

Inaccuracies within a Decentralized Supply Chain: A General Framework[★]

Yacine Rekik^a, Zied Jemai^b,

^a*EMLYON Business School, 23 avenue de Guy de Collongues, 69130 Eculy, France*

^b*Ecole Centrale Paris, Grande voie des vignes, 92365 Chatenay-Malabry, France*

Abstract

One of the implicit assumptions considered in the majority of investigations performed in the area of inventory management is that the physical flow of products that passes through an inventory system as well as the associated information flow are free from defects, i.e. for a given type of product, the quantity received matches exactly the quantity ordered or there are no errors occurring during the data capture process such that the level of the available inventory shown by the information system corresponds exactly to the physical quantity available. However, various factors can create a difference between the expected and the effective physical and information flows and perturb the synchronized evolution between these two flows. The performance of such inventory systems whose flows are disturbed by defects can be improved by using advanced product identification and data capture technologies such as the RFID (Radio Frequency Identification) technology. This paper deals with the impact of inaccuracies on inventory and supply chain performances. We first give an overview of potential errors that may occur within an inventory system. Then, we propose a general framework to model the impact of errors and we provide analytical optimal solutions for both centralized and decentralized supply chains. For the centralized case, we evaluate the performance improvement enabled by the RFID technology on such inventory systems

Key words: Inventory management, errors, inventory inaccuracies, Newsvendor problem, product identification and data capture technology, RFID technology.

1 Introduction

So far, many research have alluded to the tremendous payoff that is associated with an effective management of operations ([12], [9]). Companies adopting innovative supply chain management solutions that enhance the value added to customers at a lower cost are improving their competitive advantage. Nowadays, the RFID technology which is one type of AIDC system (Automatic Identification and Data Capture) currently available is becoming the basis for such new solutions contributing to a better management of supply chains, in terms of cost reduction and improvement of the customer service level. In most industries, AIDC systems originated with the use of barcode readers, barcode labels and the UPC (Universal Product Code). In a Bar Code system, in order to be detected and identified by readers, labels must be positioned precisely. This characteristic called line of sight positioning requirement necessitates human intervention for scanning products and leaves room for errors and inefficiencies. The problem is intensified by the fact that companies rarely have common product codes for specific products or parts

[★] This paper was not presented at any other revue. Corresponding author Yacine Rekik. Tel. +33478337886. Fax +33478337886.

Email addresses: rekik@em-lyon.com (Yacine Rekik), zied.jemai@ecp.fr (Zied Jemai).