Chapter 45
Physical and Digital Integration Strategies of Electronic Device Supply Chains and Their Applicability to ETO Supply Chains

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ABSTRACT

The growth in the manufacture and distribution of electronic devices presents a source of continuing innovation. Electronic devices are products that integrate physical forms (i.e. hardware) and virtual forms (e.g. software) to deliver value to customers. These forms are very different from a product design and supply chain perspective, but nevertheless they need to work closely together in order to create value for the customers. For electronic device manufacturers, it is important that processes are in place to facilitate the seamless integration of both forms throughout the engineering, production, distribution and support stages of the product lifecycle. This chapter examines the role of physical and virtual supply chain innovation strategies in electronic device supply chains by exploring the commonalities and differences between the design, manufacturing, and distribution models of digital and physical elements. It also explores to what extent such strategies can be employed for engineer-to-order (ETO) supply chains.

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INTRODUCTION

One of the most significant trends over the last few years has been the massive increase in the number of electronic devices in use. Examples of such products are smart phones, tablets, watches, camcorders, vehicles and many different kinds of industrial, military and healthcare devices. The growth in the manufacture and distribution of electronic devices presents a source of continuing innovation. Electronic devices are products that integrate physical forms (i.e. hardware) and virtual forms (e.g. software) to deliver value to customers. These forms are very different from a product design and supply chain perspective, but nevertheless they need to work closely together in order to create value for the customers (Wagner & Ryan, 2009). For electronic device manufacturers, it is important that processes are in place to facilitate the seamless integration of both forms throughout the engineering, production, distribution and support stages of the product lifecycle.

Although digital products potentially offer considerable advantages to innovators as they are less constrained by physical properties, they also present significant challenges. Hybrid approaches are explored, where the best of both worlds, physical and digital, can be applied. The merging of physical and digital elements into an integrated product creates a supply chain that is very different to a purely physical situation. Supply chain management principles of such a hybrid product approach can be derived from the concept of servitisation, which refers to the bundling of products and services into one harmonised product offering. Services and software are two very much overlapping concepts. Typically, in a hybrid product bundle, software as the digital element of the product is an enabler behind a service. While the software can be copied, a service is more difficult to emulate because it often incorporates non-digital elements. The authors introduce a digital SC framework by outlining some current physical and digital supply chain integration and distribution examples and by determining likely innovative supply chain scenarios on how these strategies might develop over the coming years.

Thus, this chapter examines the role of physical and virtual supply chain innovation strategies in electronic device supply chains by exploring the commonalities and differences between the design, manufacturing, and distribution models of digital and physical elements. The aim is to identify to what extent such strategies can be employed for engineer-to-order (ETO) supply chains. Gosling and Naim (2009) see ETO as a supply chain where the decoupling point is located at the design phase of a product. Integration between design and downstream supply chain activities is paramount.

BACKGROUND

Research in operations management, marketing and supply chain management has predominantly studied the relationships between upstream manufacturers and downstream retailers in supply chains for physical goods (Chellappa & Shivendu, 2003; Padmanabhan & Png, 1997). Physical goods are so defined because they obey physical laws. They possess mass and occupy volume. Over time, they can break down and degrade. It is not possible to create products without first sourcing appropriate materials. Energy (which also needs to be sourced) is expended in transformation and transportation. It could be said, therefore, that a large proportion of SCM has to do with overcoming the constraints imposed by physics on the products under consideration.