

Dissemination of Supply Chain Visibility: Intra-Organization Perspective

Ville Voipio
School of Engineering Science
LUT University
Lappeenranta, Finland
vville@gmail.com

Jyri Vilko
School of Engineering Science
LUT University
Kouvola, Finland
jyri.vilko@lut.fi

Abstract— Information generation has been raised as a source for superior innovativeness and organizational performance by the Market Orientation (MO) research stream. Supply Chain Management research has in parallel shown a growing interest in Supply Chain Visibility (SCV), which focuses on real-time information about inventories and can be used to understand markets and customer needs. This theoretical paper that stems from the abductive theory-building approach proposes that the connection of SCV-MO has a strong grounding to practice and clear request by academia but has lacked solid theoretical formation. The paper contributes to the research gap by connecting the key theories and proposing an SCV-MO framework model with a research agenda.

Keywords— *supply chain visibility, innovativeness, digital transformation of supply chain*

I. INTRODUCTION

Supply chain management (SCM) has grown from the fragmented management of activities emerging as a research field in the 1960s [2]. At the time, ‘material handling’ was seen as part of marketing responsible for selling and delivering goods to customers [18]. Eventually, logistics became a concept of handling purchasing, materials management, and distribution, and investigating how to efficiently manage product and service flows [9,2]. Today SCM researchers describe that in a globalizing competitive marketplace, the focus is on increasingly boundary-spanning collaborative practices, which in a virtual setting enable not only cost-saving but in an equal measure sales increase [2,22]. The sales contribution of SCM comes from its ability to drive customer value (e.g., cost competitiveness), support customer desires and experience (e.g., sustainability in sourcing, omnichannel fulfillment), and extract insights from the customer front.

This theoretical paper is interested in the accurate and nearly real-time information that SCM collects from the customer interface, which can give indications and insights about the customers. Supply Chain Visibility (SCV) has become an emerging research theme within SCM focusing on the data capture and sharing practices in its function. However, as the research interest has been within SCM function and related inter-firm relationships, the use of SCV data within a firm on a cross-functional use has not yet been fully discovered. This paper intends to understand how SCV can support market intelligence (MI) in its information generation that fosters the innovativeness of an organization

and propose a related research agenda. The paper contributes to discussions taking place in SCV, MI, and the integration of SCM and marketing.

II. LITERATURE REVIEW

A. Market Orientation

The marketing concept is an organizational culture that puts the customer at the heart of its strategy and operations [8]. Understanding how customers perceive the market requires not just focusing on the customer but understanding the firm’s competition as well, which reveals the alternatives that a customer has in fulfilling a need. This defines the essence of Market Orientation (MO) [16]. Competition, as a component of MO, has been earlier portrayed through the theory of Five Forces proposing that powers parties (rivals, suppliers, buyers, new entrants, and substitutes) hold in a marketplace eventually influence the competitive situation [25]. Researchers suggest that translating marketing philosophy into practice provides a competitive advantage for a firm and studies have verified that MO helps companies to win the competition, which is less market-oriented [5,15]. The challenging notion in MO for a firm that wants to become more market-oriented is its anchoring to a culture, which is known to be difficult to lead. Research on corporate cultures has suggested that cultures emerge from behaviors, but superior cultures leading to competitive advantage are not reached by managerial manipulation [1]. Researchers have pointed out that besides customers and competitors, a MO organization needs cross-functional coordination meaning behaviors and actions that a company jointly takes to provide superior value to customers over its competition [24].

Kohli and Jaworski [16] stressed in their research the importance of MI (defined as information generation, dissemination, and responsiveness) as a source of MO. However, “generating and using insight to shape marketing practice” has been pointed out by American Marketing Association in 2016 as one of the seven challenges faced by marketers today [14], which is confirmed by other researchers stating that academic empirical research on market intelligence practices is limited and lacks theoretical grounding [16]. Despite the generally accepted importance of MI, it is not clear in practice how intelligence is generated,

disseminated, and responded to across the organization [10]. Furthermore, they see that managers are unclear on how to use MI in decision-making raising concerns that information generation and dissemination may not be well planned, and the MI unit may, bluntly speaking, just operate as an internal news desk that generates and shares information for internal audiences that uses if they wish. However, scholars note that efficient information generation and end-use should be planned beforehand [23].

