





# EurOMA Sustainable Operations and Supply Chains Forum 2023

Book of Abstracts

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# Closing the loop for plastic in high-quality applications

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## Abstract

#### Purpose

Most recycled plastic is downcycled into low-quality applications like garden furniture or flower pots. The plastic in these applications cannot be recovered again because its quality is unsuitable for recycling, and at the end of life, these products are not collected for recycling. To effectively keep plastic in the loop, it is essential to increase the use of recycled plastic in high-quality applications. For example, in the electronics industry in Europe, only 2% of the plastic used comes from recycled sources (Plastics Europe 2022). At the same time, leading electronics manufacturers have pledged to increase their use of recycled plastics to 25% or 30% by 2030 (Lase et al., 2021). Therefore, we aim to understand how recycled plastic use in high-quality applications can be increased.

#### Methodology

We conducted 49 semi-structured interviews in the electronics industry, talking to manufacturers and all actors along the e-waste recycling chain. For triangulation, we collected archival data from the companies in our sample and other information like reports, conference presentations, and news articles. We follow Gioia et al.'s (2013) systematic, three-step approach to grounded theory building to develop a theoretical model for the increased use of recycled plastics in high-quality applications.

#### Findings

We observe a severe misalignment of recycled plastic's supplied and demanded quality. Recyclers and manufacturers need to adapt their operations to increase the use of recycled plastic. Plastic recyclers need to improve recycled plastic's stability and quality before entering a high-quality market. Additionally, they need to convince the manufacturers of their material. If the manufacturers are serious about using recycled plastic, they need to adapt their products and processes to conform with the material specifications of the recycled plastic available. Additionally, manufacturers must run extensive tests and pilots to familiarize themselves with recycled plastic before extending its use across the whole product range.

#### **Practical implications**

Our study suggests that recyclers need to understand themselves more as producers of secondary raw materials instead of waste companies. Additionally, the recyclers need to improve their marketing to build confidence in the material. Product manufacturers must overcome negative preconceptions towards recycled plastic by working with the materials. Additionally, manufacturers must adapt their corporate culture to introduce recycled plastic across a broad range of products successfully.

#### Contribution

We present a grounded theoretical model for the increased use of recycled plastics. This model highlights that operations management needs to support technological advancements to close plastic loops. Additionally, we propose an output-oriented perspective on recycling. The prevailing perspective on recycling focuses on the recycling process's input (i.e., collection) and throughput. However, we show that the quality of the output of the recycling process is critical, and the whole process should be focused on improving its quality.

Keywords: Circular Economy, Plastic Recycling, Closed-Loop Supply Chain

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# Sustainable Packaging Innovation in Circular Supply Chains: who is steering the ship?

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## Abstract

#### **Purpose:**

Given the global plastic pollution crisis, both governments and NGOs are introducing initiatives to reduce unnecessary single use plastic packaging, thereby also providing firms with opportunities for competitive advantage through sustainable innovation (Keränen et al., 2021). Using the UK food industry as an exemplar, we compare how this issue is being influenced by legislative change (including the Plastic Packaging Tax introduced in April 2022 and the planned Extended Producer Responsibility (EPR) legislation) and/or normative initiatives (including the NGO led Plastics Pact) – see Burgess et al. (2021). Thus, extending Sayed et al. (2017) to define the circular supply chain as the institutional field, we use institutional theory (Greenwood et al., 2011) to ask: *How do institutional logics lead to institutional complexity, and thereby impact legislative and normative measures in the pursuit of sustainable packaging innovation*?

#### Design/methodology/approach:

Taking a multi-methods approach involving a multi-disciplinary research team, data has been collected through multi-case study, ethnographic and action research approaches. The multi-case study and ethnographic studies involved circular economy supply chain actors including producers, consumers and waste management organisations, whilst the action research focuses on sustainable packaging innovations being introduced by food manufacturers.

#### **Findings:**

Key findings suggest that normative measures such as the Plastic Pact targets are expensive to implement, with the costs being prohibitive to smaller supply chain organisations. Similarly, costs are impacting the effectiveness of legislative measures with many firms preferring to pay the Plastic Packaging Tax rather than changing their packaging due to the higher price of alternatives. However, various supply chain actors have indicated that the planned EPR legislation is likely to be more powerful towards a circular economy given more far-reaching taxation implications. From these differences, it can be concluded that 'financial logic' is currently the dominant deciding factor in packaging innovation decisions among smaller supply chain organisations. However, larger players (retailers in the UK food industry) demonstrate a dominant 'sustainability logic' related to 'greening growth' as they have the capacity to make bigger investments for the longer term and the power to enforce change on their suppliers. Our data analysis thus shows that competing supply chain logics drive circular supply chain institutional complexity which limits change to incremental innovations only, confirming Sayed et al (2017). For example, a common current change is to move to a thinner plastic packaging material, which will reduce plastic packaging taxation, but complicates processing at recycling plants.

#### **Practical implications:**

This paper provides insights for governments, industry and NGOs seeking to influence packaging innovation to reduce environmental impacts within circular supply chains. We show that ultimately the major retailers appear to be steering the ship, albeit partially influenced by both legislative and normative measures.

#### **Relevance**/ contribution:

We extend both the supply chain management literature (e.g. Sayed et al., 2017) and the broader business and society literature (e.g., Stowell and Brigham, 2019) to illustrate how institutional logics need to be better aligned throughout the circular supply chain to reduce institutional complexity and enable more radical change in the pursuit of sustainable packaging innovation.

**Keywords:** sustainable supply chain management, Circular economy, sustainable packaging innovation

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# A bibliometric analysis of the impact of Industry 4.0 technologies on the Circular Economy

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## Abstract

The concepts of circular economy (CE) and Industry 4.0 (I4.0) have grown in popularity among policymakers, researchers, academics, and manufacturers since 2013. CE represents a suitable strategy for achieving sustainability. I4.0 technologies, besides allowing manufacturing companies to increase their effectiveness and efficiency, can enable the adoption and implementation of CE. Comprehensive bibliometric mapping and clustering approaches would enable the visualization and organization of the most influential research literature in the area. However, bibliometric review articles have not properly discussed the research hotspot, knowledge base and CE research evolution in the context of I4.0 technologies. So, this research aims to analyse the literature dealing with CE and I4.0 technologies, to provide a preliminary picture of the field. The research methodology consists of a bibliometric study from the Scopus database, analyzing a sample of 2632 articles published between 2009 and June-2022 and then the final sample of 925 articles is used to conduct the cluster analysis. The study utilized PRISMA methodology with VOS Viewer and Biblioshiny for bibliometric analysis and visualization. The analysis revealed influential authors, journals, institutions, and trending articles within the CE and I4.0 technologies literature, and relationships between these streams. This may benefit academics and practitioners in understanding the main investigated areas and persisting gaps in CE and I4.0 research, giving suggestions for future studies in these fields.

**Keywords:** Circular Economy, Sustainability, Industry 4.0, Digital technologies, VOS viewer, Bibliometrics

# Analyzing the digital and sustainable supply chain intersection in emerging economies: A social capital perspective

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### Abstract

**Purpose**: There has been growing scholarly interest in analyzing the intersection between digital technologies and sustainable supply chain management. This is due to the role of digital technologies in fostering transparency and transforming supply chain operations. However, there remains a gap in analyzing this intersection from the perspective of emerging economies, which suffer from various institutional voids, such as limited availability of technological advancements, and capabilities and traceability issues. Moreover, there is a need to investigate this intersection using social capital theory, which provides a useful lens to understand structural, cognitive, and relational dimensions within digital and sustainable supply chains. To address this gap, this study systematically reviews the role of digital technologies and sustainable supply chain management in emerging economies.

**Methodology**: A systematic literature review is conducted to comprehend existing research in the context of digital and sustainable supply chains. Content analysis was employed to examine 77 papers retrieved from the Web of Science. Additionally, frequency and contingency analysis was conducted to enhance the content analysis findings and understand the associations among constructs. Based on the literature review results, a conceptual framework is developed to identify key relationships.

**Finding**: The study has captured the correlations between the domains of digital and sustainable supply chain management on the theoretical front. The frequency analysis identifies the most discussed constructs in digital and sustainable supply chain literature which include economic outcome, information exchange, innovation, and quality. The contingencies reflect the linkage between environmental management with pollution and commitment, long-term relationships with business practices, and innovation with regulatory and human rights.

**Contribution**: This study will contribute to the literature as it will highlight a new perspective on digital technology and sustainable supply chains. The practical contributions may well be construed as an implied focus for the effective implementation of economic, social, and environmental undertakings integrative with applied technologies. The development of a conceptual framework would provide a practical basis in the process of adoption and adaptation of digital technologies for sustainable supply chain contexts.

# Institutional pressures to adopt Social Engagement and the supportive role of Digital Transformation

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## Abstract

**Purpose**: When companies adopt digital transformation strategy and technologies to improve the firm performance in the supply chain management (SCM) they enable a concept known as smart supply chain Smart supply chain has already been investigated regarding the adoption of sustainable practices in the SCM. However, the literature lacks studies that portray the development of social practices in smart supply chain context. Based on this, we aim to understand the potential of the smart supply chain in endorsing social practices in manufacturing companies to support economic performance goals.

**Design/methodology/approach**: Based on this, we aim to understand the potential of the smart supply chain in endorsing social practices in manufacturing companies to support economic performance goals. To reach this goal, we adopt an institutional theory to explain the development of social practices in SCM. We collect and analyse data from 473 manufacturing companies to understand the dimensions of the smart supply chain and its contribution to social practices development and economic performance.

**Findings**: Our findings show digital transformation strategies have direct effect on economic performance and are also mediated by social practices to reach performance goals. This study

shows that the front-end technologies (collaborative robots, computer simulation, augmented reality, and 3D printing) have only indirect effects on economic performance, being mediated by social practices.

**Practical implications**: Decision makers can invest both in digital technologies and in developing a digital strategy to increase social engagement and economic results.

**Relevance/contribution**: our main contribution is that our study provides an institutional theory understanding about when social practices can lead to economic performance in SCM.

**Keywords**: Social practices; Supply Chain Management; Smart Supply Chain; Digital Transformation; Economic performance.

