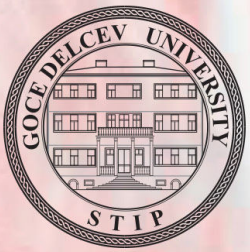

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Review paper

REVERSE LOGISTICS – POSSIBILITY, EXPECTATION AND SUSTAINABILITY PERSPECTIVES

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Abstract

Reversible logistics are complex to manage due to the uncertainty involved in the range of quality products, product return time, and return volume. The purpose of reversible logistics (RL) is to reduce the raw material, the material for reuse and to respect the environment, which fits into some activities and purposes of the circular economy (CE), although in a broader concept. The optimized reverse logistics (RL) demonstrated by world examples and different brands also lead to better supply chain visibility, leading to benefits. The optimized reverse logistics demonstrated by domestic examples case study 1 (for pellets) and case study 2 (for pallets) also lead to better supply chain visibility, leading to benefits. The studies explore the impact that decisions made in the supply chain phases have on the overall level of "circularity". Optimized reverse logistics produces financial benefits while positively impacting the environment and business culture. Optimized reverse logistics also leads to better supply chain visibility, leading to benefits such as cost savings, greater customer satisfaction, better customer retention, faster and better service and reduced losses, improved sense of reduction of brand and waste, and greater sustainability.

Key words: *reverse logistics; collection system; circular economy; sustainability; five (5) Rs*

INTRODUCTION

Product returns are usually from the first days of trading, originally marked as the starting point of reversible logistics (RL). In the eighties, many researchers [1] tried to formulate definitions of reversible logistics, although they defined it in a very limited way [2]. There are the material movements from customers to manufacturers, which means that it is only in terms of product returns [3]. Reversible logistics itself has been attracting the attention of academics since the early 1990s. Reversible logistics is considered to be much more complex than a traditional supply chain [4]. It includes product return, source reduction, recycling, material replacement, material reuse, waste disposal and renovation, and repair and recycling. [5] Reversible logistics is also considered to be more complex to manage than advanced logistics [6], as detailed activities in reversible logistics include the size, scope and impact on industry and the types of distribution channels [7]. Following the literature review, trends and some case studies in the world and in domestic research are identified, as well as collection systems and directions for future and further research. The idea of reversible logistics obviously shares similarities with the activities of the circular economy - repair, renovation, processing, recycling, and reduction [8,9].

Reverse logistics is the type and form of management of the modern supply chain that moves goods or products from customers back to vendors or manufacturers. Reverse logistics starts at the end consumer, moving backwards through the supply chain to the distributor or from the distributor to the manufacturer. Reverse logistics can benefit or involve various processes and strategies where the end consumer is responsible for the final disposal of the product, including recycling, renewal, or resale [20].

Organizations and manufacturers use reverse logistics when goods move from their destination back through the supply chain to the seller primarily and potentially back to suppliers. The goal is to return the value of the product, increase the value or discard the product. In the world, yields are worth almost a tril-

lion dollars a year and are becoming more common with the emergence and growth of e-commerce use. The goal of reverse logistics is to recoup value and secure new and repeat customers. The traditional product flow begins with suppliers and continues to the factory, plant, or distributor. Hence, the goods go to retailers and customers. Reverse logistics management starts at the customer and, moving in the opposite direction, returns the products to the desired, appropriate or any point in the supply chain [20]. By implementing the activities there is a connection between the concepts of Reversible Logistics and Circular Economics. Some conclusions will produce other findings that can be identified as knowledge gaps and formulated as justification for research [15-19].

REVERSE LOGISTICS AND SEARCH STRATEGY

Reversible logistics as a part of the logistics field is studied by many authors and is the focus of this research. Thus, the definition of reverse logistics should be mapped appropriately and well. Understanding reversible logistics itself is complex. Indeed, this study identified its definition by several researchers, such as Murphy (1986) [3], Lambert and Stock (1987) [2], and Murphy and Poist (1989) [1]. They defined it as a reversible flow of motion within a channel distribution. They focused on the flow of movement of the product from the back. However, in the 1990s, other researchers not only described the feedback loop, but also explained the flow of activities, such as recycling, reuse, disposal, etc. Some identify definitions from which it can be concluded that reverse logistics theoretically corresponds to management action, logistics activities/roles [10], recovery/reuse activities [11], return flow [12], distribution channel [13], and cost [14]. On the other hand, product return, the common term within reversible logistics, should be clearly defined to avoid confusion between them. Return product, as defined by Guide et al. (2003) [6], is a product that is returned as a return by the client because it has not met its needs or standards. The product recovery process was described by Blackburn et al. (2004) [6] starting from the process of return of value, to reuse or resale.