In a study focusing on the quality of market intelligence, the researchers defined that “information generation is the acquisition of data concerning the firm’s markets from sources external to the firm” which can be understood to claim that an organization learns from markets only through external sources such as from marketing research [4]. However, Moorman [23] has proposed that information acquisition is a process of bringing information from the outside into the firm environment describing insight generation as a listening capacity. Heinrichs and Lim [11] suggest in their theoretical model of a strategic response capability that insight generation capabilities include adaptive capacity, learning curves, market sensing capability, organizational learning & memory, and knowledge management processes. The sources used in the model also stress the role of internal sources in insights generation.

Internal information sources are important from the competitive advantage perspective, as they are exclusively controlled by an organization itself. Maltz and Kohli [21] note that without unique (exclusive) information sources, information dissemination is the only source of competitive advantage in MI. Hunt and Morgan [13] propose in comparative advantage theory that the modern understanding of resources expands to information, and an organization, which has low-cost access to a high-value resource, has a comparative advantage leading to a competitive advantage position in the marketplace and thus, it has potential on a firm level to high financial performance.

B. Supply Chain Visibility

The definition of SCV has been unclear and debated, which has resulted in inconsistent use of the term [36, 29]. This paper borrows some of the definitions from Williams et al. [35] and perceives SCV as (i) a capability that (ii) provides “access to high-quality (accurate, timely, complete, and in useable forms) information that describes various factors of demand and supply.” The key functionalities of SCV capability are data capturing and sharing [12]. This paper argues that SCV research started from product identification research in early 2000 [see e.g., 17], which became ten years later the SCV research stream that adopted the view of competition that was alliance-led (chain-to-chain) [22], and hence, resulting to intra-functional and cross-company context. The authors propose that the research needs to re-focus on the intra-firm aspect, where the data is utilized cross-functionally to form an integrated data-driven firm responsive to the speed and agility required by markets today. Figure 1 illustrates the proposed shift in SCV research orientation.

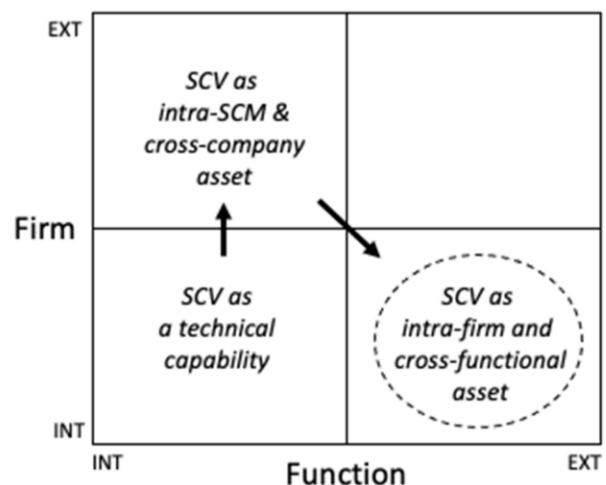


Figure 1: The proposed shift in SCV orientation

However, the aspect of internal-external chains is not fully absent in this era either as the control of SC matters to SCV. In an open-loop SC, the brand owner does not have end-to-end control of the chain but collaborates for instance with an external distributor that manages the reselling. Hence, a brand owner does not automatically have visibility and accurate data from stores, which could provide an ideal source of customer insights. Studies have reported that data sharing is sensitive with external partners [20], and for that reason, a closed-loop SC structure favors the SCV concept as it is viewed in this paper. Observations from companies (e.g., Inditex in the fast fashion business) also confirm first movers on SCV appear to be from closed-loop structures [see e.g., 31].

According to our view on research evolution, the interest in SCV stems from the observation that SC data found in enterprise resource platforms (ERP) is commonly inaccurate.