# Future Trends of Digital Technologies in (Sustainable) Supply Chains: A Podcast Analysis

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## Abstract

**Purpose:** Digitalization reconfigures the supply chains (SCs) in various aspects. With the development of concepts such as Industry 4.0 (I4.0) and artificial intelligence (AI), the traditional supply chain processes gained a facelift. The discussion on such topics is gaining popularity among both scholars and practitioners, opening new research avenues. Hence, this study attempts to identify the future trends and impact of digital technologies in sustainable SCs based on the expert opinions derived from podcasts. This study aims to answer (1) what are the prevalent trends in digital technologies to improve sustainability in SCs? and (2) How could digitalization trends contribute enhance the sustainability of SCs? based on experts' opinions on the emergence of digital technologies in different industries.

**Design/methodology/approach:** We did a podcast mining as podcasts are good sources to explore upcoming trends (Welz *et al.*, 2021). The analysis was based on 40 podcasts selected from TED Talks given its deliberate speaker selection based on area expertise. Categories for the analysis were derived deductively from four comprehensive frameworks related to Digital Technologies (Dolgui *et al.*, 2020), sustainable SC management (Beske and Seuring, 2014), Circular Economy (Reike *et al.*, 2018) and performance measures (White, 1996) to reveal the hidden ideas of the latent content.

**Findings:** The study revealed AI as the most prevalent digital technology applied in different areas of sustainable SCs while collaborative robots also gained attention in industry applications. Several future research outlooks were also presented to extend the discussion on the intersection of sustainability, AI and I4.0-related technologies such as blockchain and big data analytics.

**Practical implications:** This study strives to guide practitioners in adopting various digital technologies to improve sustainability throughout the SCs.

Relevance/contribution: This study contributes to the scholarly debate by exploring the

impact of digital technologies on sustainable SC performance while highlighting future research avenues to enhance the integration of digital technologies to improve the sustainability of SCs.

Keywords: Digital technologies, Supply Chain Management, Sustainability Performance

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# Building a Decarbonized Supply Chain from the Ground Up: Early Evidence from the E-Methanol Shipping Fuel Supply Chain

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## Abstract

#### Purpose

In this study, we investigate the barriers and enablers companies face when they seek to establish a fully decarbonized supply chain from the ground up. While recent research on sustainable supply chain management has advanced our understanding of how existing supply chains can become more sustainable, there is less research on fully decarbonized supply chains that are designed carbon neutral to produce carbon neutral products. This research aims to expand that frontier by investigating the case of the emerging supply chain delivering fossil-neutral e- methanol to the shipping industry.

#### Design/methodology/approach

The research design is built as a case study of a network of companies and organizations working to produce e-methanol for the shipping industry. It is a contextualized case design based on indepth semi-structured interviews with supply chain professionals, business developers, and coordinators from both e-methanol producers, energy providers, end user companies, and biogenic carbon sub-suppliers. The study is done inductively given the novel nature of the phenomena. As empirical material is analyzed using early-round coding structures based on thematic analysis, we are investigating how different parts of the supply network face different barriers and enabling structures in their work.

#### Findings

Preliminary findings are structured according to Walker & Jones (2012). For barriers, we find that 1) lack of government flexibility at the agency level prevents scaling of production networks to occur, 2) the supply chain must be constructed before there is consumer willingness to pay a premium for decarbonized services, 3) participating firms must spend significant resources to invest in the supply chain because the network infrastructure does not exist. For enablers, we find that 1) involved companies are willing to collaborate and have a high degree of trust and willingness to share information, including information about carbon sources upstream, 2) the technology in question (electrolysis and methanol synthesis) is readily available, despite at a small scale, 3) main actors are willing to and capable of investing significant resources in the network to accelerate upstream investments.

#### **Practical implications**

Our research suggests early considerations managers must be aware of when building carbon neutral supply chains from the ground up. Due to the uncertain nature of supply chains in the context of the climate crisis and current geopolitical challenges, managers must be prepared to collaborate to create new networks instead of decarbonizing existing supply chains. Our research gives early guidance for managers on this issue.

#### **Relevance/contribution**

To our knowledge, ours is the first case study of a supply chain that is designed to be carbon neutral from its inception. We advance the important research frontier on decarbonization of supply chains by demonstrating the early barriers and enablers that structure the critical success or failure of firms aiming to create net production networks to deliver novel carbon neutral products and services.

Keywords: Sustainable Supply Chain Management, Sustainable Shipping, E-methanol Supply Chain

#### References

Walker, H. & Jones, N. (2012), "Sustainable supply chain management across the UK private sector", *Supply Chain Management*, Vol.17, No.1, pp 15–28. *Business Strategy and the Environment*,26(1),pp.49-68

# The effect of carbon neutral operations on shareholders' wealth

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## Abstract

We examine the shareholder impact of carbon neutral operations (CNOs) measuring the stock market reaction to firms going carbon neutral. The market does not react negatively, rather returns depend on whether a decarbonization of upstream supply chain, high level of environmental capabilities, and intermediate targets are present. We propose a roadmap to frame the competitive response to the management of operations under carbon neutrality.

#### Purpose

As firms move closer to zero emissions, further CO2 reductions require new processes and production technologies, and there is no guarantee that CNOs will deliver net private gains. Quality management was used to examine emissions (Kroes et al,2012), but this is problematic with zero-emission targets. We adopt a Natural Resource-Based View holding that firms earn a competitive advantage from adjusting beyond environmental compliance. Past research groups quantitatively different emission reductions together, despite evidence of decarboniza-tion being path dependent (Jacobs,2014). We collected a sample of zero emission firms. We contribute to the first wave of empirical investigations on the CNOs effects on performance asking: what is the CNOs impact on shareholders' value? The research offers a roadmap to understand how operations, environmental practices and partnerships must evolve to sustain competitiveness under carbon neutrality.



Fig.1 offers the arguments linking CNOs to performance and we use this framework for our

research hypotheses.

H1 The market reacts positively to CNOs

H2 CNOs market reaction is more positive with a scope 3 reduction

H3 CNOs market reaction is more positive for clean firms

H4 CNOs market reaction is more positive if intermediate reduction targets are set.

#### Methodology

We perform an event study to measure the market reaction to CNO announcements and link CNOs to expected firm performance, as in Klassen and McLaughlin (1996) with the following "market model":

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) = R_{i,t} - i + i(R_{m,t}) + \Box \qquad \Box_{i,t}$$

$$(1)$$

Where ARi,t,Ri,t,E(Ri,t) represent abnormal, actual, expected returns. The sample consists of 163 CNOs 1/2 emissions announcements.

#### Findings, implications, and relevance

Tab.1								
Abrnormal Returns	Day -2	Day -1	Day 0	Day +1	Day +2	Day-1 and 0	Day 0 and +1	Day -1 and +1
Average	0023426	0027297	.0003314	0006706	.0034468	0023983	0003392	0030689
t-statistic(1)	8085145	943552	.1156557	2316569	1,19263	5869405	0830469	6133046
Median	0013159	0007284	.0018658	0008104	.0019058	0004945	0015778	0025186
n-statistic(2)	-1,01257	6011897	1229136	-1,022143	.034282	4823847	0314083	3601108
% Positive	44,44%	47,53%	48,64%	46,30%	56,17%	48,77%	47,53%	44,44%
n-statistic(3)	-1,493557	7078676	079316	1,492063	1,41225	3935918	7078676	-1,49356

(1) t-statistics average abnormal returns (2) n-statistic Wilcoxon (1945) rank test (3) n-statistic generalised sign test (Cowan 1992) Two-tailed tests: (\*) significant at 0,10, (\*\*) significant at 0,05, (\*\*\*) significant at 0,01

Tab.1 reports the abnormal returns, Tab.2 the cross-section. CNOs is value-neutral, contrarily to Jacobs (2014) and others. The ability to extract positive returns from CNOs depends on the level of a firm's environmental capabilities. The market values significantly decarbonization of upstream suppliers, but not downstream (customer and employees). The speed of CNOs is significant, supporting an early mover advantage. High electricity price implies greater value of CNOs. The market responds more positively by CNOs issued by unprofitable firms.

Tab.2							
	Coefficient	Robust standard error	t	VIF			
ElecPrice	0152915	.0070507	-2.17**	1.09			
EnvironReput	.0004155	.0001672	2.49**	1.39			
Scope3suppliers	.0101254	.0054327	1.86*	1.31			
Scope3other	.0022989	.0104838	0.22	1.11			
Firstreduction	0017106	.0007328	-2.33**	1.15			
ROA	0010537	.0003476	-3.03***	1.21			
Size	0006357	.0021561	-0.29	1.65			
Manufacturing	.001204	.0053403	0.23	1.11			
_cons	.1629719	.0884682	1.84*				
Number of obs	= 111	F(8, 102)	= 3.83				
R-squared	= 0.2466	Prob > F	= 0.0006				
CAR, cumulative abnormal returns; VIF, variance inflation factor							

Robust standard error, Huber–White corrections

Two-tailed tests: \* is significant at 0,10; \*\* is significant at 0,05; \*\*\* significant at 0,01

#### Keywords: carbon neutrality, event-study, shareholder value

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# The journey towards Net Zero targets by businesses in the UK: A regional perspective

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#### Abstract

This paper presents the progress of businesses towards Net Zero targets in a region in the UK, using the regional route map to Net Zero, which includes decarbonisation of supply chains (SC). It uses mixed methods: interviews and a survey questionnaire with senior managers. Findings indicate that progress towards Net Zero is being made, however it is slow and patchy. The contributions are: (1) understanding of the mismatch between the Net Zero targets and the reality of businesses across the region;

(2) delineation of recommendations for SC practitioners and local councils to help businesses achieve Net Zero targets more effectively.

Keywords: Net Zero, businesses, mixed methods.

