RECYCLING MATERIALS THROUGH: A REVERSE LOGISTICS APPROACH

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ABSTRACT

Recycling has been stretching out worldwide, involving all the layers of supply chains in various industry sectors. Construction industry produces large amount of waste throughout the year. Most of the time construction and demolition waste ends up in landfills disturbing environmental, economical and social life cycle. Components of construction and demolition waste typically include concrete, asphalt, wood, metals, gypsum wallboard, roofing, paper, plastic, drywall and glass. While some actors in the chain have been forced to take products back, others have pro-actively done so, attracted by the value in used products one way or the other, Reverse Logistics has become a key competence in modern supply chains. In this paper, we present a content to recycle using reverse logistics issues. To do so, we propose a content framework focusing on the following questions with respect to reverse logistics: Why? What? How?; and, Who?, i.e. driving forces and return reasons, what type of products are streaming back, how are they being recovered, and who is executing and managing the various operations. These four basic characteristics are interrelated and their combination determines to a large extent the type of issues arising from the resulting reverse logistics system.

1. INTRODUCTION

The promotion of environmental management and the mission of sustainable development have exerted the pressure demanding for the adoption of proper methods to protect the environment across all industries including construction. Twenty-years ago, supply chains were busy fine-tuning the logistics of products from raw material to the end customer. Products are obviously still streaming in the direction of the end customer but an increasing flow of products is coming back. This is happening for a whole range of industries, covering electronic goods, pharmaceuticals, beverages and so on. For instance, Kodak, the venerable camera company, offers nine different, models of disposable or "single use" cameras, including special models for weddings and underwater use. These cameras, which are used once, taken to a photo finishing shop, and returned to Kodak from the photo processor, represent a huge stream of returns to Kodak. According to Kodak, 80% of the weight of their cameras will be used or recycled. Undoubtedly, a company in this position is motivated to build an effective reverse logistics supply chain to capitalize on the potential value of its high-volume of returns.

2. DEFINATION AND SCOPE

2.1. DEFINITION AND A BRIEF HISTORY

"In the sweat of your face you shall eat bread till you return to the ground, for out of it you were taken; for dust you are, And to dust you shall return"[1]. Though the conception of Reverse Logistics dates from long time ago, the denomination of the term is difficult to trace with precision [2]. Logistics network design is one of the most important strategic decisions in supply chain management [3]. It is originated in a waste management standpoint [2]. The terms 'reverse logistics' or 'closed-loop supply chains' include a wide variety of return flow types that entail different levels of complexity and management importance[4]. We would like to remark that Reverse Logistics is different from waste management as the latter mainly refers to collecting and processing waste efficiently and effectively [2]. Because of the increasing importance of network responsiveness in supply chain management, this has recently been considered as a significant additional objective for multi-objective logistics network design. Along the same lines, the concern about major changes in the business environment has triggered an interest in designing scalable and robust supply chains [3].

2.2. SCOPE

Reverse Logistics offers several advantages to the company in terms of both tangible and intangible benefits, managing reverse logistics process is as operations intensive and complex as forward supply chain and

demands the same focus and involves multiple logistics partners [6].The design and management of reusable articles systems are expected to become more important in the near future, as a result of growing concern at the depletion of natural resources. In the medium-term, industries that are currently choosing disposable packaging or single-use instrumentation (recycle) are likely to reorient their policy towards reuse [4].

3. REVERSE LOGISTICS: WHY? WHAT? HOW? AND, WHO?

After having briefly introduced the topic of Reverse Logistics, we now go into the fundamentals of Reverse Logistics by analyzing the topic from four essential viewpoints: why, what, how and who. Former studies have argued that these types of characteristics are relevant to characterize reverse logistics (see e.g. Thierry, 1995; Fleischmann et al., 1997; Zhiquiang, 2003). In this paper, we consider the following details:

• Why are things returned: we go over the driving forces behind companies and institutions to become active in Reverse Logistics, Why-drivers (receiver), and the reasons for reverse flows (return reasons), i.e. Why-reasons (sender);

• What is being returned: we describe a product characteristic which makes recovery attractive or compulsory and give examples based on real cases (products and materials);

• How Reverse Logistics works in practice: we give a list of processes carried out in reverse logistic systems and we focus on how value is recovered in the reverse chain (recovery options);

• Who is executing reverse logistic activities: we go over the actors and their roles in implementing reverse logistics (reverse chain actors).