According to Carter and Ellram (1998) [22], the definition of reversible logistics is: "*The process by which companies can become more environmentally efficient by recycling, reusing, and reducing the amount of materials used*".

According to Rogers and Tibben-Lembke (1999) [23], the definition of reversible logistics is: "*The process of planning, implementing and controlling efficient, economical flow of raw materials, process inventories, finished goods and similar information from place of consumption to place of origin in order to regain value or appropriate removal* ".

Activities need to be identified, according to the Reversible Logistics definitions, in order to begin the identification process. As inferred from the above definitions, Reversible Logistics focuses on several points, such as reuse, recovery, recycling, and reduction / disposal. Based on these points, other researchers have also described activities such as Thierry et al. (1995) [5], who illustrate the feedback flow in an integrated supply chain, and Krumwiede and Sheu (2002) [6], who illustrate core activities. The activities of the return flow have three main parts: direct reuse, product recovery management (PPM), and waste management (WM). Its process can be started by the users who return their product until the processing is raw. There are several activities in feedback flow, e.g., testing, repair, renovation, service, dismantling, where the flow is initiated by sending a used product from consumers to become raw material.

Reverse logistics is a globally sustainable and responsible process that fully assists in environmental protection. It reduces toxic waste and pollution caused by the development and production of new products. Companies and factories that are aware of sustainability and are struggling to get their supply chain "*green*" enough can rely on reverse logistics because all its aspects and tendencies lead to green implications. Apart from reuse and recycling, the renewal of products for sale on the secondary market is also environmentally friendly, while at the same time increasing the desired revenue in the production results for the company. [21]

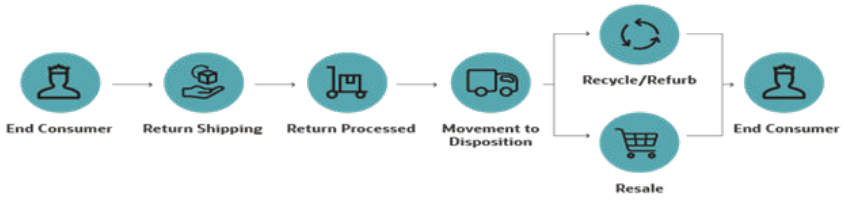

Figure 1. Reverse logistics Supply Chain [20,21]

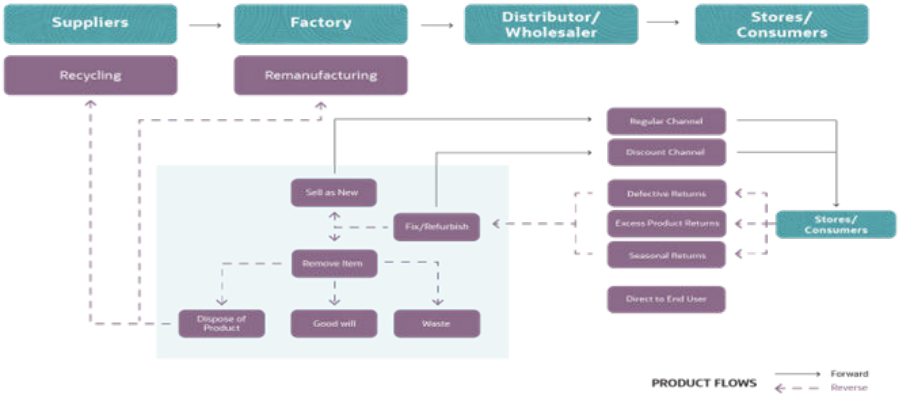

Figure 2. Forward and Reverse logistics Process [20,21]

FIVE (5) STEPS VS THREE (3) STEPS TO GOOD REVERSE LOGISTICS

The reverse logistics process uses empty tap containers. All companies certainly want to return the value of their containers with their proper and appropriate reuse. This requires transport planning, transport load management, and container cleaning. In different industries (textile, mining, rubber, wood, forest etc.), reverse logistics moves and recycles used and stored materials to new locations. These industries have adopted more sustainable practices to reduce diversified waste; there is the potential for cost savings through the proper use of reverse logistics. In the food industry, reverse logistics is responsible for the return or reuse of packaging materials and pallets. Companies also have to deal with or use rejected food shipments from various places. Rejections can create logistical challenges due to delays leading to food spoilage and concerns, with opportunities for manipulation [23].

