Impact of Product Characteristics on Supply Chains: An Analytical Literature Review

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ABSTRACT
Supply chains are typically considered to consist of many stages across several organizations starting from raw material sources through component production to manufacturing and further on via distribution operations to B-to-B customers and consumers. This paper focuses on analyzing product-related characteristics: what the characteristics mentioned in the literature are, and the impact they have on the structure and design of supply chains. The authors look at how product characteristics in general influence the design of supply chains, and their effect on different stages of supply chains. In the literature analysis, the focus is on examining the impact of product characteristics on supply chain strategy and structures, purchasing, manufacturing, distribution, and logistics services. Finally, they draw conclusions on the above. The contribution of this paper is twofold. Firstly, based on supply chain management literature, the authors propose a framework for analyzing the impact of product characteristics on supply chains. Secondly, at the end of the paper, they extend the framework by summarizing the key results pertaining to each supply chain management area under analysis. These include the characteristics of the main frameworks used in previous studies and the generic product characteristics used.

Keywords: Distribution, Logistic Services, Manufacturing, Product Characteristics, Purchasing, Strategy and Structure, Supply Chains

INTRODUCTION
Supply chains have been regarded as vertical connections between members of networks stretching from raw material production to end-user consumption. More recent definitions of supply chain management tend to emphasize the strategic and the value creation aspects of supply chains, recognizing the crucial nature of the effectiveness and efficiency of a supply chain in providing value to ultimate customers. We can observe supply chain structures through a variety of performance and design criteria. Each supply chain and its design seem to have
a connection to the type of products it focuses on. Thus, product characteristics seem to have an influence on supply chain designs, manufacturing, supply and distribution structures, as well as on other operations. Such product characteristics are, for example, the number of product choices given to customers, the product mix manufactured, or the product complexity.

There are a number of frameworks focusing on supply chains, and several of these frameworks also recognize the influence of product characteristics on supply chains. However, there are relatively few studies focusing on the impact of product characteristics on supply chains and summarizing these characteristics and impacts. Therefore, in this paper we provide a systematic and analytical review of articles with a focus on product-related characteristics and their impacts on supply chain structures and design. As part of the analysis we suggest a framework for classifying the impacts of product characteristics on different parts of supply chains, from strategy and structure to purchasing, manufacturing, distribution and logistics services.

It has long been recognized that, in manufacturing operations, the structure of manufacturing is profoundly influenced by the product. Other parts of supply chains are similarly influenced. For example, the distribution structure of a company is dependent on the type of product it delivers to its customers. During recent decades the trend to outsource has increased, and this has influenced the kind of products or parts that are outsourced. Consequently, our objective in this paper is to analyze how the literature describes product characteristics: what the recognized characteristics are, and how they impact supply chains in general and the different stages of supply chains in particular. We also provide examples of products that are presented in the literature.

We start by summarizing the different approaches to supply chain management and defining our approach; i.e. we propose a framework. Then we review the literature and its focus on describing and analyzing product-related supply chains. In particular, we look at the impact of product characteristics on supply chains in general (at the strategic level), as well as on the different stages of the supply chain – purchasing, manufacturing, distribution and logistics services. Thereafter, we look at each of these supply chain stages in greater depth. Finally, in the discussion and conclusion section, we analyze and summarize the findings of the study by applying and extending the framework to key issues.

DEFINING SUPPLY CHAIN MANAGEMENT AND A FRAMEWORK FOR ANALYSIS

Supply chains have been defined as consisting of vertically networked companies extending from raw material production to consumption by end-users. According to one of the first definitions given by Stevens (1989), a supply chain is a connected series of activities involving the planning, coordinating and controlling of materials, parts and finished goods in their journey from the supplier to the customer. It is concerned with two distinct flows – those of material and information – through the organization. Christopher (1992) also includes the service aspect in his definition, in which supply chains consist of networked organizations connected by up and downstream linkages, activities and processes to produce value in the form of products and services for ultimate customers.

There is a variety of definitions available on supply chain management. In general, supply chain management (SCM) includes the integration and performance of manufacturing activities and logistic services (Pagh & Cooper, 1998). Lambert et al. (1998) highlight business processes in their definition of supply chain management: “supply chain management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders”. Moreover, in their definition, Mentzer et al. (2001), emphasize the strategic approach and long term performance, and define SCM as “the systematic, strategic coordination
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