# Fostering sustainability commitments among upstream supply chain actors: the role of traceability

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## Abstract

#### Purpose

Robust traceability systems are particularly important in global, resource-intensive supply chains (SCs) that are highly vulnerable to environmental and social risks (Garcia-Torres et al., 2019). However, tracking and tracing the sustainability-related effects of SC activities requires firms to be able to access the appropriate resources, knowledge and competences, which is challenging in the often financially-constrained upstream SC tiers (Agyabeng-Mensah et al., 2020). Given that end-to-end sustainability relies on the systematic examination of all SC tiers, the extant literature has pointed to inter-firm resource synergies as a means of achieving sustainability whilst reducing the traceability costs per firm (Senyo & Osabutey, 2021). However, there is a paucity of empirical evidence on how upstream SC actors can leverage their inter-firm relationships to obtain the resources, knowledge, and competences required to enhance the effectiveness of their traceability systems and improve sustainability performance. Hence, this paper asks: "How can upstream SC actors use complementary resources and knowledge-sharing routines to enhance the capacity of traceability systems to aid the improvement of SC sustainability performance?"

#### Design/methodology/approach

A multi-case study of two food SCs in Ghana that supply global markets was adopted for this study. Data were collected from the upstream tiers of the cocoa and fruit SCs using semistructured interviews, observation and documentary analysis. Adopting the relational view (Dyer & Singh, 1998) as the theoretical lens, the data were coded using two key relational constructs to explore how (1) specific complementary resources/capabilities, and (2) knowledge-sharing routines impacted traceability and hence SC sustainability.

#### Findings

The study identifies four distinct categories of sustainability commitments among upstream SC tiers -(1) forest and wildlife conservation; (2) sustainable use of resources; (3) empowering farmers and employees; and (4) community engagement and society wellbeing. The data suggests that traceability facilitated the attainment of SC sustainability by transcending these commitments across the multi-tiers. However, there is a need to access the right resources, expertise/capabilities, and information through inter-firm relationships

with other SC actors and external stakeholders. Inter-firm resource complementarities and knowledge-sharing routines facilitated traceability among the upstream SC tiers and further ensured their collective adherence to sustainability commitments. More specifically, the presence of complementary resources motivated upstream SC actors that otherwise lacked the individual capacity (resources and expertise) to implement effective traceability systems. However, it was important to find the right SC partners with the required stock of complementary resources and a willingness to combine resources to achieve a common goal. Meanwhile, knowledge-sharing routines stipulated an agreed format and scope for traceability information, thereby reducing the probability of having insufficient information and ensuring authorised SC actors could unpack the full value of traceability information. This ensured that all necessary sustainability indicators were generated and verified as traceability information was transferred along the SC.

#### **Practical implications**

The study provides a deeper understanding of the link between inter-firm relationships and improvements in traceability, and hence SC sustainability. This understanding can aid practitioners in making critical investment decisions when adopting traceability systems, which in turn can reduce the exploitation of vulnerable upper-tier suppliers.

#### **Relevance/contribution**

Although most sustainability problems occur in upstream SC tiers (Marttinen & Kähkönen, 2022), most prior studies have adopted a downstream, focal firm perspective. This paper provides one of the first studies on multiple tiers of the upstream SC. In doing so, it enables a more in-depth understanding of the interactions between varying firm-level traceability systems, and how these systems can be aligned towards the attainment of SC sustainability.

**Keywords:** Traceability, Upstream supply chain, Relational view

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## **ESG Management Model to Rare Earth Magnets Industry**

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## Abstract

#### **Purpose**:

Rare Earth Magnets (REM) are crucial for the transition to clean and low carbon energy since they are applied in efficient electric motors, electronic equipment, efficient medical equipment and wind turbines. Historically, Rare Earth industry is seen as highly polluting due the intensive use of chemicals (Ali, 2014). However, a new factory is being established in Brazil aiming to produce Green Magnets, following Environmental, Social and Governance (ESG) principles. Therefore, methods and tools to manage ESG practices and actions are required to overcome the barrier of incorporating sustainable practices into the company's strategy and translating the general principles of sustainable development into business practices (Azapagic, 2003; Baumgartner, 2014). By dealing more specifically with the REM industry, there is a gap of practical tools to afford business sustainability management, since the industrial sector needs to be analyzed in detail, taking into account their specificities. The present research presents a model to guide sustainability management built in two main stages, the first focused on identifying the adequate ESG practices for the REM industry in Brazil, and the second focused on proposing the steps to put sustainability into the business actions.

#### Methodology:

The ESG practices were determined by integrating scientific documents, manuals, and experts' opinions. First, a content analysis was performed with documents concerning REM, metals and sustainability, then, the set of ESG practices extracted from the documents was submitted for evaluation by REM experts. In the second stage, the steps to sustainability management were determined by analyzing the main information reported in the literature about management models and corporate sustainability. Finally, the correctness, completeness, clarity and applicability of the model were verified in a focus group meeting with eight managers and engineers responsible for the first Brazilian REM factory.

#### **Findings**:

The resulting model is composed of a set of ESG practices and four phases to integrate sustainability in the REM industry. A total of 32 ESG practices related to REM were raised. The "Use of Materials" were considered the more relevant issue in the Environmental aspect, "Health and Safety" in the Social aspect and "Chain Management" in the Governance aspect. The four management phases proposed are: 1) Understanding and Leading 2) Identifying opportunities and goals 3) Integrating sustainability, and 4) Communicating and learning.

#### **Practical implications:**

This model aims to guide the implementation of sustainability through the management of ESG practices, being useful in planning and conducting sustainability management. The model can guide daily actions, helping managers to understand what steps to take and how to start the move towards a more sustainable corporation.

#### Relevance

The REM production chain in Brazil has a strategic importance for the country's economic growth. Despite the economic and technological benefits, the production of REM must respect environmental and social justice. At the moment, the literature concerning REM and sustainability is scarce, so special attention was given to design a set of ESG practices, considering REM industry particularities in Brazil.

Keywords: ESG, Rare Earth, Management Model

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# **Corporate strategies for net-zero: Building capabilities in operations**

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### Abstract

#### Purpose

Over 5000 businesses globally have made commitments to achieve net-zero greenhouse gas (GHG) emissions by 2050 (United Nations Climate Change, 2022). These commitments are being driven by a variety of stakeholders, including customers, investors, public policies, and NGOs. Establishing a strategic credible pathway to netzero for a firm presents both uncertain risks and transformative opportunities, potentially altering key aspects of the firm's business model, supply chain and competitive positioning. The complex interplay of supply chain relationships, investor pressure, new capital investment, early phase-out of carbon-intensive assets, ambiguous national policy frameworks, and ratcheting societal expectations makes planning over a three-decade horizon very challenging. Efforts to explore these linkages can draw from an extensive literature on buyer-supplier relationships, as Scope 3 emissions must be reduced (e.g., Patchell, 2018); prior research in operations planning and technological change, as one considers long-life capital assets (e.g., Grösser, et al., 2017); and carbon reduction and climate change (e.g., Lee, et al., 2016).

This study considers three key research questions. First, as an organization explores making a commitment to net-zero, how does a strategy emerge to achieve net-zero? As this strategy develops, how do inter-organizational relationships change? And finally, how might innovation be leveraged? We will stress that the key objectives are to focus on firm-level strategy, rather than sectoral level transition.

#### **Research design and methodology**

A case-based methodology was employed, as the primary objectives were to explore how and why decisions were made. The general criteria for selecting cases included public commitment to net-zero, as defined by Science-based Target Initiative (SBTi) (https://science-basedtargets.org); coverage of multiple industries and supply chain tiers; and geographic focus (i.e., Canada). Primary data collection included 26 interviews, typically one hour in length interviews, focusing on background, process and organization; and archival data on climate-related practices and performance.

#### **Findings**

Regardless of the industry, the case study firms are making similar commitments to level of carbon reduction. Across the firms, a number of common factors emerged as key considerations as they continued to develop their net-zero strategy. First, a few critical stakeholders provided much of the impetus for moving forward to develop a strategy. Second, the corporate vision often only moved aggressively forward if the executive team in the organization strongly support the concept of net-zero for their firm. Third, established capabalities formed a basis from which to build action toward this objective, although multiple pathways were reported. Yet, firms face important choices about how and where to innovate as they look ahead to develop new technologies and capabilities. Finally, combining these three to iden- tify, develop, and leverage new business models or retooled product-service portfolios re- mained in early stages. For many firms, aligning ambitious emissions reductions with long- term competitive strategy, innovation and value creation still remains a difficult conundrum.

Keywords: carbon reduction, sustainability; stakeholders.

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# Industry 4.0's support for the circular economy: an empirical analysis in the manufacturing industry

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#### Purpose

This study aims to shed light on the relationship between the circular economy and digital technol- ogies. Ultimately, this paper aims to observe how firms in the Italian manufacturing industry can rely on digital technologies to consolidate their green and circular practices.

#### Design/methodology/approach

This paper is based on a qualitative study. The choice of conducting an analysis directly in the field is partly dictated by a need expressed by many researchers who have contributed to the theme (Laskurain-Iturbe et al., 2021). Specifically, the multiple case study approach has been identified as the most appropriate methodology to achieve the study objectives. Multiple techniques have been applied to achieve external validity and reduce the risk of relying on biased information (Voss, Tsikriktsis and Frohlich, 2002).

Three companies were chosen due to their strong attitude towards the circular economy, in addi- tion to their commitment to the implementation of 4.0 technologies.

Semi-structured interviews based on an interview protocol have been conducted and eventually integrated with other data from secondary sources.

#### Findings

A purposive sampling process has been carried out, and interviews are currently being conducted. We expect to present findings concerning:

- A description of the circular practices implemented by each case categorized with the 9R framework, and a description of the most implemented digital technologies;
- A description of the challenges encountered during the digitalization process and the cir- cular transition;
- Insights on how digital technologies can support and progress the development of circular economy practices,

#### **Practical implications**

Practical implications arise for companies at different stages of implementation of both circular practices and digital technologies. Firms that are approaching both the digital and green transitions can benefit from this work by leveraging the identified challenges to avoid them, and implement successfully and efficiently circular practices thanks to the support received by digital technologies. Firms that instead have already faced the transitions could benefit from the results of this work by highlighting what symbiotic aspects between circular practices and digital technologies are un-derappreciated,

#### **Relevance/contribution**

The present work contributes to the body of literature that studies the relationship between the circular economy and digital technologies by providing empirical evidence on how the latter can support and enhance the implantation of the former. This empirical evidence strengthens the liter- ature that, to the best of the authors' knowledge, is mainly conceptual (Cagno et al., 2021, Rosa et al., 2020).

