



7th International Conference
on New Business Models

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Sustainable Business Model Challenges:
Economic Recovery and Digital Transformation
Conference Proceedings

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Track 2.6 - Sustainable Development, reporting and digital transformation

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From Linear To Circular Supply Chain: Insights From Case Study in Sustainable Packaging Logistics

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Abstract

The debate on the impact of packaging logistics on sustainability has shifted towards a more holistic discussion of the impact of the packaging life cycle throughout the entire supply chain, in the research stream of circular supply chain management. Since how circular economy systems really work for firms around the world is at the very beginning of knowledge development, this paper aims at providing an analysis on how to implement and manage innovative projects to shift from linear to circular economy, moving from recycling approaches to upcycling solutions, with empirical cases from Fercam Echo Labs.

Keywords

Circular supply chain, Sustainability, Upcycling, Logistics Packaging, Packaging Logistics, Wooden Pallets and Crates, Social Enterprise

1. Introduction

Many authors have emphasised the close relationship between the concepts of “logistics” and “packaging” (Garcia-Arca et al., 2014; Azzi *et al.*, 2012 p. 441; García-Arca and Prado-Prado, 2008; Hellström and Saghir, 2007; Verghese and Lewis, 2007; Saghir, 2002; Lockamy, 1995; Twede, 1992): which focuses on the “synergies” achieved by integrating logistics and packaging with the potential of increased supply chain efficiency and effectiveness (Vernuccio *et al.*, 2010). Packaging is an integral part of the logistical system and plays an important role in the supply chain (Kirwan and Coles, 2011). The link between logistics and packaging was initially summarized in the expression “logistical packaging” which was used by academics referring to the personalization of packaging useful for logistics (Paine 1990; Twede 1992; Twede and Parsons, 1997). This concept does not communicate the full potential of the link between logistics and packaging: it was considered more appropriate to use the expression of “packaging logistics” which, in addition to focusing on the interface between packaging and logistics systems, recognizes the interdisciplinary nature of the packaging itself and fully enhance the interaction among

packaging, logistics and marketing decisions (Saghir, 2004). So that the expression “packaging logistics” refers to the integration of packaging design with logistics management, with a particular emphasis on strategic aspects (Garcia-Arca et al., 2014; Saghir, 2002; Hellstrom and Saghir, 2007).

The presence of the packaging along the supply chain is pervasive, both as product itself and as combination of product-packaging (Silva and Pålsson, 2022; Massaroni and Cozzolino, 2021; Cozzolino, 2021). Even more alongside the direct logistical flow (from upstream to downstream) is the return flow of packaging and product - reverse / return logistics – that has attracted more attention in the last years (Meherishi et al., 2019). This for many reasons, such as the emerging changes in the end-market, in the productive context, and in the regulatory framework, all those aspects especially in a sustainable perspective; sustainability-focused initiatives around logistics innovation and the need for change in the use of packaging are combining also with major industry trends affecting the packaging industry: for example, cost pressures, e-commerce and digitization (in general), and shifting consumer preferences (Berg *et al.*, 2020). The idea of a sustainable packaging logistics has been growing in academia and professional contexts (Massaroni and Cozzolino, 2021; Cozzolino, 2021). The concept of sustainable packaging logistics may be connected with a strategic, systemic and holistic view, going beyond a formal - accounting, social (and environmental) - responsibility, imposed by rules and regulations, according to a sustainability that works “toward a triple helix for value creation, a genetic code for tomorrow’s capitalism, spurring the regeneration of our economies, societies, and biosphere” (Elkington, 2018). The concept of sustainable packaging logistics is growing, but it is still not easy to univocally define it due to the multitude of criteria which should be considered, a large variety of packaging materials, as well as the dynamic development of the industry (Kozik, 2020), and with different actors involved and along the whole life cycle of the products and of the packaging-product combination (Lindh et al., 2016). In a general view, sustainable packaging logistics compared to conventional one, meet higher environmental, economic and social standards, have better performance and quality features, and at the same time bring new possibilities in the field of the recovery and waste management. These standards should apply to the entire packaging life cycle - from production, through packaging, distribution, transport processes, to use and disposal along the entire supply chain, in a closed-loop supply chain or also with a circular supply perspective (Kozik, 2020).

In particular, “Circular Supply Chain Management” (CSCM), which integrates the philosophy of the circular economy into supply chain management, offers a new and compelling perspective to the supply chain sustainability domain (Farooque et al., 2019; Genovese et al., 2017; Nasir et al., 2017); consequently, there is increasing research interest in this viewpoint by many authors (Ying and Lijun, 2012; Aminoff and Kettunen, 2016; Batista et al., 2018; Bressanelli et al., 2018; De Angelis et al., 2018; Govindan and Hasanagic, 2018; Howard et al., 2018; Liu et al., 2018) as underlined by Farooque et al. (2019) in their literature review paper. However, research is still at a nascent stage and great potential would be realized in this direction (Farooque et al., 2019). Inside this new framework concrete solutions may be developed but are still at a beginning phase stage.

