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Designing an effective closed loop system for pallet management

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Abstracts: Pallets are currently the most widespread system for internal material handling and logistics of goods through a supply chain: they represent a critical asset for all firms, especially for Logistics Service Providers (LSPs). Analyzing pallet management systems according to a logistics point of view is quite a new research trend. Open or closed loop networks are now applied worldwide for pallet logistics: the latter is more complex to design and manage due to the presence of a reverse logistics process; several inbound and outbound processes have to be assessed. On the other hand, closed loop systems are the most effective, both from an environmental and an economic point of views. The aim of the paper is to outline critical factors (such as the pallet logistics network, the interchange system) in designing closed loop pallet management systems; a simulation-based tool has been developed in order to support logistic managers in designing effective organizational scenarios for these systems. Cost and time based KPIs will be estimated by the simulation model. A case study about a LSP firm has been also analyzed in order to validate the proposed model. A sensitivity analysis has been carried out aiming to evaluate impacts on supply chain performance due to context parameters. The proposed study could support both practitioners and academics in better understanding the key management aspects involved in closed loop pallet management, thus allowing a most effective design of this critical reverse logistics system.

Keywords: Closed loop; Pallet management; Logistic service provider; reverse logistics, Discrete-event simulation; Scenario analysis.

1 Introduction

Packaging nowadays could represent for all companies an important source for improving the efficiency of their operations, especially for Logistics Service Providers, LSPs, (Marasco, 2008; Prockl et al., 2012; Kye et al., 2013). The most widespread packaging type used for material handling and transportations is the pallet: a pallet is a portable, rigid platform used as base for assembling, storing, stacking, handling and transporting goods. Palletized loadings allow companies to optimize logistics costs as the load could be transported and stored as a unique unit. Several pallet types are available in the market in order to respond to the huge variety of goods loading requirements; furthermore, pallets could be made of various materials, such as wood, metal and plastic (Clarke, 2004), although wooden ones are the most common (Buehlmann et al., 2009) in the U.S. as in Europe. The number of pallets in use all over the world is very high: Kim et al. (2009) report that the total number of pallets in use in the U.S. is estimated to be 1.9 billion. A recent market research (Freedomia, 2013) forecasts an increasing trend of the annual demand for new pallets: about 3.5% per year until 2017. According to an economic point of view, Dallari (2010) outlined in a recent field analysis about the Italian market, an unitary management cost for LSPs about 1.2 € and a unitary purchase cost about 9 € for wooden

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