Keywords: Circular economy, industry 4.0, multiple case study

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# **Circular Business Models in the service sector, a multiple case study comparing traditional and hybrid organizations**

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#### Abstract

The objective of this research paper is to bridge two concepts: Circular Economy (CE) and Hybrid Organisations, i.e., organizations with a purpose which aims to manage the Triple Bottom Line (economic performance combined with social and environment impact), in the service sector. To conduct this explanatory research, the choice was made to pursue an inductive approach based on a multi-case study. This study highlights that, in terms of CE in the service sector, there is not the for-profit organizations, which would be "nasty" players and, the Hybrids that would be "ethical" players. However, this study also highlights that being a Hybrid motivates to engage further in the battle around sustainable stakes and TBL management.

Keywords: Circular Business Model, Hybrid Organizations, inductive multi-business case study.

# Mapping of the conditions for efficient remanufacturing of furniture used in public environments

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## Abstract

The purpose of the study is to map the conditions for efficient remanufacturing of furniture for public environment from producers' perspective. Data was collected and analysed based on case study design including a literature review, interviews, and workshops. Findings indicates that enablers for remanufacturing are high quality (wooden) furniture, higher volume, as well as a functioning reverse logistics setup. The main hinder for remanufacturing of are the customer expectation of a much-discounted price for remanufactured products.

Keywords: Remanufacturing, furniture, repurpose

### Introduction

In this study, remanufacturing is defined according to British Standard Institute as "*returning* a used product to at least its original performance with a warranty that is equivalent or better that that of the newly manufactured product" (Jensen et al., 2019, p. 305). For furniture used in public environment this may mean that the original producer takes back for example office furniture and renovates or repurpose the used office furniture. While this is made to a small extent today, the demand for remanufactured products from customers in the public sector is increasing. Producing companies see remanufacturing as an important issue but lack effective production strategies to meet this demand. There is also a lack of research about remanufacturing of furniture for public environment, especially from a producer's perspective. The research that exists focus on decision models for remanufacturing, ecodesign, life-cycle analysis, and reverse logistics (see for example Cobut et al., 2016; Krystofik et al., 2018; Ocampo et al., 2019). The purpose of the study is to map the conditions for efficient remanufacturing of furniture for public environment from producers' perspective.

#### Design/methodology/approach

The research method is based on a case study including a literature review and multiple- case design. A structured literature review was conducted during autumn 2022 in EDS, Scopus, and Web of Science. The aim of the literature review was to overview research published in remanufacturing within the wood and furniture industry.36 unique articles were identified. The articles were read, categorized, analysed, and summarized. Empirical data was gathered by a semi-structured interview approach of the different Swedish actors involved in the furniture business for public environments. A total of 20 interviews were conducted with producers, retailers, third party providers, regions, and municipalities in Sweden. In addition, one workshops with selected participants actors was conducted to discuss results and possible solutions in depth. The data from the interviews and workshop were analysed to identify patterns using thematic analysis based on the literature review results.

#### Findings

Findings indicate that there exist different definitions of remanufacturing both in theory and in practice. Another finding is that the driving force for utilization of remanufactured, repurposed, or reused furniture lies with actors from the public environment. Factors enabling remanufacturing of furniture are high quality (wooden) furniture, higher volume, as well as a functioning reverse logistics setup. Main hinders for remanufacturing of are the customer expectation of a much-discounted price for remanufactured products, worries about the loss for brand reliability for smaller companies, as well a perceived outdated aesthetic design of furniture, i.e., furniture that is far from its end-of-life, but has reached it end from a design perspective.

#### Conclusions

The mapping of the conditions for remanufacturing from producers' perspective will help both public sector and producers towards more remanufactured furniture's in future. For the customer, an increased understanding of the needs of furniture in public environments is required, as well as the ability to specify these needs in the procurement. Producers should focus on design for remanufacturing, large-volume remanufacturing processes, as well as setting up licenced, decentralised repair and renovation workshops. The theoretical contribution of the paper is the exploration of an under researched area, i.e., remanufacturing from producers' perspective and remanufacturing of furniture for public environments.

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## Disintermediation, food security, and sustainability: A critical discourse analysis of blockchain applications in supply chains

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### Abstract

Despite a kind of positive hype, organizations face difficulties in implementing blockchain along supply chains. To analyse this, we conduct a critical discourse analysis of academic publications while focusing on buyer-supplier relationships and related power asymmetries. Based on textual, discursive, and context analyses, we identified that the discourse is determined by positive sentiments and blockchain's favourable impact on supply chains. These benefits are reached by reinforcing the power of large multinational companies over small and medium-sized suppliers. We propose that the rollout of blockchain technology under the consideration of inter- organizational justice would stimulate a fair benefit distribution among supply chain members.

Keywords: Blockchain, buyer-supplier relationships, critical discourse analysis

#### Purpose

Blockchain's promises to transform and disrupt global supply chains have so far resulted in a rapidly growing body of literature, consulting practices and platforms. Yet, the more we look into practice, the less we can find instances where blockchains have truly transformed supply chains. Multinational companies (MNCs) that initiate the use of blockchain technology have trouble getting it adopted in the supply chain. Sternberg et al. (2022) argued that blockchain technology's transparency in the supply chain is mostly exclusive to MNCs, which act as technology principals. Thus, this study aims to analyse how blockchain technology influences power asymmetries in buyer-supplier relationships (Maloni and Benton, 2000).

#### Design/methodology/approach

We conducted a critical discourse analysis (CDA) of academic publications to investigate how blockchain technology and related power relations have been discussed in academia. We followed Fairclough's (2003) critical approach to discourse analysis combining textual aspects with their impact on the social context. It considers three levels of analysis: (1) the text dimension, (2) the discursive dimension, and (3) the social context dimension.

In the first step, we identified 767 relevant academic articles via Scopus using the search

string ("blockchain\*") AND ("supply chain\*") and analysed their abstracts with a sentiment and semantic word analysis. In the second stage, we went beyond the textual to the intertextual level. To identify the most meaningful texts, we conducted a co- citation analysis and determined the 100 most popular and prestigious texts out of the initial sample based on their related PageRank. Based on these articles, we identified the dominant discourses and the power relationships they brought forth between buyers and suppliers with the help of a content analysis. In the third stage, we performed a purposive search to point out institutionalized value claims, authorities, or specific value systems from the wider social context on which the dominant discourses are based.

#### Findings

The sentiment and semantic analyses show that the extant literature views blockchain applications in supply chains as highly favourable. In the content analysis, three main themes and related dominant discourses have been inductively identified: Blockchains

(1) decrease intermediation and increase efficiency, (2) ensure food and drug safety, and

(3) improve sustainability (3). It is noteworthy that these effects are presented in the discourses as empowering for large organizations and end consumers. Due to lacking standardization and interoperability the efficiency gains mainly benefit the technology principal. The underlying assumption is that MNCs have the *legitimate power* to prescribe their suppliers to use blockchain technology to solve the MNCs' inefficiency problems. Blockchain-enabled transparency and traceability improvements mainly satisfy customers' increasing safety and sustainability concerns. Suppliers get to feel the *coercive power* of MNCs once a food or drug safety issue happens. Besides, MNCs use their *expert power* to inform their suppliers whether and how they have to improve their sustainability performance in terms of greenhouse gas reductions or the elimination of child labour to meet society's moral requirements. Based on the identified power relations, we propose an alternative perspective on blockchain applications to empower small and medium-sized suppliers and foster inter-organizational justice.

#### **Relevance/contribution**

Our paper contributes to the literature on hegemony by showing that researchers construct the potential of blockchain applications in supply chains building on established buyer-supplier power asymmetries in global supply chains (Maloni and Benton, 2000). In line with George et al. (2022), we show how blockchain can be used to empower suppliers. Thus, this research challenges the widely held assumption that the power of MNCs over their suppliers is desirable from a sustainability perspective. Suggesting a more balanced view, this research explores ways to share blockchain's benefits within the supply chain equally and fairly.

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# Understanding Impact of Blockchain-driven Sustainable Supply Chain Transparency on Supplier Selection: Insights from Choice-based Conjoint Experiment

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## Abstract

**Purpose** - When selecting new suppliers, buyers often look beyond purely financial concerns to include suppliers' disclosure of sustainability information as well. The paper aims to investigate how buyers assess the importance of various attributes of supply chain information disclosed by suppliers. These include three types of disclosure as identified from previous literature (e.g., Bai and Sarkis, 2020; Sodhi and Tang, 2019) - product, process, and sourcing network disclosures – as well as the attributes associated with information disclosure using blockchain technology such as the immutability and update frequency of the information.

**Design/methodology/approach** - Building on signalling theory, five hypotheses are proposed:

*H1: Buyers prefer suppliers with information disclosure over suppliers with nondisclosure. H2: Buyers prefer suppliers with third-party verification over suppliers with selfdisclosure.* 

H3: Buyers prefer suppliers with full disclosure over suppliers with partial disclosure.

*H4: Buyers prefer suppliers that disclose information more frequently. H5: Buyers prefer suppliers that disclose immutable information.* 

The paper uses a choice-based conjoint (CBC) experimental design to collect both quantitative and qualitative responses from 234 managers with procurement responsibilities. The CBC design is based on similar conditions from the previous studies (e.g., Hartmann and Moeller, 2014; Banerjee, Ries and Wiertz, 2020) and then validated by 17 leading scholars and industry experts. The Sawtooth software specialising in CBC design and analysis is used to generate eight orthogonal choice sets for each participant with three suppliers and a non-option per choice set. Each supplier comprised six attributes at different levels as shown in Table 1. An example of a singlechoice set from the CBC is shown in Figure 1. The relative importance of attributes, part-worth utility, logistic regression, and marginal willingness to pay analyses are conducted to test our hypotheses.

**Findings** - The empirical results show that buyers are concerned with sustainability signals from suppliers when selecting new suppliers. All hypotheses H1-H5 are supported. Even though a significant factor in supplier selection remains price, this research finds evidence to support the view that buyers are willing to pay a price premium for suppliers that have greater sustainable supply chain transparency. Buyers expect blockchain technology to increase supply chain transparency, but we do not find a significantly higher willingness to pay for blockchain-enabled information. Overall, buyers prioritise information on products over information on processes and sourcing networks, while the immutability of information and update frequency of information received less attention. This suggests that buyers implicitly trust the information disclosed by suppliers, especially if the information is detailed and frequently updated.