Here are some areas and opportunities where reverse logistics can help companies or factories return the value of used parts and products. The three (3) Rs are reuse, repair, and recycling. The five (5) Rs of reverse logistics are return, resale, repair, repackaging, and recycling. Companies apply options to track improvement and success. Businesses may want to take a closer look at Five Rs to streamline their reverse logistics routes, processes, activities and strategies, reducing unnecessary losses. The five (5) steps are presented by [20]:

- Recycling – it may be possible to recycle part of products and their components with sustainable alternative and initiative.
- Reuse - many of the products we buy can be reused.
- Repair - most products, which have warranties.
- Renovation - the market for refurbished products.
- Replacement - with modern world e-commerce, replacing defective products.

Figure 3. 5Rs Reverse logistics [20,21]

Types of reverse logistics and components. The different types of reverse logistics are also known as reverse logistics components. They focus entirely on return and return management (RPP) policies and procedures and address potential problems with reprocessing, packaging, unsold goods, and delivery. Other types of reverse logistics account lease, repairs, and retirement product.

- **Return Management:** This process deals with returning products from customers or avoiding returning in the first place. These activities should be fast, controlled, visible and clear. Customers rate the company according to its flow, return time, and return policies.
- **Return Policy and Procedure (RPP):** The return policies and activities that a company shares with its customers are its RPP. These policies should be visible and consistent.
- **Re-production or renovation:** These activities repair, renew and refine products. Reconstruction involves separating, cleaning, and reassembling products.
- **Packaging management:** These activities of reverse logistics focus on reusing packaging materials to reduce waste and disposal.
- **Unsold goods:** Reverse logistics for unsold goods handles returns from retailers to manufacturers or distributors.
- **End of Life (EOL) and Leasing:** When a product is EOL, it is no longer useful or does not work. The product may no longer meet the customer's needs. Failed deliveries, drivers return products to sorting centers.
- **Repairs and maintenance:** In some product contracts, customers and companies maintain equipment or repair it if problems arise.

WORLD REVERSE LOGISTICS EXAMPLES

Globally, companies, factories, and plants are changing the way they handle waste, while the supply chain is a big part of that initiative. These reverse logistics examples focus on return, exchange, and recycling. Home Depot offers reverse logistics assistance for online purchases through its website. Home Depot reverse logistics centers handle damaged and misdirected products. Retailer Levi Strauss uses reverse logistics to improve textile sustainability. The business repurchases jeans or renews and processes into raw materials to make new jeans. Some big brands are also turning to reverse logistics to deal with waste. Proctor & Gamble, PepsiCo and Unilever switch to reusable packaging that consumers can return. The companies will clean and use the containers again. Transportation and logistics are developed for these companies. Some companies, such as GE Healthcare and Cisco, specialize in renovating, repairing, and reproducing defective or obsolete goods for consumers of pellets and pallets. Microsoft has a great global initiative and aspirations to deal with the end of life of all its manufactured and sold devices, batteries, and their proper packaging. Microsoft product packaging is 100% recyclable and has a PC recovery and reuse program. [20]

DOMESTIC REVERSE LOGISTICS CASE STUDY

Domestic examples presented in case study 1 and case study 2 use reverse logistics to improve sustainability in the timber industry for reuse of wood waste into useful pellet and pallet products.

Case study 1. A true scenario is studied by a local furniture company that manages the entire production process. It starts with a very careful selection of wood from strictly controlled forests (with the support of renewable sources and ecological atmosphere) and continues with the processing of raw materials. We also managed to find a very efficient solution for waste minimization, by establishing a granulation line for waste recycling from the production process. The company's sophisticated management system ensures precision and flexibility. There are still people behind the machines: thanks to their contribution, the products (pellets) always differ in their creative and unique characteristics. During the processing of the pieces in the production of furniture, two main types of solid waste are created: sawdust and small pieces. Half of the companies surveyed in this study used a dust collection system. The use of waste generated in the production of furniture as a source of heat in homes is low, but solid waste produces heat and can go to sawmills to collect sawdust. In some cities there is an increasing demand for wood waste and many sawmills are already using their waste for their own energy needs. Pellet production, animal and landscape suppliers have also increased demand for wood waste. Due to this trend, the waste generated by the wood sector is no longer free junk that no one wants.

