functions of the organization, and in particular, with the Sales and Marketing departments.

It seems paradoxical that although the overall objective of SCOM is commonly stated as “matching demand and supply,” to date considerations related to the management of demand play only a minor role in most SCOM departments, models, and theories. However, sales and marketing must be considered in SCOM because plans and decision the Sales and Marketing team makes (pricing, promotions, salesforce size, salesforce incentives, market expansion, etc.) affect mean demand and demand variability, which are essential factors in effective and efficient supply chain configu-
ration and operations. Obviously, the management of supply requires consideration of sales and marketing aspects to the same extent as the appropriateness of sales and marketing plans and actions depends on SCOM.

Although firms have worked for over 35 years on the issue of aligning sales and marketing with the operational processes of supply, only a handful of them have effective alignment processes in place. This situation has led to a frequent mismatch between demand and supply – with a multitude of undesirable implications (Hendricks and Singhal, 2005a,b, 2009, 2013; Wagner et al., 2014; Forbes Magazine, 2015). Various factors are responsible for managers’ failure to align SCOM with the “demand-side” functions of the organization, but based on the past years of research and many conversations with managers, we identified the following as being the most crucial:

1. To a great extent, the prior research addresses SCOM and sales/marketing topics independently of each other, leaving managers unaware of the dynamics that emerge from interdependencies between organizational functions and encouraging a silo mentality.

2. Empirical evidence linking the ability to effectively adjust supply to changing demand without stockpiling unnecessary inventories to firm financial performance is scarce, which leads managers to underestimate the consequences of demand-supply mismatches.

3. Even if managers grasp the interconnection between organizational functions and decisions and strive for better organizational alignment, there is little concrete help available to them for assessing current performance and pointing the way toward improvement.

Each of the chapters included in this dissertation addresses at least one of the factors listed above and taken together, the information they contain can help managers to sustainably reduce demand and supply mismatch, while making several implications for theory as well.
Because the premise of this dissertation is that merely understanding and appreciating the value of cross-functional integration is not enough to distinguish a company from the marketplace, in Chapter 2 we provide hands-on guidance for managers who want to transform their company into a better-aligned organization. Many companies face the challenge of establishing a comprehensive plan for each business function to guide the organization in one direction. The difficulty arises from the lack of a structured, and iterative process for building a single consensus forecast as the basis for all further activities – leading to the frequent mismatch of demand and supply. In particular, several academics and practitioners have proposed S&OP as a means of improving organizational alignment. S&OP is an ongoing process of monthly planning, reviewing, and evaluation to generate one set of integrated plans by ensuring the involvement of all key stakeholders. The process makes it easier to recognize early warning signals when supply and demand are at risk of becoming imbalanced so the company can respond quickly to changing market and operations situations. However, although the process was developed more than three centuries ago, many firms are still hindered by ineffective planning processes (Wagner et al., 2014; Forbes Magazine, 2015).

Chapter 2 presents multi-method research that develops a holistic S&OP maturity model derived from the existing S&OP literature and expert interviews. It shows the way to an integrated S&OP approach and firms can use it to assess their internal S&OP processes. We also present the case study of a medium-sized, Swiss-based pharmaceutical company that has recently implemented S&OP. It highlights why companies implement S&OP, the prerequisites and roadblocks they encounter during implementation, and the benefits envisioned and achieved. Finally, we highlight the relevance of the topic by means of a questionnaire survey showing that organizations’ current S&OP performance is underdeveloped and that many improvements are indispensable to enjoy all benefits associated with the alignment process. There is ample room for improvement as well as the potential for firms to distinguish themselves from competitors. For these reasons, we urge and expect top managers to realize the importance of a well-implemented S&OP process and take
the appropriate steps to balance demand and supply.

In Chapter 3, we conceptualize the interdependence of inventory investment, demand, gross margin, and sales effort as the "inventory rhombus" and provide empirical evidence that causality between these variables runs in each direction. This finding alone substantiates the importance of an integrated sales, marketing, and operations planning as it implies that changes in one of these variables have an effect on all of the others. We propose an econometric method to address the resulting endogeneity and encourage future research to address the interdependence of the variables that comprise the inventory rhombus in a similar way.