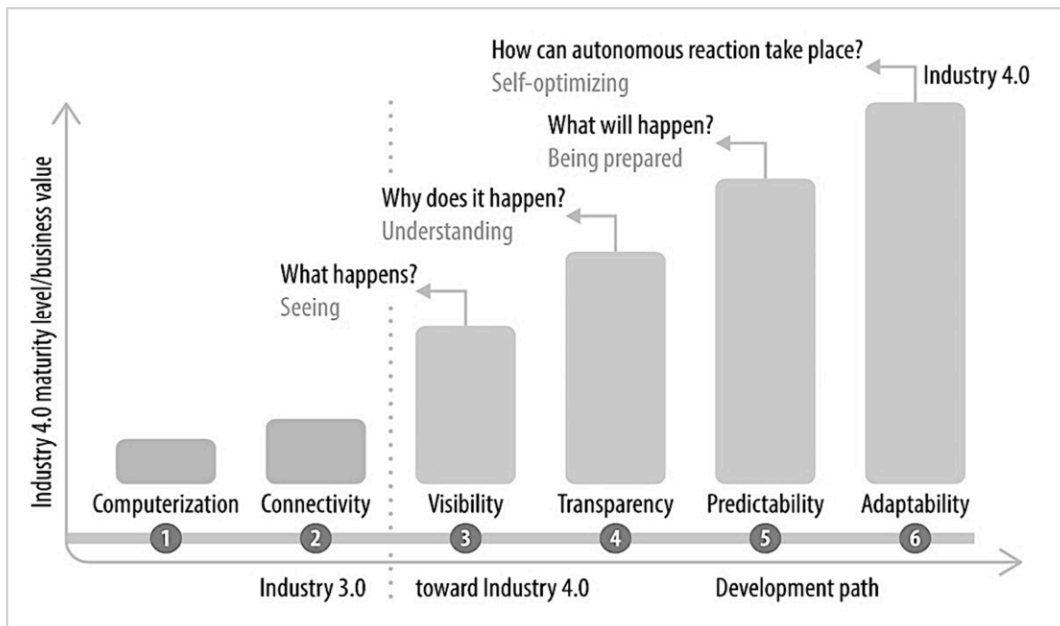


Figure 2: Visibility as a gateway to higher cognition (Schuh et al., 2017)

Depending on the industry, the inventory record inaccuracy (IRI) has been reported to be at a 30-80% level [32,7,27], which has led to several managerial challenges within SC (e.g., bullwhip and ripple effect) [3,37,19]. SCV provides a solution to IRI, which combined with SCM challenges (e.g., ever-shortening product lifecycles, quick constant changes, and increasing customer requirements) demand a new approach [12].

The technical approach to SCV can be provided through an automated product identification and tracking solution, which has three main elements in a typical system: (i) an ID (e.g., serial numbering, bar coding, radio-frequency identification), (ii) integration and reading infrastructure (e.g., antenna or camera with an artificial intelligence engine), and (iii) cloud solution generating, managing, and displaying data on inventories. Benefits for the SCM are obvious efficiency gains; global consultancy Kurt Salmon Associates reported in an RFID Retail study that automated product identification and tracking (i.e., SCV) provided 11-60% improvements in six performance indicators (customer satisfaction, inventory accuracy, stock-outs, shrinkage, profit margin, and markdowns) [32] among retailers reporting experiences from system implementation. In many cases, the design of the SCV system is also connected to solving company and industry-specific dilemmas, e.g., how to minimize food waste in the grocery retail industry. Although the number of core technologies is limited, studies have reported high versatility of adoption between industries [33, 38]. Some industries (e.g., fast fashion) have proven plug-and-play solutions for SCV implementation, while many others tend to be still working with manual serial numbering and tracking [33].

The emergence of SCV is also partly a consequence of new data-savvy technologies and the industry 4.0 (I40)

research trend, which proposes a shift in business models when data is translated (with e.g., advanced analytics, machine learning, and artificial intelligence) to modern IT capabilities and customer experiences (Schwab, 2016). While the I40 is a common research interest in digital transformation studies, it provokes organizations to innovate new cross-functional connections that can improve and renew the traditional roles of functions and organizations among their peers. In an I40 framework describing the maturity and roadmap for digitalization, introduced in Figure 2, SCV is proposed to be a gateway for a firm to higher cognition tools as it can create a digital twin and provides data for advanced analytical data processing [39].

III. CONCEPTUALISATION OF SCV-MO

The interest in SCV-MO connection comes from some of the leading firms in the textile and fast-fashion industry, who have been keenly studied by scholars to understand their supply chain strategy and operational model. The observations present that they use real-time and item-level data from the supply chain to understand the current inventories and market demand to optimize e.g., what kind of products customer desire and how to optimize the store-level stock replenishment to avoid excess inventory build [31]. Thus, these firms have built a strong SCV capability which is used cross-functionally in an intra-firm context.