**Practical implications -** The paper presents managerial implications for suppliers planning to use blockchain-enabled reporting as well as data aggregators in supply chain management.

**Relevance/contribution** - The paper contributes to our understanding of the role of blockchain in supply chain transparency and opens new lines of inquiry on the value of blockchain technology usage perceived by buyers in supply chain sustainability reporting.

Keywords: Sustainable supply chain transparency, Blockchain, Signalling theory

	Supplier 1	Supplier 2	Supplier 3			
Price	10,500	11,500	11,000			
Product Transparency	Third-party verification of "contain only sustainable materials"	Self-disclosure of corporate policy to contain only sustainable materials	No Disclosure			
Process Transparency	No Disclosure	No Disclosure	Self-disclosure of corporate governance policy following industry-standard labour rights			
Sourcing Network Disclosure	Partial disclosure of direct suppliers only	No Disclosure	Partial disclosure of direct suppliers only			
lmmutability of Information	No disclosure on immutability	Information immutable due to blockchain	Information immutable due to blockchain			
Information Update Frequency	No disclosure on update frequency	Monthly update	Daily update			
	Select	Select	Select			
	NONE: Firm A wouldn't choose any of these suppliers.					

Figure 1: Example of a single choice set from the CBC

Select

Attributes	Price	Product Disclosure	Process Disclosure	Sourcing Network Disclosure	Immutability of Information	Information update frequency
Level 1	10,000	No disclosure	No disclosure	No disclosure	No disclosure on immutability	No disclosure on update frequency
Level 2	10,500	Self-disclosure of corporate policy to contain only sustainable materials	Self-disclosure of corporate governance policy following industry-standard labour rights	Partial disclosure of direct suppliers only	Information immutable due to blockchain	Annual update
Level 3	11,000	Third-party verification of "contain only sustainable materials"	Third-party verification of "corporate governance policy on labour rights"	Full disclosure of entire supply chain		Monthly update
Level 4	11,500					Daily update
Level 5	12,000					

*Table1: List of attributes and levels for the Choice-Based-Conjoint experimental design* 

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# Blockchain technology and sustainability: A step toward net zero

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#### Abstract

Globalization and complexity of the supply chain, growing population, and income disparity make it more challenging to achieve sustainable development goals (SDGs). The rising interest in blockchain technology and sustainability on a global scale allows researchers to drive the development forward. One major sustainability concern is the power consumption of blockchain. This paper seeks to explore the application of blockchain in attaining sustainability and whether the resource-intensive nature of blockchain is itself a threat to society. The analysis will allow decision-makers to contemplate changes and put them into action, which will help the business reach net zero in near future.

Keywords: Blockchain Technology, Sustainability, Consensus mechanisms

#### Introduction

Blockchain Technologies (BCT) have gained significant attention in recent years. The technology offers several benefits, including cost-saving, traceability, and immutability of data. In order to increase environmental sustainability, several governments have embraced BCT, which is used in a variety of businesses (Glavanits, 2020). Though the extant literature has analyzed the link between blockchain and sustainable development, it needs to be more cohesive and often focused on a specific aspect, including the traceability of products, and green supply chain. This study seeks to determine if the resource-intensive nature of the blockchain poses an operational risk in achieving sustainable goals and how it might be used to promote sustainability.

#### Methodology

This study employs a systematic literature review in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guideline in order to give an impartial analysis(Moher et al., 2009). Two electronic databases, SCOPUS, and Web of Science, are used in the systematic search to gather academic research publications that

- 1. were published online from 2016 to 2022.
- 2. contained at least one of the terms in either the abstract, title, and keyword.
- 3. Were published in journals, conference proceedings, or book series in

Management, Social Science, Environmental Science, and Energy domain.

80 papers out of a total of 252 were found to be pertinent to the research. Following a comprehensive study of the literature, focused group technique is being used.

#### Findings

The extant literature suggests that BCT potentially helps the SDGs from various angles to achieve sustainability. Blockchain can automate customs and regulatory submissions. Smart Contracts are helpful for all forms of energy and peer-to-peer trade. Blockchain's immutability characteristic enables digital assets like ESG to endure forever and gives provenance and ownership proof for socially and environmentally responsible actions (Saberi et al., 2019). The traceability feature aids in reducing the danger of double- counting certificates and managing compensation goods and offers transparency in international and cross-sector CO<sub>2</sub> reduction exchanges thus allowing efficient demand- driven energy supply. However, the present underpinning consensus techniques (Proof of Work) consume much energy. Proof of Stake comes out to be a better alternative compared to the Proof of Work consensus in the case of permissionless blockchain. To have a centralized authority, with faster transactions and better privacy, organizations are moving toward embracing permissioned blockchain. Proof of Authority, another consensus mechanism with a high-risk tolerance and resistance to other attacks, can be helpful (Dorfleitner et al., 2021).

#### Conclusion

The work-in-progress paper helps to get an overview of the application of BCT and how it can impact sustainability. To comprehend the present role of BCT towards sustainability, more experts will be taken into consideration.. The analysis will allow managers and decision-makers to consider and adjust and put them into practice to assist businesses in achieving net zero in the near future.

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# An interpretive model for decarbonizing road freight transportation in Colombia

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#### Abstract

**Purporse:** Decarbonization is a growing and recurring theme in the literature. Road Freight Transportation (RFT) is one of the difficult sectors to achieve NetZero and requires governmental support for reaching its set goals (McKinnon, 2018). According to Osman (2021) most RFT research has been conducted in developed countries. There is a lack of literature on socio- technical and political aspects of decarbonization of RFT as pointed out by (Churchman, 2021). The purpose of this paper is to interrelate the elements identified from data obtained from a series of focus groups and complement them with a literature review. The using these elements we aim to develop a conceptual model capable of explaining the relationships among the main elements that influence the decarbonization of road freight transportation in Colombia.

Design/Approach/methodology: The methodology adopted included three stages. In the stage 1, a series of focus groups were run in order to identify relevant factors for constructing a NetZero strategy in the context of the Colombian road freight transport sector. These focus groups included 32 stakeholders from Original Equipment Manufacturers (OEMs), industry producer/shippers, public sector organisations, business associations, trucking companies and logistics service providers, software providers, consultant companies and truck owners. (Rey-Ladino et al., 2022). In Stage 2, a focused literature review was undertaken to complement missing elements and to review relational models. In this stage, more elements and relationships were reviewed: from the work proposed by McKinnon et al. (2014) with the "TIMBER" categories namely Technology, Infrastructure, Market, Behaviour, Energy and Regulation; from Pålsson & Johansson, (2016) by identifying actions, barriers and factors; from Yan et al. (2021) by modelling a set of policies and from Churchman (2021) by identifying social and political barriers to overcome. Stage 3 consisted in identifying a range of elements from the focus group and combining them with the elements found in the literature. In order to derive a conceptual model Interpretive Structure Modelling (ISM) is applied, since it is a well-established methodology for identifying relationships among specific items (Sage, 1977) and already used in Supply Chain Management context. This latter stage will be applied during a second round of workshops with the participation of experts. The purpose is to understand the interrelationships of the full set of elements as a part of a large-scale system considering different stakeholder perspectives.

**Findings:** Stages 1 and 2 have been completed. Currently, we are in the third stage and we are applying the ISM methodology. The expected outcome using ISM is to graph a conceptual model which empirically will interrelate the decarbonization elements of RFT sector in the context of an emerging economy. The analytical output from the application of the ISM methodology will be available in 2023 and presented at the conference.

**Practical Implications:** Decisions should move from aspirational policy guides and basic company's pathways to concrete plans and strategies. The findings can be used by researchers, policy makers and decision makers to identify factors and therefore to establish informed roadmaps and emissions-reducing strategies. Having identify the most influential factors can lead to more effective actions to decarbonize RFT in emerging countries.

**Relevance:** Emerging economies often have a different outlook towards RFT than developed countries, this model can be used to understand different strategies and policies that must be considered in order to achieve NetZero in RFT in emerging countries.

**Keywords:** Decarbonization, road freight transportation (RFT), Interpretive Structure Modelling (ISM)

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# The road for decarbonizing freight transport: A qualitative study of a voluntary program in France

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#### Abstract

The role of individual supply chain actors in carbon emissions reduction (CER) is welldocumented. However, it is critical to identify conditions required to develop a systemic approach for encouraging actors to share their visions and align their environmental strategy for CER. By adopting a multi-stakeholder approach this research aims to examine motivations, pressures, incentives and the transfer of sustainable practices for CER. Through a qualitative analysis, we explore the main features of a French voluntary program for CER for freight transportation and we evaluate through stakeholder interviews the existence of a shared strategy able to foster the adoption of green practices.

Keywords: Carbon Emissions Reduction, Green Purchasing, Green Transportation

## **Implementing Electrified Freight – Challenges for Hauliers**

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#### Abstract

#### Purpose

Electromobility is foreseen to become one main pathway to decarbonize logistics. To facilitate this transition from a practical perspective, but also from a business management perspective, a deeper understanding of supply chain actors' perspectives is crucial. The role of the haulier is of particular interest. Investments are normally the responsibility of the haulier, however the price of electrified vehicles are dramatically higher than for traditional diesel-driven vehicles. Another area of concern is how the charging infrastructure and the charging process affects the hauliers' operations, and hence influences the business potential. The purpose of the paper is to identify and categorize the perceived challenges of adopting Battery Electric Vehicles (BEVs) and implementing electrified freight among hauliers.

#### Design/methodology/approach

The paper is built on semi-structured interviews of 10 haulier firms. The firms are located in Sweden, The Netherlands, Norway and Italy. In the analysis, challenges are classified and discussed primarily in relation to the role of the haulier, but also reflected against the roles of commercial vehicle manufacturers and the hauliers' customers: forwarders as well as shippers. The different geographical markets studied offer additional insights into the dependence between the actors and the context in which they operate.

