Chapter 3
Engineer-To-Order Product Development: A Communication Network Analysis for Supply-Chain's Sustainable Competitive Advantage

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ABSTRACT

Industrial manufacturers' complex product-development activities have seen various advancement and improvement approaches over the past decades. In order to enable the implementation of efficient and effective product-development support processes in the quest of achieving shorter product development lead-times and higher return on investments (ROIs). Engineer-To-Order (ETO) product capacity projects, including large electric machine, huge centrifugal pumps, Diesel/Natural fuel power plant engines, steam turbine, boiler, ship, etc., have challenges concerning their long product-development lead-times. The challenges confronting these enterprises industrial Original Equipment Manufacturers (OEMs) are enormous with one of the major ones being the effective and efficient network or flow of technical communication among the main stakeholders for complex / new product-development. Moreover, with all the industrial manufacturing complex product-development process improvements, in terms of complex engineering design and delivery, there are still a lot more variances to be addressed on the 'better, faster and cheaper' paradigm. Furthermore, attention is needed on efficient information exchange systems as well as effective operational communication in their complex product-development processes for a sustainable competitive advantage. Therefore, this paper presents a proposed optimum conceptual information technology systems' architecture towards enhancing an industrial sustainable competitive advantage: By employing social network theory (SNT) analysis to advise on a strategic and effective communication network for industrial supply-chain (SC) sustainable competitive advantage.

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INTRODUCTION

Engineer to order as popularly known as ETO; (ETO) is a manufacturing process whereby finished goods are built to unique customer product specifications. Engineer to order products may require a specific set of item numbers, bills of material (BOM), and routings; these are usually complex with long lead times. ETO is a product-development process, which starts with a product specification and finishes with an engineering design as its deliverable, it rarely sometimes includes a bit of practical manufacturing processes. It is usually limited to an engineering design process which involves the tasks of engineering analysis, concept design, architectural design, detailed design and manufacturing process design. These are all technical communication network processes of the complex / new product to be developed, which needs proper effective and efficient coronation for sustainable competitive advantage. Therefore, in order to sustain competitive advantage and operational survival; industrial organizations have been compelled to implement new strategies, based on collaboration with their SC partners and an advanced utilization of information technologies (IT) systems and Internet-based services (Geunes, Pardalos, & Romeijn, 2002). According to Musa, et al., (2014) end-to-end supply-chain product visibility (i.e., product tracking and tracing) has been exploited as a means of product support security, process control and optimisation in many industrial sectors. Including huge complex products such as jet engines - aviation, ship power engines - marine, automobiles, etc., (Maier, et al., (2008); Hsu, and Wallace, (2007); Addo-Tenkorang, and Eyob, (2012)). Chandra, and Grabis, (2007) Identified some key triggers for designing and implementing SC with regard to effectiveness, efficiency, flexibility and responsiveness. This key triggers include; introduction of new/complex product(s), upgrades for existing product(s); introduction of new or improvement in an existing product development support process (es). In addition are, allocation of new or re-allocation of the existing resource(s); selection of new supplier(s), de-selection of existing ones; changes in demand patterns for complex product(s) manufactured; changes in lead-times for product and/or product support process life cycle; and changes in commitments among the SC network partners, etc.

The challenges confronted by industrial SC networks are severe. Some of the real-life pressures include growing customer demands, inflexible global competition, and the need to improve new/complex product development's time-to-market (Murman, Rebentisch, & Walton, (2000); Molina, Aca, & Wright, (2005); De Brentani, Kleinschmidt, & Salomo, (2010)). All these challenges can be effectively dealt with, if the information exchange flow as well as communication network among them is effective and efficient. Hence, integration approached programs, applications and processes involving all the SC stakeholders in complex / new product-development *(i.e. customers, suppliers, marketers, accountants, design engineers, production engineers, manufacturing engineers, etc.)* during the capacity management, enhances the ETO supply chain. Thus, this integration process turns to shortening the delivery lead-time for customer specification (Swafford et al., 2006). Moreover, customer relationship effects in ETO process integration in the supply-chain, increases understanding in customer demand, managing complaints and improving customer satisfaction which critical responsive element through the ETO value chain (Li et al., 2006; Holweg, 2005). According to Zhou and Benton (2007) quality information, sharing on a common and assessable platform among stakeholders enhances ETO supply chain practices such as just-in-time (JIT) and lean lead-time delivery. Thus, the capability to collect and disseminate various data or information stakeholders across ETO supply-chain network concurrently is imminent in order enable internal manufacturing strategies to respond effectively to the needs of customers.

Related Content