Based on prior research, we also hypothesize that the structure of CEO compensation affects inventory investments. Although prior research reveals associations between CEO compensation and CEO risk preferences, to date no one has researched whether CEO compensation might be a driver of inventory investment. The relationship appears to be plausible because inventory investment determination always requires a careful trade-off between the risk of obsolescence and the risk of missing sales opportunities. In addition to the direct effect of CEO compensation on inventory investment, we analyze mediating mechanisms through demand, gross margin, and sales effort, as described in the context of the inventory rhombus to account for the dynamics that emerge from interdependencies between the demand- and supply-side functions of an organization.

The compensation package characteristics that we consider are the sensitivity of CEO option portfolios to the stock price (SSP) and the sensitivity of the CEO option portfolios to the stock return volatility (SSV). Analyzing the secondary financial data of a large number of public U.S. firms, we show that CEO compensation has an impact on inventory investment directly and in multiple indirect ways. In particular, we find that a 20% increase in SSP is associated with a reduction of capital invested in inventory of approximately US$ 1.652M and that moving from the 20th to the 80th SSP percentile is associated with a reduction of capital invested in inventory of approximately US$ 22.6M. This finding confirms that CEOs whose compensation is more dependent on the stock price follow less risky strategies. We further show
that a 20% increase in CEO SSV is associated with an increase of capital invested in inventory of approximately US$ 0.873M. This association corresponds to an increase of US$ 12.5M in capital invested in inventory when shifting from the 20th to the 80th SSV percentile and confirms that increasing SSV motivates risk-seeking behavior.

These findings provide valuable insights into the complex dynamics in organizations and the effects of managerial incentives on inventory investment. The two elements of CEO compensation that we consider, SSP and SSV, both have a high economic impact on inventory investments. Therefore, operations managers, CEOs themselves, researchers, and compensation committees must all be aware of this impact and be able to estimate and manage it. Moreover, the results of this study are of great interest to supply chain and operations managers because if their bonuses depend on inventory metrics, they should be aware of the fact that several causes for inventory buildup lie outside their direct sphere of action, substantiating the importance of integrated sales, marketing, and operations planning. Moreover, Chapter 3 responds to the frequent call to strengthen the empirical basis of SCOM research and might encourage more SCOM scholars to stop considering demand as exogenous.

Throughout Chapter 4, we study salesforce contracting for a firm that employs multiple sales agents. Most firms design incentive contracts to induce salespeople to exert high sales effort to increase demand while neglecting its SCOM implications. In particular, most of the existing research on salesforce compensation assumes that supply perfectly matches demand and therefore demand can be used as a contracting parameter. However, a more realistic model should account for the possibility of stock-outs which may have an effect on the firm’s ability to observe actual demand. In recent contributions, Chu and Lai (2013) and Dai and Jerath (2013) account for the possibility of inventory shortages and demand censorship in a setting in which a firm employs a single sales agent. However, in practice, salesforces comprise typically more than one salesperson so that firms can pool inventories in a central warehouse. This makes the amount of inventory available to each individual sales agent contingent on the other agents’ effort decisions and sales success. Accordingly, the
existing salesforce compensation models with inventory considerations do not account for pooling effects and the game-theoretic problem that emerges from the agents’ decision-making process on effort, which has implications for the optimal stocking quantities, service levels, contract parameters, and ultimately, profits. To close this gap in the literature, we study a setting in which the firm employs two sales agents that exert unobservable effort to increase the level of (uncertain) demand in an environment in which demand is censored by the stocking quantity. The firm makes a stocking decision contingent on the supply chain design (i.e., joint inventory pool or decentralized inventories for each agent/market) and designs an incentive contract on the basis of which the sales agents determine their effort levels.