#### Findings

The results include a range of challenges that can be categorized as technological, operational, and financial. These overall themes are alike between previously researched vehicle manufacturers and hauliers, however they differ to detail due to the actors' respective position in the supply chain. Potential conflicts occur between hauliers and other actors respectively, such as the responsibility to finance the new freight transport solutions. The differences in context also indicate that variations in business practices, in infrastructure maturity and the position of the commercial vehicle manufacturer may moderate the challenges between geographical contexts.

#### **Practical implications**

The paper will support hauliers and potentially other actors in their transition towards electrified freight, through the categorisation of challenges and the understanding of context. In addition, the papers' results may support the development of policies that can contribute to speed up the

transition to electrified freight and logistics.

#### **Relevance/contribution**

The research contributes to the maigre but growing literature on logistics actors in the transition towards electrified freight, with great potential to improve environmental sustainability. In particular the haulier role, that is crucial for the implementation of electrified freight, has previously been sparsely addressed in previous research.

Keywords: Electromobility, Green logistics, Hauliers

# Methodological approaches to measuring the financial impact of environmental management implementation: A literature review

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#### Abstract

#### Purpose

The impact of environmental management systems (EMS) implementation on financial performance of the firm is a well-researched topic (see e.g., literature review by Molina-Azorín et al., 2009). Some studies focus generally on EMS, while others pick out specific frameworks, such as ISO 14001 (see e.g., the literature reviews by Tarí et al., 2012; Salim et al., 2018, and (reference omitted to protect the confidentiality of the review process)). The objective of these studies is evident: While the firms' motivation is to improve environmental impact (Molina-Azorín et al., 2009), or on a broader scale, to communicate the willingness to render the firm more sustainable, EMS implementation can incur significant costs. Conversely, measures that reduce waste or energy use should improve financial performance (Molina-Azorín et al., 2009), or firms can ask higher prices for products that are produced in more sustainable modus. Regardless of the significant number of studies, the results, however, are inconclusive (Tarí et al., 2012; Abisourour et al., 2020), with some papers finding a positive impact of EMS implementation on financial performance, while others find no relationship or a negative impact. Focusing on ISO 14001, an exploratory analysis of relevant papers links these inconclusive results to differences in methodological approaches (reference omitted to protect the confidentiality of the review process). Postulating that these differences are at the root of the inconsistent results, the preliminary analysis is extended to studies reporting on financial performance and EMS implementation in general.

#### **Research design**

This research follows the three-phase process for a systematic literature review, as outlined by Tranfield et al., 2003. Through an exploratory review (phase 1), the following research questions was formulated: 1) Does the methodological approach to studying the relationship of EMS implementation and financial performance impact the results? 2) Is it possible to identify a superior research method? During the ongoing phase 2, the review is being executed.

#### Findings

Findings of the exploratory review indicate that there are five methodological aspects where research differs *(reference omitted to protect the confidentiality of the review process)*:1) Type of Measurement of Financial Performance, 2) Choice of Testing Method, 3) Details of Statistical Testing, 4) Firm Pairing (when used), and 5) Definition of Financial Metrics. Additional papers

will be analyzed to consolidate this finding and to answer the research question.

#### **Practical implications**

Firstly, the researchers attempting to optimize methodological approaches to study the relationship of financial impact and EMS (and operational excellence measures in general) will benefit from the results. Furthermore, by determining preferred methods, this research will in the future also aim at resolving the issue of inconsistent results, thus providing important information for managers.

#### Contribution

To the knowledge of the authors, a literature review on the topic of financial performance and environmental management - or other operational excellence measures - that focuses on the methodological approaches has not been done. The results are therefore not only relevant in this context but may educate research methods in a wider context.

#### **Keywords:**

Environmental management, environmental performance, financial performance, methodology, systematic literature review.

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## A Systematic Review of Scope 3 Carbon Footprint

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#### Abstract

Minimising carbon emissions have become the top agenda worldwide. The GHG Protocol classifies emissions into three: Scope 1, 2 and 3. The last one relates to major emissions within the firm's supply chain and represents its largest GHG impact. This study aims to answer: How did the literature on Scope 3 evolve? What are the emerging themes linked with Scope 3? What are the main gaps for future research to explore? This study offers a SLR on Scope 3 carbon footprint to answer those questions. Understanding this topic is crucial to meet the Paris Agreement and achieve science- based targets.

Keywords: Carbon Footprint, Scope 3, Carbon emissions

# The role of power asymmetries in implementing multi- tier sustainable supply chains initiatives

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#### Abstract

Large companies face increasing pressure to manage sustainability across their supply chains (SCs), requiring an orchestration of initiatives by focal companies, suppliers, and subsuppliers. The industrial electronics sector is a cornerstone for mass electrification and decarbonisation of the energy and transport system, yet it is not immune from these pressures. Given the multiplicity of materials and components embedded in the high-tech products of this industry, the role of the SC for tackling sustainability is particularly critical (Johnsen et al., 2022). However, there is a lack of evidence on whether and how companies engage the SC in their sustainability initiatives. Thus, the purpose of this research is to investigate the approaches adopted by organisations to manage sustainability beyond their borders and the role of power asymmetries in the implementation of such initiatives in different production tiers.

Through a multiple case study methodology, we implemented an inductive investigation of the main mechanisms leveraged by industrial electronic companies to engage the SC in their sustainability strategies. We interviewed ten multinational companies operating in industrial electronics' SCs - including appliances, energy, and electric mobility companies – at different tiers of the SC.

Organisations adopt multiple tactics to spread sustainability requirements in the upstream SC (Wilhelm & Villena, 2021), following a gradual and incremental approach. Codes of conducts are used as an entry-level requirement to establish minimum sustainability thresholds, while sustainability scorecards are increasingly adopted to assess the sustainable performance of suppliers at the organisational level. Occasionally these measures are accompanied by suppliers' training, especially targeting small suppliers unable to pursue assessments or certifications independently. Financial measures are emerging tools, yet not widespread and rarely formalised into contracts. The choice of different levers is linked to the power relations in these multi-tier SCs. Asymmetric power in terms of company size and supplier dependence enhances the ability to influence upstream suppliers (Villena & Craighead,

2017). Finally, the multi-tier SC approach, influences the SC coverage of sustainability initiatives and the scope for substantial improvements.

Tackling sustainability in industrial electronics requires the participation of multiple tiers of suppliers to reduce environmental impacts (Dou et al., 2017). However, given the lack of standardization and legal frameworks on most decarbonization and sustainability targets, engaging the SC remains one of the key hurdles for companies. Ambitious players able to exercise a significant pressure on their suppliers are leading the transition, steadily introducing requirements such as measurement and reporting of environmental impacts, but will gradually encompass and contractually require the reduction of these impacts. While the evolution of future regulation remains uncertain, our results indicate that SC pressure will increase, especially from the largest and most influential companies.

This study is the first work to investigate multi-tier sustainable SC initiatives under a power asymmetries lens. The work contributes to the multi-tier sustainability SC literature by (a) identifying the formal and informal actions adopted by organisations in the industrial electronics industry to implement sustainability across their SCs and (b) distinguishing the key power asymmetries that allow cascading the sustainability requirements in the upstream SC.

Keywords: Sustainability, Multi-tier Supply Chain Management, Power Asymmetries

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# Boundary Spanning in Social Impact Supply Chains: Improving Lives Through Coffee

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Keywords: Social Enterprises, Social Impact Supply Chain Management

#### Motivation

Social enterprises embed societal issues in their operations and supply chains and aim to create impact through a commercially viable business model. A predominant type of social enterprises is the social procurement model in multi-tier agri-food supply chains. Typically, these social enterprises source commodity products (e.g., coffee, tea, cacao) from farmers in developing countries and commercialize them in developed countries. In these supply chains, social enterprise can take on different boundary spanning roles to address social issues (Pullman et al., 2018). While previous research has considered boundary spanning concerning compliance to work conditions standards in global supply chains (Soundararajan et al., 2018), this research goes beyond compliance to consider how boundary spanning entities make broader social impacts in multi-tier supply chains.

The goal of this research is to understand the pursuit of integrated social and commercial goals in multi-tier agri-food supply chains where social businesses are focal actors. We are particularly interested in how firms build a system of shared meaning across the multi-tier supply chains in different institutional settings.

#### **Literature Review**

In a global multi-tier supply chain, there are several layers of bridging actors between the lead firm (buyer, usually located in the country of consumption) and suppliers located in the country of origin. In agri-food multi-tier supply chains, it is common to have two sets of bridging actors: upstream intermediaries in the country of origin and downstream intermediaries in the country of consumption.

In the country of origin, one actor – sourcing agent – bridges the links between the lead firm and further upstream suppliers and farmers on the ground. Sourcing agents in developing countries can fill in several roles by connecting lead firms to local producers, and translating cultural and institutional norms across domains (Reinecke et al., 2018). In the country of consumption, there are importers that bridge the cultural and institutional gaps between the buyers and sourcing agents in the country of origin. These intermediaries have received limited attention in the literature and traditionally have been regarded as transaction-focused firms.

Supply chain intermediaries, both upstream and downstream, are critical for the creation of social interactions through linking mechanisms, the mediation and influencing of these relationships, and the alleviation or aggravation of existing power disparities in the

relationship. Throughout their involvement in these interactions, intermediaries can play multiple and non-exclusive roles as connectors, translators, governance actors, and boundary spanners (Reinecke et al., 2018).

#### **Research Design**

As a context, this study focuses on high quality coffee supply chains as a large number of social enterprises operate in these supply chains which aim to challenge the traditional power balance by redistributing value to coffee farmers (Borella et al., 2015). Moreover, the social enterprises in these supply chains employ different approaches for legitimation and bridging (certification, direct trade, etc.) which can enable a compare-and-contrast approach.

We collect data from social enterprises in agri-food supply chains via interviews supplemented with secondary data analysis. The data collection focuses on agri-food supply chains in different institutional contexts: Netherlands and USA as countries of consumption and Colombia as country of origin. Data collection was conducted until saturation and this process resulted in 16 interviews with exporters and local businesses in Colombia and 27 interviews with roasters and importers in the Netherlands and USA.