4. OBJECTIVES AND METHODOLOGY

The aim of the paper is to

- To define the terms recycle materials, making clear how reverse logistics are different from waste management.
- To build a typology for reusable articles that integrates under the same term three different categories of articles that are frequently reused. Combining several classes under the same concept enables us to extend the results obtained for one type of reusable articles to the other categories. This typology is also a proposal of standard terminology in the reusable articles field.
- To identify and characterize the common features that the three categories of reusable articles share, as well as the differences existing among them.

The integrated forward/reverse logistics network (IFRLN) discussed in this paper is a multi-stage logistics network including production, distribution, customer zones, collection /inspection, recovery and disposal centers with multi-level capacities. As illustrated in Fig. 1, in the forward flow, new products are shipped from production centers to customer zones through distribution centers to meet the demand of each customer. Customer zones are assumed to be predetermined and fixed.

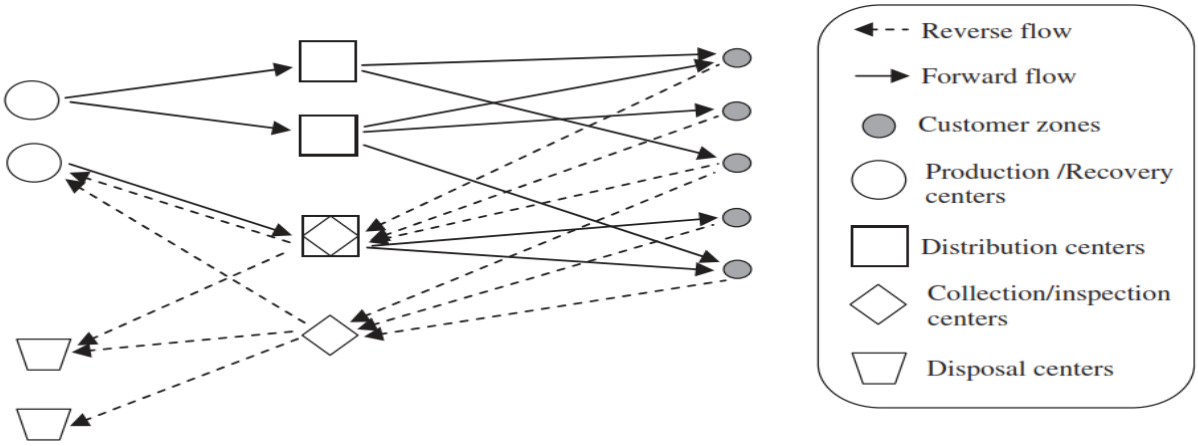

Fig.1

5. REUSABLE ARTICLES: DEFINATION AND TYPOLOGY

We use the term reusable articles (RA) to refer to durable products intended to be used multiple times by different users in different locations of a supply-chain network. This definition implies that the time the product is in use with each consumer is short compared with the article lifetime, and that each use cycle does not significantly deteriorate the product. It also implies that after each use, the RA needs to be returned to an adequate location where it is made available for the next user. In many cases, RA can even be directly reused after their collection. Eventually, some RA will require reconditioning, which is defined here, in line with Guide and Van Wassenhove (2002), as the necessary processes required to bring a used RA to a condition in which it can be safely reused again. In the case of RA, reconditioning only involves short and simple operations, such as inspection, cleaning, or minor repairs, that enable quick utilization by the next user. RA are returned and reintroduced in a closed-loop system to be reused in multiple use cycles.

Reusable packaging is a natural example of RA, but it is not the only class that can be included under this term. Other articles also exhibit the same characteristics, as will be explained in the following paragraphs. We put forward the following typology for RA:

- Returnable transportation items (RTI);
- Returnable packaging materials (RPM);
- Reusable products (RP).