Along this research gap the present paper aims at investigating the following research question:

RQ – What concrete initiatives are implemented by companies to realize sustainable packaging logistics innovations in a circular supply chain perspective?

To answer to the research question, the rest of the paper is organized as follow: section 2 presents the upcycling solution referring to logistics, packaging and sustainability; section 3 describes the case study

on sustainable packaging logistics in a circular supply chain management perspective, with the emblematic example of Fercam Echo Labs; in section 4 some conclusive considerations are proposed.

2. Logistics, packaging and sustainability

The European Commission adopted the new Circular Economy Action Plan (CEAP) in March 2020, as one of the main building blocks of the European Green Deal, the new European agenda for sustainable growth. In the document “Circular economy action plan” packaging is placed among the “key product value chains”²³.

The integration of Circular Economy into Supply Chain Management has been termed Circular supply chain in the literature, and Farooque et al. (2018 p. 884) define “Circular supply chain management” as following: *“is the integration of circular thinking into the management of the supply chain and its surrounding industrial and natural ecosystems. It systematically restores technical materials and regenerates biological materials toward a zero-waste vision through system-wide innovation in business models and supply chain functions from product/service design to end-of-life and waste management, involving all stakeholders in a product/service lifecycle including parts/product manufacturers, service providers, consumers, and users”*.

The purpose of CSCM is to lead towards circular supply chains from a linear one (Farooque et al., 2018). A linear supply chain extracts resources from the geosphere and the biosphere and disposes products, packaging materials, and wastes from multiple supply chain stages; the unwanted items are often deposited in landfills (Farooque et al., 2018). A closed loop supply chain improves environmental performance by bringing back goods and packaging materials to the producer to recover value (Guide and Van Wassenhove, 2006); however, the extent of value recovery in a closed loop supply chain is often limited because the efforts are restricted within the original supply chain (producer's supply chain) and do not include secondary supply chains and/or involve new channel members (Moula et al., 2017). A circular supply chain goes further by recovering value from waste by collaborating with other organizations (Farooque et al., 2018), within the industrial sector (open loop, same sector), or with different industrial sectors (open loop, cross-sector) (Weetman, 2017).

In a circular supply chain perspective, an interesting initiative is the upcycling one (Sung et al., 2021). The term upcycling originated in the 1990s (Bridgens et al., 2018) and means reuse of discarded objects or material in such a way as to create a product of higher quality or value than the original (Wegener, 2016). Upcycling has the potential to transform the way we consider individual products, as assemblages of functional component modules with multiple life spans rather than complete stand-alone objects with singular finite lives (Richardson, 2011). Sung (2015) in a literature review paper described as, despite variations among definitions, there are two dominant viewpoints in the analyzed publications: one based on material recovery of which the major aim is to maintain value and quality of materials safely in their second life and beyond by the improved recycling or remanufacturing; the other focused on product (re)creation for higher values and qualities by transforming, repurposing or refashioning waste or used materials/products either by companies or by individuals. For industrial upcycling, both as upgraded recycling and as remanufacturing, are required specialist skills, equipment, tools, space and time. The area of upcycling in a concrete application is relatively new and unexplored. Yet industrial practices – who is

²³ https://ec.europa.eu/environment/pdf/circular-economy/new_circular_economy_action_plan.pdf

doing what, when, where and how, and how (un)/successful it is – remained largely unknown (Bridgens et al., 2018).

In this paper, the focus is on packaging as an exemplar of material objects that, whilst carefully designed and manufactured, have quite short life spans and little status as objects of value in themselves. Very often once packaging served its purpose it is discarded, even though it has not degraded and is still functional or have functional materials. These materials discarded may be upcycled into useful objects, tailored to the requirements of individual and/or companies, in a circular perspective. The analyzed cases are based on circular supply chain solutions for wooden packaging – pallets and crates. Wooden pallets are load support that are indispensable for the logistics, transport, handling, and storage of goods in many industrial sectors. These pallets are horizontal wooden platforms characterized by a minimum height compatible with movement using pallet trucks, forklift trucks and other appropriate handling equipment. The wooden pallet supply chain is a complex product network, and the way pallets are managed throughout their lifecycle phases produces a notable difference in terms of environmental and economic impacts (Tornese et al., 2021; Gnoni et al., 2018). Crates are logistical boxes useful for moving highly value products, in this paper in particular they are used for the fine-art transport. Upcycling for pallets and crates offers a whole new life for discarded materials, taking a position opposed to un-usability or recycling. Recycling is typically accepted as breaking down the original material and making it into something else (also using more energy), for pallets or crates for example the typical recycled products are mainly chipboard, MDF panels, etcetera. In this specific case of wood, the shredding process compromises its very essence and in order to produce new boards, it is necessary to continue deforestation. While upcycling preserves the integrity of the material (and is totally energy saving) creating new products, often acquiring a greater value than the original object or material, thanks to a creative reuse; creative reuse that interrupts the deforestation process.

