

Chapter 22

Integration Strategies for Electronic Device Supply Chains

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ABSTRACT

The growth in the manufacture and distribution of electronic devices is one of the most significant sources of continuing innovation of the last half-century. These products are notable in that they integrate physical elements (i.e. hardware) and virtual elements (e.g. software) to deliver value to customers. This chapter examines the role of innovation in electronic product supply chains by exploring the commonalities and differences between the distribution models of digital and physical elements and examining alternative frameworks from which digital and physical distribution methods can be merged. A number of contemporary case studies are presented that highlight how the different elements can work together to deliver continuously innovative value to customers.

INTRODUCTION

One of the most significant trends of the last thirty years has been the massive increase in the number of digital devices in use. Products in this category are notable in that they need to seamlessly incorporate physical and virtual elements, often referred to as hardware and software. These elements are quite different, but nevertheless they need to work together in a closely integrated way.

From a supply chain (SC) perspective, hardware and software are dissimilar in many ways. Hardware is relatively expensive to procure, manufacture and distribute. It requires long lead times and strict management of yields and inventory, as well as compliance with multiple directives such as electromagnetic interference and waste disposal. Its design and functionality is difficult to change and product lifecycles can be comparatively long. Software, on the other hand, is primarily a creative, person centred activity. Once released, it is relatively easy to distribute

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and change. Lifecycles can be much shorter, and issues such as product returns or inventory management do not apply.

The challenge, therefore, is how best to integrate these two heterogeneous factors in the context of relentless and rapid innovation. The incorporation of the software supply chain into the hardware supply chain is a key concern for device manufacturers, particularly as the Internet and online software distribution continues to gain greater prominence.

This chapter looks at ways these different elements can be integrated within hi-tech supply chains in order to maximise value for customers and consumers in a cost effective way. It starts by contrasting dimensions of traditional physical product supply chains and the wider concept of supply chain management (SCM) with digital product supply chains and the distinctive ways of managing them and outlines potential interfaces for integration and innovation. Very little research has been published that links innovation management to digital products. To close this gap, new approaches for management of innovation in the context of digital products are presented. Although digital products potentially offer considerable advantages to innovators as they are less constrained by physical constraints, they also present significant challenges for innovators. Hybrid approaches are therefore explored, where the best of both worlds, physical and digital, can be applied. The authors conclude their theoretical framework by outlining some current physical and digital supply chain integration examples and by determining likely innovative supply chain scenarios on how these strategies might develop over the coming years.

BACKGROUND

This section sets out the background to this chapter by introducing traditional physical supply chain concepts and contrasts them to digital product

supply chain frameworks. It outlines the importance of supply chain integration in a physical and digital context and sets the scene for the effective management of supply chain innovation cycles as a critical component.

Physical vs. Digital Product Supply Chain Frameworks

A myriad of different definitions of supply chains and their effective management exist in literature. Supply Chain Management in a traditional sense is concerned with the strategic management of a firm's activities, which together provide customers with the appropriate level of service at optimum cost (Christopher, 2005; Lambert et al., 1998; Sweeney et al., 2005). Chou and Ruchika (2006) note that the aim of supply chain management is to ensure that a product moves down the chain in the most effective manner, so as to maximise profits earned by the whole chain as well as minimise wastage of raw materials, labour and time. Supply chains can be external (macro) or internal (micro) in nature. Pant, Sethia and Bhandari (2003) define the supply chain in a macro-perspective as *"a connected series of (networked) organisations (suppliers, original equipment manufacturer, distributors, transporters, etc.), resources, and activities involved in the creation and delivery of value, in the form of both finished products and services to end customers"*. An organisation's external supply chain is further interlinked with the micro or intra-firm supply chain that addresses the integration of different functions within an organisation. Supply chain integration (SCI) aims to facilitate the flow between all organisations in a supply chain and thus positively affects operational performance (Naylor et al., 1999; Bagchi et al. 2005). The sharing of information is a critical success factor if seamless product and money flows between initial suppliers and end-consumers are to be achieved. Supply chain management as such allows value-add to customers starting from product design to delivery through the planning,

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