The RTI abbreviation, coined by Johansson and Hellstrom (2007), is used in this paper to designate secondary and tertiary packaging materials (Stock 1992), which are used for assembling goods in material handling and transportation in the supply chain and then returned for further usage. RTI are not in direct contact with the product consumed by the end customer. Examples of RTI include pallets, maritime containers (Crainic et al. 1993), railcars (Young et al. 2002), standardized vessels for fluids transportation, crates, tote boxes, collapsible plastic boxes, trays (Duhaime et al. 2001), roll cages (Carrasco-Gallego and Ponce-Cueto 2009), barrels, trolleys, pallet collars, racks, lids, etc. Most RTI are used in B2B settings, although they can also appear in B2C contexts with elements such as supermarket trolleys, baggage trolleys in airports and train stations, and wheeled bins arranged by local councils (Breen 2006).

We use the RPM abbreviation, coined by Van Dalen et al. (2005), for denominating primary packaging materials designed to directly protect and hold the product that the end consumer really wants. Examples of RPM are refillable glass bottles for beverages (Goh and Varaprasad 1986, Del Castillo and Cochran 1996), gas cylinders (Kelle and Silver 1989a, b), kegs (Swinkels and Van Esch 1998), containers for chemicals, toner cartridges (Guide and Van Wassenhove 2003), single-use cameras (Toktay et al. 2000), or special oversized packaging designed for transporting medical equipment, wind turbine parts, or steel coils (Rubio et al. 2009).

Finally, we use the term reusable products (RP) for a third category where the product itself is used multiple times. We refer, for instance, to sterilized surgical instruments (Glorie 2008), wheelchairs or other types of medical equipment lent by National Health Services to patients (Rudi et al. 2000), systems for borrowing books, videotapes or sport equipment (Yuan and Cheung 1998), public sharing systems for bikes and electric cars (Nadal 2008) or the service tools (Vliegen and Van Houtum 2009) required to perform maintenance actions that are borrowed from a central unit. It is essential in the RP category to consider articles together with their usage pattern. RP intend to provide the user with a service rather than with the ownership of the product (servicing). A given product is included or not in the RP category depending on how it is used. Consider, for instance, books. Library books are included under the RP category, while personal books are not, because the latter are not acquired with the intention of being reused by multiple different users.

The rationale for considering together these three types of items as reusable articles resides in the fact that the three categories share the same logistical characteristics. Hence, the results obtained from the analysis of an individual class (RTI, RPM, or RP) can be extended to all classes of reusable articles. This allows the results obtained in the RTI literature (which, although scarce, is the more abundant in the three types of reusable articles) to be generalized to a wider number of situations in which reuse is involved. Our claim for generality also enables us to 'learn' from other classes and transfer the best practices developed for one particular category to the others. For instance, models developed for RTI can be extended to service tools or other types of RP.

6. CONCLUSION

- Feature the Reverse Logistics phenomenon for the recycle of construction materials.

- Design frameworks in order to facilitate integration of Forward and Reverse Logistics flow for construction organizations.
- Examine the reusable or recyclable materials associated with the context of the construction industry.
- Developing richer integrated logistics networks for receiving materials for recycling.

7. REFERENCE

[1]. Genesis 3:19, Holy Bible.
[2]. M. Brito, R. Dekker, A Framework for Reverse Logistics, in: R. Dekker, M. Fleischmann, K. Inderfurth, L. Wassenhove (Eds.), Reverse Logistics, Springer Berlin Heidelberg, 2004, pp.3-27.

[3]. M.S. Pishvaee, R.Z. Farahani, W. Dullaert, A memetic algorithm for bi-objective integrated forward/reverse logistics network design, Computers & Operations Research 37 (6) (2010) 1100-1112.
[4]. R. Carrasco-Gallego, E. Ponce-Cueto, R. Dekker, Closed-loop supply chains of reusable articles: a typology grounded on case studies, International Journal of Production Research 50 (19) (2012) 5582-5596.
[5]. https://prezi.com/ulog1ufbdw99/kodak-reverse-logistics/
[6]. http://www.managementstudyguide.com/reverse-logistics-scm.htm