This theory paper proposes a conceptual model in figure 3 that in practical terms illustrates how SCV can be used as a real-time sensor of the marketplace demand, which by connecting to MI function can drive the innovativeness of a firm as presented by Kirca et al. [15]. The model proposes that the assimilation of SCV data to cross-functional use should occur on two levels: on the operational level as an ongoing

information supply from markets to new product/service development (NP/SD), offering decisions, and marketing promotions (MP); and on a strategic level monitoring the long-term responsiveness of the business introducing improvements to the strategic business plan (BP).

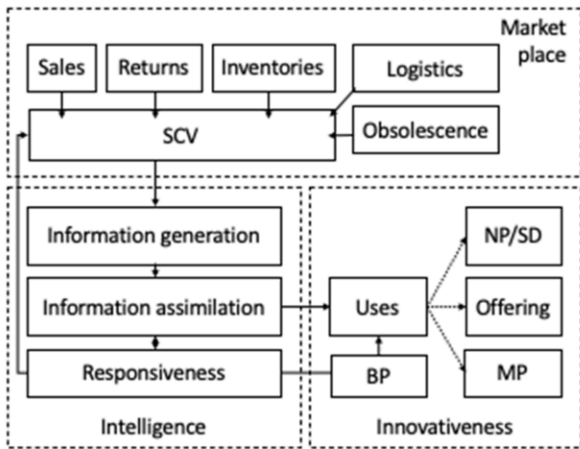


Figure 3: Conceptual framework

The conceptual framework is used in figure 4 to establish a relationship model that presents operational relationships between SCV-specific data sources (both from online and offline touchpoints) and their cross-functional operational uses marked as demand pulses (DP) in the figure. The relationship model exemplifies also the long-term strategic perspective to demand fluctuations that the responsiveness functionality monitors to identify trends needing attention from organizational design to stay competitive. The DP's (on the left) and trends (on the right) mentioned in the model is illustrative and meant to showcase how the relationship model can be used to research relationships and causalities.

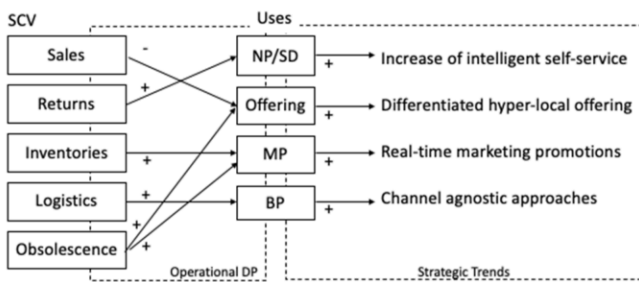


Figure 4: Relationship model

IV. DISCUSSION AND RESEARCH AGENDA

The theoretical paper presented approaches to theory building from an abductive perspective [see e.g., 30] and draws attention to the data-driven practices demonstrated by some of the leading firms in the textile industry. It presents an interesting phenomenon that lacks theoretical backing, which

is the gap filled in this paper by the formation of the SCV-MO conceptual model. It can be used to expose and research relationships between data sources and uses in a cross-functionally integrated organization to understand what kind of ties and methods support organizational performance, and further contribute to theory building in SCV, MI, and MO.

Although the paper draws from the example of the textile industry, the authors claim that the need for SCV-MO connection is universal and is more connected to speed, agility, and data-driven business models than to a specific context in a certain vertical.

As the research agenda, the authors propose studies that respond to some of the most striking research questions arising from the SCV-MO model:

- How can the implementation of the SCV-MO model support organizational performance? E.g., empirical studies illuminating new cross-functional data-sharing practices and their impact on key performance indicators followed in an organization.
- How SCV practices should be optimized to support cross-functional utilization? I.e., how the broader utilization of SCV data in an organization influences the data collection practices. For instance, if the customer desires are needed to understand, potentially understanding the purchase basket compositions is a critical data point needed in the offering development and marketing promotion although it would not have significance to supply chain management.
- What kind of cross-functional processes should support the value capturing of SCV-MO? This is a theme that is highly essential in the current business environment, where it has been unclear how to organize and re-structure the organization to become more collaborative and cross-functional, and less functionally organized with clear boundaries in the roles and responsibilities. One example of such is the emergence of agile organizations, which aim to tear down internal fences.
- And, how the reverse utilization of the information flows should be applied, i.e., how SCM can further optimize their processes in procurement, capacity building, and preparations by understanding the conclusions made at the marketing units.
- Finally, as many of the previous questions are qualitative by nature and intended to explore the new research agenda, quantitative approaches are needed to explore and validate the cross-functional relationships observed in an SCV-MO setup as it is exemplified in Figure 4.

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