Defining value chain architectures: Linking strategic value creation to operational supply chain design

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ABSTRACT

Over the past three decades scholars have developed comprehensive insights into the operational and strategic aspect of designing and managing the supply chain. Reviewing this ample body of knowledge however one cannot help but notice a persistent disunion between the "value chain" view that considers aspects of value creation and appropriation, and the operational "supply chain" view that considers strategies and tools for designing and operating efficient inter-firm networks. Commonly these views do not interact: value creation has the aim of capturing the maximum value-added in financial terms, the supply chain view aims for designing operationally efficient supply chains. In contrast to their treatise within the academic literature, from a practical point of view these two aspects are both necessary (and thus in their own right insufficient) components to a firm's supply chain strategy. In this paper we thus turn to an exploratory case study to identify what such a combined view of the value *and* supply chain would entail. We refer to this purposeful creation as the "value chain architecture" and propose five fundamental decisions that define the latter: (1) the nature of value provision (driven by the core competence of the firm), (2) the operational footprint decisions for manufacturing, sourcing and distribution, (3) the approach to risk management, (4) the order fulfillment strategy (and implicit in that, the type of product customization), and (5) the buffering strategy. We conclude with an exploration of the application and utility of the "value chain architecture" concept in both academia and practice.

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1. Introduction

The rapid evolution of Supply Chain Management (SCM) as a sub-discipline within Operations Management (OM) provides strong evidence that, as Martin Christopher put it, companies no longer compete but entire value chains (Christopher, 1998). A wealth of studies and reviews, too numerous to cite here, coupled with the remarkable successes of companies such as Wal-Mart, Amazon, Dell, Toyota, Zara and the like, provide an unequivocal case that a company's ability to design and manage its value chain has become a cornerstone of contemporaneous management. The management literature covers these cases well, as for example in the cases of Dell's build-to-order value chain strategy (cf. Fugate and Mentzer, 2004; Holweg and Pil, 2001; Kapuscinki et al., 2004) or Zara's quick response manufacturing (Ferdows et al., 2004). While the overall language is well developed, and there is insurmountable evidence that value chains differ substantially in their morphology according the type of product being supplied (Lamming et al., 2000), a general classification of value chain

architectures—at the firm level–is sill amiss. In fact three decades into SCM research there remains an interesting dichotomy between the "value chain" view that considers aspects of value creating, appropriation and financial aspects of the supply chain, and the operational "supply chain" view that largely considers strategies and tools for designing and operating efficient supply chains. Commonly these views do not interact. We argue that this is a fundamental gap in bridging the strategy and OM literatures where we lack conceptual understanding of the "structural" aspects of why these supply chain structures work for certain firms, but may not for others.

In this paper we are using an exploratory, longitudinal case study to investigate the analogy of an "architecture", i.e. the purposeful design of a value chain. Conceptually we see the "value chain" as an equivalent to product and process architectures, where such "purposeful" design has been proposed before (Baldwin and Clark, 1997; Hayes and Wheelwright, 1979; Ulrich, 1995). In proposing a "value chain architecture" we seek to build a bridge between the research on value creation strategies in the supply chain context (Normann and Ramirez, 1993; Pil and Holweg, 2006), and the work on supply chain design (Beamon, 1998; Meixell and Gargeya, 2005). Our paper builds on earlier work seeking to link product and process architectures with

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supply chain design (Fixson, 2005a; Rungtusanatham and Forza, 2005). We also draw upon the initial quantitative descriptions of *supply* networks (Harland et al., 2004; Harland, 1996; Lamming et al., 2000), and build on this prior work along three dimensions: firstly, we extend the often restricted focus of *supply* (*chain*) *management* beyond the immediate supplier tiers, to encompass the entire *value chain*, in other words, the system that includes all value-adding steps, from raw materials to the distribution system that delivers the product or service to the end customer. Secondly, in addition to the mostly qualitative description of value chain architectures, a combination of qualitative and quantitative measurements and descriptors of a value chain configuration is presented. Thirdly, we argue that a key tenet of defining value chain architectures is to consider the alignment between process, product and supply network configuration.

The paper is organized as follows: in Section 2 we will introduce the distinction between a value chain and a supply chain view in more detail, before introducing the method used in this case study in Section 3. The case findings are presented in Section 4, followed by the discussion of key findings and implications in Section 5.