#### Findings

The analysis of each case led us to develop four groups of social enterprises operating in agrifood multi-tier supply chains. First, there are the ambidextrous integrators – integrated firms that link farmers with roasters, and thereby operate in both institutional contexts. They employ a holistic approach to impact on-the-ground and engage in a wide range of activities, such as quality and price enhancement or more elaborate programs. Second, upstream, in the country of origin, there are the direct traders – firms that have a strong focus on quality and aim to maximize product value at origin by working directly with farmers. Third, downstream in the country of consumption – there are importers and roasters that either engage in direct relationships with farmers. Fourth, there are importers and roasters that focus on certification and NGO collaboration to deliver the impact promised to customers.

The comparison of the four groups reveals several forms of boundary spanning in multi-tier social impact supply chains. Impact oriented intermediation focuses on transparency and quality as means to empower the farmers and promote long-term relationships between farmers and coffee buyers. Quality emerges as a holistic approach to address social and environmental challenges.

#### **Relevance/contribution to research and practice**

The findings provide a novel perspective on multi-tier supply chains crossing institutional contexts with focus on social impact by moving beyond compliance to approaches aimed at empowering farmers and other actors in the supply chain.

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## Supply Chain Wages and Distributional Justice: Problems and Prospects

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#### Abstract

How can powerful firms address injustice, inequality and poverty in their supply chains? Despite dramatic reductions in global poverty levels, substantial numbers of those working at the base of complex supply chains remain very poor and endure exploitative working conditions. Indeed, supply chains can be seen as mechanisms that in fact perpetuate exploitation and injustice, with some writers casting them as 'global inequality chains' and 'poverty chains' (Campling and Quentin 2021; Selwyn 2019)

This discussion explores how major firms might seek to ensure that supplying organizations pay a specified 'living wage' (which may be in excess of local legal minimum wages). The analysis is framed by a detailed analysis of such an initiative launched in 2021 by the food giant Unilever. The paper presents a brief review of the history of the ideas of minimum and Living Wages, and an analysis of some of problematic aspects of the Unilever promise. The discussion has significant implications for firms seeking to achieve social sustainability through their supply chain: living wage promises may have substantial negative consequences. For academics seeking to frame research in this field, the discussion raises complex questions about how the impacts of attractive-sounding initiatives might be evaluated. The paper concludes with three propositions: achieving distributional justice cannot be left to large corporations; the state should act to redistribute power among supply chain actors; and, that even progressive firms must be subject to critical scrutiny.

Keywords: Supply chains, inequality, living wages

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# Defining social sustainability issues in manufacturing companies

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Keywords: Social Sustainability, Manufacturing companies

#### 1. Introduction

The recent increased attention towards sustainability in academia and industry has mainly focused on the issues related to environmental and economic sustainability (Hakovirta and Denuwara, 2020). Issues related to social sustainability are rather neglected in the literature (da Silva and Nascimento, 2015, Morais and Silvestre, 2018), while some studies aiming at addressing sustainability missing the context of social dimension (Ranjbari et al., 2021) and discuss only the perspective of environmental problems (Yu et al., 2020) and economic performance, others fail in addressing social issues due to the difficulties in identifying parameters for social sustainability accounting (Klymenko et al., 2021, Clarke-Sather et al., 2011). Moreover, there are slightly different perceptions of social sustainability, which are often limited to the employees and customers wellbeing and other stakeholders are neglected. Firms located in developed countries claim for having a well-standardised approach to handle social and ethical issues at the country level that does not require many initiatives from the side of the firms. However, knowing the globalised structure of many supply chains reveals that focal firms struggle to identify all suppliers and sub-suppliers social and environmental performance. The outbreak of the COVID-19 has highlighted the emergency of social issues, thus lifted existing problems directed to staff, society and customers wellbeing (Ranjbari et al., 2021).

The analysis of the previous literature in sustainable supply chain management (SSCM) reveal that due to the various reasons, the main efforts in addressing sustainability are directed to environmental issues.

The aim of the paper is at shedding light on the reasons for low interest towards social sustainability issues by the firms. Furthermore, the paper will address te nature of newly emerged social issues derived from the COVID-19 outbreak, thus showing how do manegers deal with problems associated with social sustainability. The paper will address main theoretical directions in the field, knowledge gaps and will give a summary of the existing studies within social sustainability literature in operational management.

In the paper we are planning to start with literature review that will evaluate existing studies on social sustainability during pre-Covid 19 time and in the second part we will discuss the status of research on social sustainability since the outbreak of Covid-19 has started.

Furthermore, we will conduct interviews with SMEs regarding their perception and practices on social sustainability. By integrating literature review and qualitative study we aim at shedding light

on how social sustainability research and practices have emerged before and post-COVID-19 time. Paper aims at providing novel knowledge on social dimension of sustainability in academia and how do the practitioners deal with it. The paper will be directed towards identifying and explaining main changes of how social sustainability issues are treated.

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# Exploring sustainable food supply chains enabled by digitalization

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#### Abstract

#### Purpose

The population of our planet is expected to increase up to nearly 10 billion by mid- century. Growth is projected not only in numbers but also in affluence, leading to higher levels of consumption of food products, which have serious impact on environmental, social and economic sustainability. Food production contributes for example to GHG emissions, deforestation, loss of biodiversity and additionally, there is lots of waste in the production, processing, distribution, and consumption stages of the food supply chain.

The purpose of our paper is to explore different business models and distribution channels supported by digitalization solutions, that connect farmers with consumers.

#### Design/methodology/approach

As a response to consumers' demand for better quality, safer and more diverse products as well as increased environmental awareness, alternatives to global agri-food networks have appeared. These can be categorized under the umbrella term of short food supply chains (SFSCs). The defining characteristic of SFSCs is a reduced number of intermediaries between the food producer and the consumer while physical distance is considered an important aspect as well (Jarzębowski et al., 2020).

More and more innovative digitalization solutions are used to connect farmers with the end consumers with the aim of reducing negative impacts of food production and distribution, providing benefits for consumers and farmers as well.

In our research first we analyse European best practices of shortening and optimizing food supply chains. We examine the distribution channels and highlight digitalization as an enabler of building networks between actors in short food chains. Then to narrow the scope we analyse Hungarian best practices of shortening and optimizing food supply chains with qualitative research methods - focusing on the B2C model, supported by in-depth interviews with participants of food networks.

#### Findings

Preliminary results show that supply can be optimized with the help of digital technologies by knowing customer demand. The customer demand can be projected for different timeframes varying between short and long term (e.g. ordering food online for next

day delivery or renting land for a year and buying the goods produced on it) Additionally transportation can also be optimized based on demand, thus avoiding unnecessary emissions.

#### **Practical implications**

The description and analyses of the different business models and distribution channels supported by digitalization can be a useful source of information for organizations within the food industry and NGOs supporting farmers in building their F2F networks.

#### **Relevance/contribution**

Food supply chains are currently experiencing a change, due to the pandemic, the rise of ecommerce, turbulent economic and political environment. The consumer expectations are also changing supported by policy level expectations (F2F, 2022). With our paper we would like to contribute to providing scientific bases for transformation of agrifood supply chains toward sustainability.

**Keywords:** food supply chains, sustainable distribution channels, short supply chains

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# Demonstrating food waste reduction using IoT-Big Data technology in the food sector and learnings for use in other sectors

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#### Abstract

**Purpose**: New technologies such as IoT sensors and Big Data have revolutionised Industry 4.0 (Akter et al., 2020). We aim to demonstrate the use and benefits of these technologies for reducing food waste and improving environmental sustainability in food supply chains in an EU (Interreg North-West Europe) funded project REAMIT (REAMIT, 2022). We summarise the valuable lessons learnt based on the technology demonstrations and discuss how the learning can be applied beyond the food sector using relevant examples.

**Design/Methodology/Approach**: We have used a combination of technology demonstrations, observation, qualitative and quantitative studies (e.g., life cycle analysis, a large scale survey). We present results from at least five of our ongoing technology demonstrations. Different sections of the supply chain are targeted in each technology demonstration to understand the practical challenges and maximise our learning.

**Findings**: We first show how technology has been used in several demonstration cases and then evaluate the efficiencies of using technology for reducing waste. Each technology demonstration is a unique case that gives us the opportunity to diversify our understanding of the impact of using IoT and big data analytics across the supply chains. The following are some important findings from the demonstrations: (i) organisations find it valuable if the data from IoT sensors is made available to them via a dashboard; (ii)a smartphone app is considered even better; (iii) it is important to capture the tacit knowledge available with organisations in deciding the range of parameters (e.g., minimum and maximum allowed temperature for keeping freshness of food); and (iv) if actual parameters measured by IoT device deviates from this range, it is important to work with organisation on how they wish to receive alerts.

Some observations on how to extend the idea to other sectors (e.g., blood supply chains or vaccine supply chains) have been discussed.

**Practical implications**: Practical implications arise by demonstrating the increased efficiencies in food supply chains with the help of technology. By helping to reduce food waste, the paper will bring out economic, environmental and social benefits of these technologies (e.g., Cattaneo et al., 2021), which can be replicated to other sectors.

**Relevance/contribution**: We make several important contributions to advancing our knowledge and research on maximising the benefit of IoT sensors and big data in supply chains using food reduction as an example. Our contribution lies in showing that IoT and big data technology can not only support waste reduction in food supply chains, but the idea can also be extended to other relevant sectors such as the blood supply chains and vaccine supply chains.

Keywords: IoT technology, big data, food sector, other sectors, supply chains

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# Expert perspectives on sustainable hydrogen innovation to decarbonise road freight: a Q-method study in the food cold chain

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#### Abstract

**Purpose**: To identify the viewpoints of experts in the food cold chain regarding the barriers to the adoption of a sustainable innovation to decarbonise road freight and to contrast these against the viewpoints of academic experts developing this innovation.

**Methodology**: Q methodology is used to identify perspectives on the barriers to the adoption of hydrogen-fuelled refrigerated vehicles. Participants consist of engineers specialised in hydrogen-based temperature-controlled technologies and stakeholders in the food cold chain, including logistics companies, supermarkets and food manufacturers. Both groups completed the same Q-sort, either face to face or online.

