Chapter 9
Aligning Product Design with the Supply Chain: Towards a Responsive and Resilient Enterprise

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ABSTRACT
The continued rise in global sourcing and manufacturing has significantly extended supply chains for many companies and has added to their complexity, often implying business fragmentation and virtualization, and thus increase supply chain risk. At the same time, there is now a growing realization that the supply chain ‘begins on the drawing board’; meaning that design decisions can dramatically impact the risk profile of the business. Historically, most organizations have been functional in their structure with responsibility for each stage in the value chain, including design being separate from the other. In today’s challenging markets these ‘silo’ type structures have been found wanting as typically they are not capable of rapid response to fast-changing requirements. This paper is focused on the need to bring design into the heart of supply chain management to achieve a more responsive - and hence competitive - organization. Thus, the primary purpose of this paper is to propose that one of the ways to achieve a more responsive and resilient enterprise is by better aligning product design with the supply chain and hence developing a concurrent design strategy. The recommendations suggest ways in which managers and key decision makers can adopt a more ‘design centric’ approach to their supply chain, which has been shown to enhance the resilience and responsiveness of a firm.

INTRODUCTION

The globalization of supply chains and the trends to outsourcing and offshore manufacturing in search for lower costs have paradoxically exposed businesses to new risks and supply chain risk management has fast become a subject of heightened interest both in academic research and businesses world-wide (Cranfield, 2003). At the same time there is growing

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realization that the supply chain begins on ‘the drawing board’; meaning that design decisions can dramatically impact the risk profile of the business (Krishnan & Ulrich, 2001). Hence, it is vital that design activities are integrated into the wider remit of supply chain management to increase a firm’s resilience. As supply chains are longer and based on wider geographical areas, companies should find ways in which they can be more responsive and resilient. This requires more than simply introducing tools and techniques which can be useful in managing the day-to-day operations. It requires more strategic and organizational changes for better coordinating the supply chain processes with its product design processes as design is inextricably linked to supply chain risk. Therefore managing the alignment of product design and supply chain can bring significant benefits to supply chain performance, but likewise the misalignment could be disastrous for the supply chain. For example transportation costs and lead times can be affected by early design decisions and risk can be increased by being locked-in single source components (Burkett, 2006). Early involvement of supply chain professionals at the design stage could highlight and eliminate some of the risks that may creep up later in the supply chain when the costs to re-engineer the product or re-design the supply chain will be significantly higher, not to mention a major barrier to responsiveness. Unfortunately the evidence seems to be that, too often, product design decisions do not consider the through-life implications for the supply chain leading to obsolete stock in pipelines, market failures because of late product introductions and ultimately having dire consequences on a firm’s ability to achieve market success.

A key challenge facing organizations in which design is a critical function is to integrate design and supply chain management in order to effectively meet customer needs and manage supply chain risk. The failure to do so could create problems at the manufacturing or logistics stages in the supply chain and thus, increase the risk of supply chain disruption. These ideas signify that we must regard design as much more than just an activity which creates novel solutions or brings stylistic changes to products. There is in fact a more strategic role for design which impacts the total supply chain (Abecassis, 2006; Ragatz et al, 1997).

The purpose of this paper is to understand the strategic relationship between product design and supply chain performance and how better alignment between the functions contributes towards building a more responsive and resilient supply chain. We first build a conceptual framework by reviewing the literature of the key areas using a structured and evidence-informed approach (Tranfield et al, 2003). This approach enables us to identify, select and analyze secondary evidence which contains any of the pre-defined research terms that were developed when we started the research. The major advantage of a structured literature approach is that it allows the researcher to undertake an in-depth and focused analysis of data which is most specific to the research. We then present the findings of three companies that were investigated to further explore the alignment between product design and the supply chain and to identify how the alignment contributes to a responsive and resilient enterprise. Following on from our cross-case examination we develop some general prescriptions and recommendations on aligning product design and the supply chain and illustrate this with a roadmap which we have developed from the research findings.

**THE IMPORTANCE OF DESIGN: A CREATIVE TOOL TO ENHANCE COMPETITIVE ADVANTAGE**

“Design is the second most important ingredient of success for rapidly growing businesses, 50% of manufacturers say that design is increasingly important to their competitive edge” (Design Council, 2004-2005).