We demonstrate that under inventory pooling, sales agents tend to exert less effort than under decentralized inventory stocking. This “free-riding” effect is driven by the fact that under demand censorship, the agents’ expected bonus payments are linked by the pooled inventory, making it optimal for agents to reduce effort levels in anticipation of the other agent’s effort because if all the inventory is sold, each agent will receive a bonus. Therefore, in some situations, forgoing the operational efficiency gains from inventory pooling and instead “pushing” inventory to each agent to prevent shirking becomes optimal for the firm. We determine the market conditions (profit margin and demand uncertainty) under which each supply chain design is dominant. In contrast to the prior research, we identify cases under demand censorship in which the optimal stocking quantity and the service level are lower than in the FB scenario. In addition, we show that both the inventory decisions and effort equilibrium are affected by the contracting parameters of the incentive contract, and vice versa. Because of this interdependence, the optimal stocking quantity under inventory pooling may exceed the sum of the decentralized inventories under certain market conditions. We derive the optimal contracting parameters for a sales-quota-based bonus contract that will lead to the firm’s optimal profit and identify the market conditions under which the sales-quota-based bonus contract will lead to the FB profit. Chapter 4 has several theoretical and practical implications and underlines the importance of combined sales and operations plan-
ning. In particular, it shows that compensation and inventory decisions should be made jointly. Relaxing or changing the assumptions and extending the model to multiple periods are some possible options for future research.

Despite retailers’ continuous improvement of their inventory management practices over the last decades by adopting paradigms – like inventory pooling, quick response, information sharing, responsive supply chains, revenue management, etc. – that have been shown to improve firms’ financial performance (e.g., Chen et al., 2007), there is growing evidence that Wall Street investors do not leverage all of the information that inventory and SCOM performance contains (Sloan, 1996; Kesavan et al., 2010; Kesavan and Mani, 2013). Moreover, since managerial incentives are usually tied to stock market performance rather than to operational metrics (because stock performance information can be accessed easily and accurately), whether or not superior inventory management is systematically related to stock market performance is of great interest to both shareholders and managers (Currim et al., 2012; Alan et al., 2014).

In Chapter 5, we apply portfolio-based asset pricing methods to analyze whether retailers’ capability to manage inventory effectively (i.e., minimizing demand-supply mismatches) predicts future stock returns. Driven by the fact that demand and supply variability are the primary factors responsible for supply chain inefficiency (e.g., Lee et al., 1997; Warburton, 2004; Chen and Lee, 2012; Cui et al., 2015), we develop a novel KPI, entitled DSM (demand-supply mismatch), which measures the relative volatility of the inventory productivity of a firm. DSM contains valuable and distinct information regarding firm operations because high volatility in inventory productivity implies that a firm faces periods with excessively high inventories and other periods with stock-outs, even though its average inventory productivity implies that its operations are well managed. Knowing that higher demand volatility causes higher inventory volatility, we normalize the volatility of inventory productivity by the volatility of demand. DSM captures the fact that a low variation in inventory productivity relative to a given level of fluctuation in demand indicates the superior synchronization of demand- and supply-side operations.
We show that DSM predicts future stock returns in a sample of publicly listed U.S. retailers in the period 1985-2013. Applying the Fama and French (1993) three-factor model augmented with a momentum factor (Carhart, 1997), we find that zero-cost portfolios formed by buying the two lowest and selling the two highest quintiles of DSM stocks yield abnormal stock returns of up to 1.13%. These strong market anomalies related to DSM are observed over the entire sample period and persist after controlling for alternative inventory productivity measures and firm characteristics that are known to predict future stock returns. We also show that DSM is indicative of lower future earnings and lower sales growth and provide evidence that the observed market inefficiency results from investors’ failure to incorporate all of the information that inventory contains into the pricing of stocks.

Chapter 5 has implications for multiple stakeholders. Investors and stock analysts can leverage the knowledge of the identified market anomaly and capitalize on it. Supply chain and operations managers may also benefit from our results because we reveal a strong correlation between demand-supply mismatches and stock market performance, thus providing empirical support for budget negotiations and to promoting the SCOM function. The DSM KPI also serves as one example of how the dependence between operations and sales/marketing can be incorporated into measurement systems and may be employed for benchmarking purposes (in academia and practice), while avoiding average measures that can smooth out important information. Whereas relative volatility measures are quite commonly employed in the context of the bullwhip effect, for example, we hope to encourage scholars to also consider relative volatility measures such as DSM to a greater extent on the firm-level. Our study focuses on the retailing sector and although industry-specific analyses have several advantages, they naturally limit the generalizability of findings. It would be interesting for future research to analyze whether our findings also apply to other sectors.