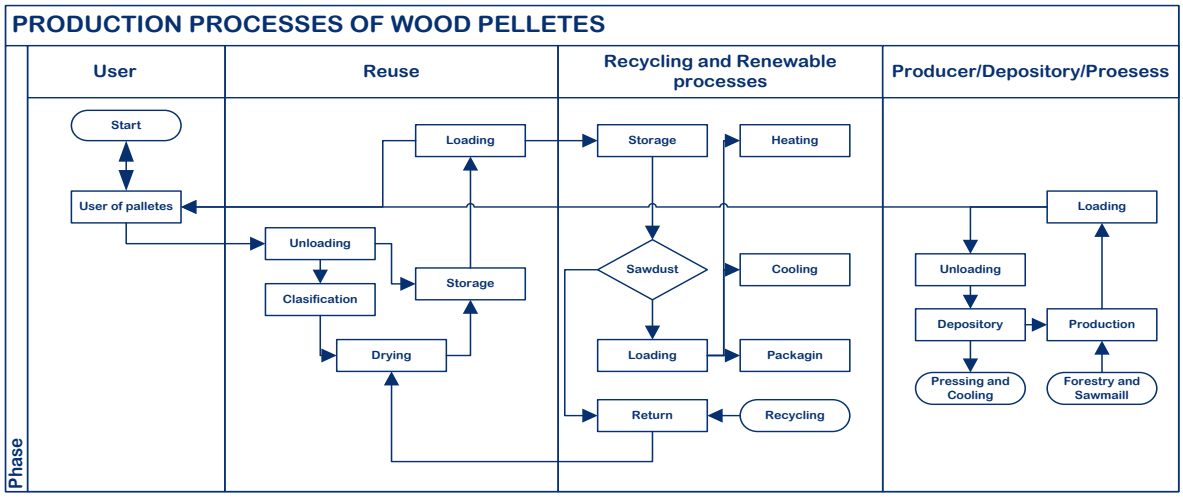

Figure 4. Product remanufacturing activities of wood pellets

Case study 2. The company has more than fifteen years of experience in the wood processing industry. The production of the sawmill consists of the following wooden products: pallets, boxes and crates and other packaging of wooden material, wooden furniture elements such as chairs and beech wood tables, steamed wood, wooden gazebos, and wooden sawdust for heating pellets. The pallet supply chain is a complex production network, and the way pallets are managed through the phases of their life cycle creates a significant difference in terms of environmental and economic impacts. This study investigates the impact that decisions made in the supply chain phases of wooden pallets have on the overall level of "circularity". Optimized reverse logistics produces financial benefits while positively affecting the environment and business culture. Refining processes on what happens to products after delivery helps retain customers and save money. Product data collected after contact with customers after delivery are an advantage of well-performed reverse logistics. The data provides insight into the organization's supply chain and the opportunity to improve products and/or the customer experience. Optimized reverse logistics also leads to better supply chain visibility, leading to benefits such as cost reduction, greater customer satisfaction, better customer retention, faster and better service, and loss reduction, improved feel for brand and waste reduction, and greater sustainability.