2. Literature review

2.1. A need for more definitions?

As Gibson et al. (2005) argue, SCM has evolved over time in the same way as all academic fields evolve as the field evolves, so do the related key concepts under investigation. In this sense one might rightfully argue that yet another paper on the (natural) evolution and of the supply chain concepts adds little value to the advancement of the field—given that a set of comprehensive reviews on all aspects of supply chain management is available (Barney, 2012; Beamon, 1998; Bertrand, 2003; Burgess et al., 2006; Christopher and Ryals, 1999; Cooper et al., 1997; Holweg and Pil, 2008; Lambert et al., 1998). We sympathize with this argument, however would argue that a key gap remains in the disunion of bridging the operations-strategy gap in SCM. This review will thus first and foremost focus on this aspect.

2.2. Supply chain or value chain?

The original term "supply chain management" had a very operational connotation when Booz & Allen consultants Oliver and Webber first proposed it in 1982 by telling firms to "manage total supply chain inventories" (cited in Christopher, 1992). To this date this operation's focus has remained, aiming for a design and operating stable and efficient supply chains. On the other hand there is the "value chain" concept originally proposed by Porter, which takes a financial view of the sequential value creation process in a network of firms (Porter, 1985). Hence, even though often used synonymously, there is a specific difference in perspective on the same phenomenon: value is created in sequential steps by a set of distinct firms.

The aspect of value creation and appropriation has been introduced as "value constellation" and "value grid" (Normann and Ramirez, 1993; Pil and Holweg, 2006), suggesting that firms are well advised by going beyond the linear view of managing dyadic supplier relations. In fact, as the cases cited by these two aforementioned studies show, considerable additional value can be captured by thinking across value streams, as well as by thinking how managing or influencing other tiers than the immediately adjacent ones can yield considerable benefit to the firm.

The key assumption in this "value" view of the supply chain is that firms can enhance their competitive position by considering the value streams they are operating in, as well as other parallel ones that use the same supply and distribution and retail chains as a "grid" in which they operate. This assumption is fundamentally different from the "supply" view, which argues that the most value can be added by ensuring the linear flows of information and material occur with as little disruption as possible. Avoiding excess inventory, the bullwhip effect and long lead-times are key objectives here. As such these assumptions, as we will argue here, are not contradictory but in fact complimentary. They have, however, so far not been merged into one conceptual framework. This paper marks a first attempt in doing so.

2.3. Strategy or architecture?

A central question one might ask is: do we need another term or definition? Is not all of this part of supply chain "strategy"? In our view it is only partly so. An architecture is defined as "a unifying or coherent form or structure" in the English language, and we apply exactly this notion of a purposeful structure to the design of supply chains at firm level. We hereby consider two objectives: to capture maximum value, with the least operational inefficiencies in providing the former.

The value chain architecture thus is essentially a function of the operations strategy. The decisions of the location of manufacturing operations, the sourcing patterns, and the configuration and customization of the products are all questions that reside within the realm of the wider business or operations strategy. The differential benefit of determining the value chain architecture that can be seen here is the ability to systematically describe the design of large network structures of value chain partners, and set overall objectives for the whole network or specific processes. In general, architecture describes the concept of creating an actual or apparent plan of a complex system, where it basically describes a subjective mapping of the elements or components of the system, which considers the relationships among these components.

We hence propose the term 'architecture' as an analogy to the way in which the term 'product architecture' has been used to distinguish between modular and integral, as well as open and closed product architectures (Ulrich, 1995), or process architectures to determine the appropriate manufacturing process in relation to volume and variety (Hayes and Wheelwright, 1979). While both product and process architectures have been widely discussed, the complexity inherent in value chains (multiple levels, network structure, dynamic and static complexity) have so far meant that value chain architectures have not been classified in the same way. In many ways it is simply not possible to talk about binary classifications such as 'modular' versus 'integral' value chain structures. Another factor is the fact that the structure of a value chain determines its dynamic behavior, as for example in the bullwhip effect shows, where removing an echelon has strong benefits for the dynamics behavior (Forrester, 1958; Lee et al., 1997; Metters, 1997).

The purpose defining a value chain architecture is to provide a common language and structure for this mapping process by proposing ways in which to classify them. Such a definition is needed for strategic planning and alignment of the elements, and thus should not only be of academic interest, but also have important managerial implications.

It is implicitly known that the alignment of architectures is a necessary, but not sufficient condition for success. We only make this explicit in product-process (Hayes and Wheelwright, 1979), and product-value chain (for example modularity). The '3D model'