3. Case of sustainable packaging logistics in a circular supply chain management perspective

3.1. Methodological approach

The case study method seems to be the most suitable for this research, whereas the nature of the research question requires an exploratory approach (Yin, 2003). The case study methodology is well recognized as a valid approach through which to deepen understanding of a phenomenon that is still in development and/or for which the dimensions have not yet fully explained (Yin, 2003; Eisenhardt, 1989). In particular, logistics researchers have promoted the use of case study analysis as an approach to scientific inquiry, and Ellram (1996) declares that case studies are excellent for providing detailed explanations of best practices. The cases selected represent best practices on how to implement and manage innovative projects for sustainable packaging logistics to shift from linear to circular economy, moving from recycling approaches to upcycling solutions along the supply chain. The cases are taken from the experience of Fercam, primary Italian family business in transport and logistics sector, that has become one of the main logistics services providers in Europe. The analysis is based on desk research from the institutional Company's website, LinkedIn news, and official documents.

3.2. Fercam Echo Labs²⁴

Fercam Echo Labs is a non-profit Social Enterprise: a permanent laboratory, that was born in 2021, which works on a more sustainable future for people and the environment. Its mission is to create networks and synergies between the Corporate Social Responsibility programs of its clients and partners, which thanks to the active participation in the laboratory will be able to carry out projects that individually they could not have carried out, preferably starting from the territory in which they manage their activity. It proposes itself to them as General Contractor for the realization of sustainable projects.

Fercam Echo Park, just realized, for example, is one of those projects. The Echo Park is an outdoor structure inside the area of the distribution center of Rome, where they have created a break area available to employees and indirect collaborators, where they can have lunch or have a coffee break. Two obsolete containers, otherwise destined for disposal for the recovery of iron, have been modified, repainting them and obtaining openings to make large windows. The non-profit association Linaria was identified as a project partner, to design and guide the creation of furnishings and accessory structures starting from wooden pallets, flowering plants and plug hotels to welcome solitary bees. The woodworking activities were a learning opportunity for a group of 7 political refugees, and with the hours of training in eco-carpentry led by the experts of the Laboratorio Linfa, the participants in the project were awarded a certificate, which is useful for entering the European world of work. Other complementary sustainable activities have been realized inside the structure (for example, with the vending machines).

Moreover, in the area dedicated to the break area and inside the Company offices, bookcases will be installed to encourage reading with voluntary and free bookcrossing initiatives, leaving books available to anyone who wants to read them, especially long-haul line drivers, during their long stops, between one stage and another. The book will then be able to travel with them, in companies branches or wherever they want to leave it. The bookcases will be made by upcycling the wooden crates built for the transport of works of art, utilized by Fercam Fine Art. In Fercam Fine Art the internal carpentry activity is one of the pillars of artworks handling operations, independently producing, according to specific needs, all the crates for transport activities. The legislation that regulates the transfer of cultural assets requires that precise rules for packaging materials be respected, so the Company uses very valuable multilayer wood panels to manufacture the crates. Whenever possible, they readjust them for subsequent transports, but the production needs of new crates still tend to outweigh the opportunities for reuse²⁵. It is a noble wood, both for the nature of the material and for its intended use, therefore, it has always been the Company priority to find the right methods to re-utilize it, possibly for equally noble purposes. Also, they have already re-used the wood from these crates to make kennels for animals, the last of which was recently donated to municipal kennel.

Fercam Echo Labs is realizing with wooden pallets and crates upcycling projects of the implementation of sustainability in each of its three dimensions—economic, environmental, and social—simultaneously and alongside the supply chain, in a circular perspective.

Dino Menichetti, Fercam S.p.A. Regional Manager and Fercam Echo Labs President, declares: “In [Fercam] corporate activities, corporate social responsibility is of great importance. With Echo Labs we wanted to go beyond the Fercam business, to establish a network of collaborations and non-profit partnerships. The

²⁴ Text and contents from <https://www.echolabs.fercam.com/it> (accessed 19 April 2022)

²⁵ Text and contents from <https://www.fercam.com/en/welcome-1.html> (accessed 19 April 2022)

synergies created between the CSR programs of the various entities involved will allow each to have an even more significant positive impact, under the aegis of the 17 Sustainable Development Goals of the UN 2030 Agenda”²⁶.

4. Some conclusive considerations

The debate on the impact of packaging logistics on sustainability has shifted towards a more holistic discussion of the impact of the packaging life cycle throughout the entire supply chain, in the research stream of circular supply chain management. Since how circular economy systems really work for firms around the world is at the very beginning of knowledge development, the paper aims at providing an analysis on how to implement and manage innovative projects to shift from linear to circular economy, moving from recycling approaches to upcycling solutions. In particular, an empirical case focuses on upcycling pilot-projects regarding wooden pallets and crates implemented by Fercam Echo Labs in each of three dimensions of sustainability—economic, environmental, and social— simultaneously and alongside the supply chain. It describes the starting ideas, how they have been developed, what initiatives have followed – also concerning structural organizational decisions and strategic alliances. The case represents a best practice inside the sector and the preliminary concrete evidence arising from this research would be a starting point for the next research on this topic both at theoretical and empirical level.

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²⁶ <https://www.euomerici.it/in-primo-piano/presentate-a-roma-fercam-green-logistics.html> (accessed 19 April 2022)

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