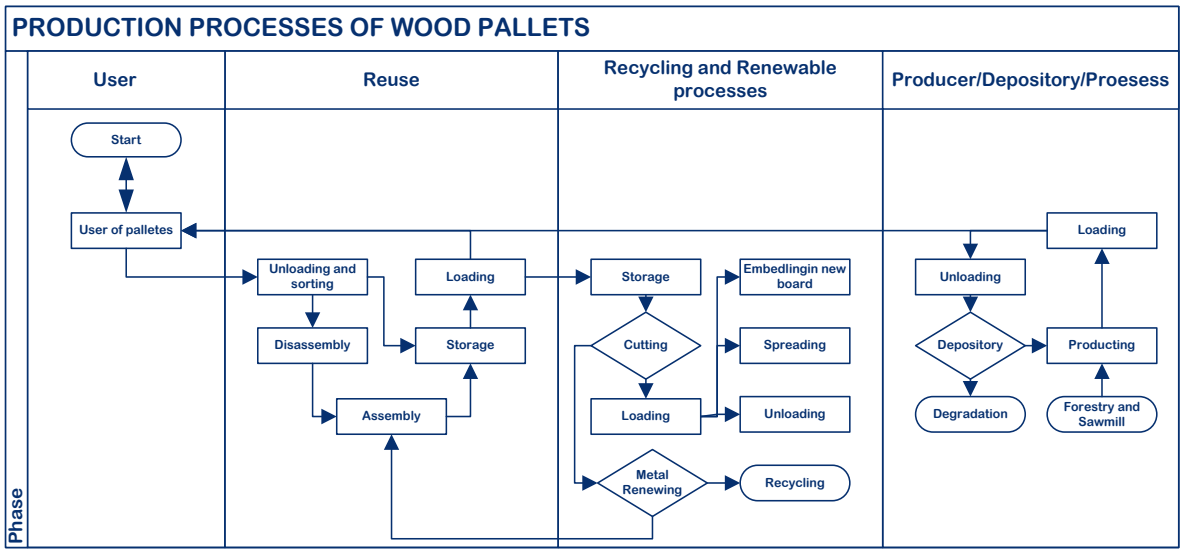

Figure 5. Processes in production wood pallets

Challenges and few strategies for optimizing reverse logistics. The challenges of treverse logistics are that flows must be two-ways. Very often, all managers or producers-manufactures need to set up the right infrastructure for it to be effective or useful. Maybe It often requires software solution that can print, automate and track every step of the reverse logistics. Additionally, once that infrastructure is in place, management should constantly monitor, review, optimize and evaluate the organization's reverse logistics processes to ensure the highest possible efficiency. Both incoming and outgoing logistics are measured from the manufacturer's perspective, while reverse logistics will be part or point in the supply chain.

For optimization of reverse logistics, companies need cohesive strategies and trends that take into account speed, efficiency, and cost, together with considering policies, partners, data, capacity, logistics and transportation. There are few strategic ways and manners to optimize reverse logistics: Evaluation of relevant policies and agreements; Review and revise company's return and repair procedures; Cooperation with suppliers; Working closely with suppliers; Using data to optimize processes; Collecting product return data; Track products back and forth; Linking raw materials to the finished product; Centralize return centers; Examination of logistics and transport and Automation

CONCLUSION

Reverse logistics moves goods from the traditional end of the supply chain at least one-step back. This process may involve different plans and controls. Some companies prefer to order this work. This reverse logistics process involves managing returns and purchasing surplus goods and materials. The process is also responsible for handling any leases or renovations. Reverse logistics varies in different industries and there are different economic incentives to improve reverse logistics management. The future of reverse logistics, together with circular economy, is to minimize return disturbances [23] especially in e-commerce, and increasingly in the retail industry the volume of returns is increasing. Companies can use reverse logistics to integrate all parts or components of the return process. One way to integrate feedback is to link product data to how staff should handle it. Documenting what happens to the returned product - whether the item will go on resale, repair or be rejected for raw goods - the supply chain can support this integration. The future of reverse logistics includes integrated supply chain management software that helps make these determinations and can provide valuable reports. As the demand for circular economy and e-commerce grows globally and consumers become more interested in sustainability, the demand for reverse logistics will grow. Truckers and logistics companies ready for this change are likely to do well in the next few years. These reverse logistics examples focus on return, exchange, and recycling. World presented examples from different large and famous companies offer reverse logistics assistance for online purchases through their websites. The optimized reverse logistics demonstrated by case study 1 (pellets production from wood waste) and case study 2 (pallets production from wood waste) also lead to better supply chain visibility, leading to benefits of some products [23].

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ПОВРАТНА ЛОГИСТИКА - ПЕРСПЕКТИВИ ЗА МОЖНОСТ, ОЧЕКУВАЊЕ И ОДРЖЛИВОСТ

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Резиме

Реверзибилната логистика е сложена за управување поради неизвесноста вклучена во опсегот на квалитетни производи, времето за враќање на производот и обемот на враќање. Оптимизираната реверзибилна логистика прикажана со светски примери и различни брендови, исто така, води до подобра видливост на синџирот на снабдување, што доведува до придобивки. Оптимизираната реверзибилна логистика, во овој труд прикажана со домашните примери случај 1 - за пелети и случај 2 - за палети, исто така, води до подобра видливост на синџирот на снабдување, што доведува до придобивки. Во студиите се истражува влијанието што го имаат одлуките донесени во фазите на синџирот на снабдување врз целокупното ниво на „кружност“. Оптимизираната реверзибилна логистика придонесува финансиски придобивки, но позитивно влијае и на околината и на деловната култура. Оптимизираната реверзибилна логистика, исто така, води до подобра видливост на синџирот на снабдување, што доведува до придобивки како што се: намалување на трошоците, поголемо задоволство на клиентите, подобро задржување на клиентите, побрза и подобра услуга и намалување на загубите, подобрено чувство за намалување на брендот и отпад и поголема одржливост.

Клучни зборови: *повратна логистика; систем за собирање; кружна економија; одржливост; пет (5) PC*