Big Data Governance for Smart Logistics: A Value-Added Perspective

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Abstract. For the last five years, worldwide curiosity concerning big data has sharply increased, along with cloud computing and the Internet of Things (IoT). However, without reasonable governance of the role of and value-sharing among stakeholders, it is difficult to recognize big data’s potential value, beyond the raw data. This research suggests refinements to this governance, in terms of cross-sector collaboration for the benefit of all. This is particularly true for those in the logistics sector, which is one of the most promising, although it is composed of complicated and exclusive industries. For the development/evaluation of such governance, we designed a new business model that governs stakeholder roles and responsibilities, and presented a case study on shipping reefer (refrigerated) containers. We found that our model is applicable to both the private and public sectors for smart logistics, and feasible for resolving conventional logistical challenges such as security, smuggling, and indemnification disputes.

Keywords: Big data · Cross-Sector collaboration · Governance · Smart logistics

1 Introduction

Advances in information and communication technologies enable many things that were once considered impossible, using smart devices (products) and services, and which cross both offline and online boundaries. The smart world brings convenience to the individual, but, in the business sector, heterogeneous and vast data, generated by freewheeling smart activities, increases the maintenance costs [1]. Recently, advanced research studies [2] have suggested ways to overcome these challenges (reduce cost and simplify technical maintenance) and, by extension, create value added from big data digital sources. Many challengers or opinion leaders define big data; however, from the business perspective, it is difficult to discuss it without considering its value [3,4].

According to [5], the logistics and distribution industry is destined to be one of the most profitable when big data investments are realized.

If logistics companies can attach smart sensors or devices to their freight and equipment (facility), intelligent and smart logistics systems can be implemented.
Recently, the IoT and machine-to-machine (M2M) technologies have been heavily researched [6,7]. Such approaches inspire logistics companies to open new businesses, but also cause problems in the management and governance of data that are constantly being generated. Additionally, in the logistics industry, developing or adopting a new concept that crosses sector boundaries requires the agreement of diverse stakeholders, from consignors (shippers) to governments.

To create a new business model for the use of big data in the logistics field, governance that is acceptable to diverse stakeholder perspectives requires definition, and the model must incorporate reasonable benefits and incentives to induce stakeholder interest from multiple sectors.

This research defines the governance that is acceptable for the logistics industry. We design a new business model, which requires changing the existing roles and responsibilities of stakeholders, as well as new rules for data governance, and present a case concerning shipping reefer containers.

2 IT and Business Challenges for Smart Logistics

2.1 IT Trends and Big Data

Gartner, an IT opinion leader, presented the top 10 technologies expected to exert a significant impact in the next three years, for the following three categories: merging the real and virtual worlds (computing everywhere, the IoT, 3D printing), intelligence everywhere (advanced, pervasive, and invisible analytics, as well as context-rich systems and smart machines), and the emergence of the new IT reality (cloud/client computing, software-defined applications and infrastructure, web-scale IT, risk-based security, and self-protection) [8,9]. The top 10 technologies for the smart world, with the exception of 3D printing, which makes physical artifacts, are those that are closely connected; these are summarized in Fig. 1.

![Fig. 1. Overview of IT Trends](image)

In time, autonomous networking using sensors embedded in items, and even living things, will pervade and enable increasingly agile services with advanced analytics (ubiquitous environment and IoT). Rich intelligent assets will be servitized (defined as services) by IT business strategies, and on-demand intelligent services will be...