**Findings**: Initial results indicate that there is not an 'industry' versus 'academic' perspective regarding the barriers to the adoption of hydrogen-fuelled refrigerated vehicles, but that industry and academic experts can be split between 4 dominant viewpoints. We label those viewpoints: (1) Big bangers pro-hydrogen, (2) External support, (3) No rush, and (4) It is too expensive. Across all 4 viewpoints, there are agreements around the facts that the mileage of hydrogen-fuelled vehicles needs to increase, the refuelling time needs to be reduced and that we need more diverse hydrogen-fuelled refrigerated vehicles. Yet, all believe that those factors will evolve and improve with time.

**Practical implications**: The paper suggests different obstacles that need to be addressed to support the adoption of a sustainable innovation in the food cold chain to decarbonise road freight that go beyond an academic/industry dichotomy. The paper also suggests areas which are not considered as barriers by experts and areas on which experts could not situate themselves and calls for greater collaboration between academia and industry in an effort to both develop and adopt sustainable innovations in supply chain.

**Contribution**: The paper provides a comprehensive appraisal of experts' perspectives on the barriers to the adoption of a sustainable innovation in the food cold chain by suggesting 4 different viewpoints. The paper contributes to a better understanding of social acceptance of

sustainable innovations in the food cold chain (Castelein et al., 2019), by (i) focusing on road freight and (ii) going beyond academic versus industry perspective. The paper also contributes to the value of Q-methodology to investigate perceptions of future technologies for sustainable transportation (Tsigdinos et al., 2022).

Key words: Q-methodology; sustainable transport; road freight

# Creating Shared Value Through Meta-Organizational Common Good Human Resource Management: An Empirical Study of "Best for the World" Certified B Corporations

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#### Abstract

#### Purpose

Human Resource Management (HRM) research on fostering sustainability to date mostly focuses on enhancing sustainability within traditional corporations. However, in firms designed for financial (shareholder) performance, the role of HRM in improving sustainability remains structurally limited (Stahl et al. 2020). Our study therefore investigates the HR systems and practices of companies that already have a strong record in environmental sustainability.

Emerging research on the design of organizations for sustainability has pointed to the importance of investigating organizations that have implemented sustainability from inception and embedded sustainability in the structural design of an organization (Bals & Tate, 2018; Tate & Bals, 2018). Our study therefore aims at understanding

(1) how such organizations' design for sustainability is reflected in their HR systems and practices, and

(2) how the HR systems and practices of such organizations contribute to the creation of shared value within the organization's ecosystem.

#### Design/methodology/approach

Combining a "common good HRM" (Aust, I., Matthews, B., & Muller-Camen, M., 2020)

perspective with the theoretical concept of meta-organizational HR management (Roundy & Burke-Smalley, 2021), we aim to engage in theory elaboration, shedding additional light on the implementation of common good HRM within organizational ecosystems. After removing firms that got decertified during 2007-2018 and duplicate observations, our sample includes 143 unique companies which were awarded at least twice in the area environment. All these 143 firms have been invited via email to participate in the study and this has resulted in a final sample of 17 B Corps that have agreed to be interviewed for this study, leading to a response rate of 12%.

#### **Findings & practical implications**

Our study set out to investigate the HR systems of companies that are designed for ecological sustainability. Our initial results support the view that the HR systems of such organizations are held together by shared goals and culture centered around ecological sustainability, organized in informal structures, and embedded in the surrounding organizational ecosystem (cf. Roundy & Burke-Smalley, 2021). This speaks to the question of how HRM structures for sustainability should be strategically designed (Stahl et al., 2020; Westerman et al., 2020), pointing to potentially relevant design features for HRM systems for ecological sustainability. Moreover, we found evidence of aspects of common good HRM (Aust et al., 2020), shedding light on ways in which HRM in these companies may contribute to creating shared common good value within their organizational ecosystem.

#### **Relevance/contribution**

Our research advances the literature on how the HR function can contribute to sustainability (Stahl et al., 2020; Aust et al., 2020) by focusing on the HR systems and organizational structures of firms with a high level of ecological sustainability. Moreover, addressing the "current lack of empirical research into Common Good HRM approaches" (Aust et al., 2020, p. 9), our study elaborates this theoretical perspective through empirical evidence identifying meta-organizational HRM (Roundy & Burke-Smalley, 2021) as a form of organizing common good HRM.

Keywords: Circular Economy, Human Resource Management (HRM) Systems, Common Good HRM

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# **CEO's Early-life Experience of Disasters and Corporate** Environmental Performance

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### Abstract

We aim to examine the relation between CEO's early-life experience of disasters and corporate environmental performance. We hypothesize that CEO's early-life exposure to the adversity of natural disasters acts as a catalyst for a change in CEO's values and cognitions that accompanies a positive influence on corporate strategy to manage environment-related risk.

We document empirical evidence that firms lead by CEOs with early-life disaster experience exhibit lower environmental concerns. Our findings are robust to controlling for other attributes of the birth-place of CEOs. We also perform a battery of robustness tests including the propensity matching approach, the two-stage model involving an instrumental variable, and difference-in-differences design around an exogenous shock to corporate environmental concerns. We argue that because CEOs with early life exposure to disasters are more sensitized to the consequences of risk, these CEOs can be wary of decisions that increase firm risk in the environmental space.

# In search of knowledge for sustainability: the case of supply chains of SMEs

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#### Abstract

#### Purpose

The objective of this research is to gain understanding of how managers of Small and Medium Enterprises (SMEs) perceive knowledge of sustainability, with the goal of improving knowledge management (KM) for sustainability. With about 90% of firms globally being SMEs, their contribution to the effectiveness of change towards sustainability should be significant. A key prerequisite for SME managers to become successful change leaders is relevant knowledge (Dunphy et al., 2003). However, research also suggests that SMEs lack an understanding of sustainability knowledge. Furthermore, research implies that the term "sustainability knowledge" is not well defined in the literature, with wide-ranging understanding such as strategic, process-oriented, holistic and systemic (reference withheld for the confidentiality of the review process). As KM frameworks for sustainability point out that the definition or indication of required knowledge is an essential first step (Klingenberg and Rothberg, 2021) for an organization to begin its pathway towards sustainability, it appears to be necessary to understand better what this knowledge is, how it can be described or categorized. The focus of this research will be placed specifically on knowledge of the sustainability of the supply chains of SMEs, as the interface between external and internal processes brings with it specific, additional challenges.

#### **Research design**

The study is using a multiple case study design as outlined by Yin (2018), as an empirical method suited to study a contemporary phenomenon. It follows theoretical sampling rooted in grounded theory, as the objective is to develop theory from data in an iterative approach (Strauss and Corbin, 1998, p. 12). Semi-structured interviews are used to collect data from SMEs in different countries. This research defines SMEs as businesses with up to 250 employees.

#### Findings

Preliminary findings (reference withheld for the confidentiality of the review process) suggest

that a well-developed concept of knowledge for sustainability is absent in SMEs that do not have moving towards sustainability as an active goal. And even those that are striving towards sustainability recognize difficulties in formulating what it is or in disseminating it. Additional cases from the latter group will help to expand these early findings.

#### **Practical implications**

It is often discussed that strategies and frameworks for the development of sustainability in large companies are not suitable for SMEs. Recognizing the importance of knowledge and KM for the change processes which drive an organization towards sustainability, the long-term practical application of this research will be to provide SMEs with the tools to identify and manage the knowledge they need for their transition, specifically creating transparency in supply chains.

#### Contribution

SMEs hold an important role in the global economy, and thus for the emergence of more sustainable business models. Following Johnson and Schaltegger's (2106) call for research into sustainability management tools for SMEs, this research aims to provide an improved understanding of knowledge needed to manage SME supply chains more sustainably.

Keywords: Knowledge for sustainability, supply chains, SMEs, knowledge management, grounded theory.

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# Sustainability performance in the energy industry: a contingency approach

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#### Abstract

#### Purpose

Sustainability has become a key priority for many industries, including the energy sector, which is often characterized by negative environmental impacts and low overall sustainability levels (Razmjoo et al. 2021 and Khan et al. 2022). Despite this, few studies about sustainability performance of energy firms can be found in the literature and several contributions on the topic could still be provided. For example, the decision-making process of both companies and policymakers needs to be fostered because of a lack of knowledge about factors that affect sustainability performance in the energy sector (Hmouda et al. 2021). In this regard, this paper seeks to identify variables and company's characteristics that may affect the sustainability performance of firms in the energy sector.

Based on the literature, we select four potential factors that may have an influence on the environmental, social, and governance (ESG) scores of companies (i.e., energy source, firm position in the supply chain (SC), geographic location, and firm size), developing the following research hypotheses:

H1: Firms that exclusively use renewable energy sources have higher ESG scores. H2: Firms that

exclusively use fossil energy sources have lower ESG scores.

H3: Firms positioned more downstream in the energy industry have higher ESG scores H4: Firms

headquartered in more developed countries have higher ESG scores.

H5: Large firms have higher ESG scores than small and medium enterprises.

#### Method

In this paper, secondary data analysis is used as a research method, following the guidelines of

Johnston (2017). 416 energy-related firms are selected from the Refinitiv Eikon Environmental, Social, and Governance (ESG) database based on the Nomenclature of Economic Activities (NACE) classification. For each firm, the following variables are extracted from the database: environmental, social, and governance performances, firms' headquarters locations, and total assets. In addition, energy sources used by the firms and firms' positions in the SC are classified through a manual coding process. Finally, a multiple linear regression analysis is performed to test the hypotheses, exploring the p-value, Beta coefficient, collinearity, and adjusted R square values.

#### Results

No differences in the sustainability performance of firms using only renewable energy and those relying on generic energy sources emerge from the result, thus rejecting H1. In contrast, as suggested in H2, fossil fuel-dependent firms present lower sustainability performance compared to companies using generic energy sources. Furthermore, firms located downstream in the SC have lower sustainability performance than those positioned upstream, rejecting H3. Firms headquartered in Europe and South America outperform North American ones, resulting in partially accepting H4. Finally, the results confirm H5, showing that the larger the firm, the higher the sustainability performance.

#### Practical implications and relevance/contribution

This paper contributes to the literature by shedding light on variables that may be correlated with the sustainability performance of firms in the energy sector. Furthermore, it helps sustainability and purchasing managers as well as policymakers to understand which energy firms have lower sustainability performance and may need targeted incentives to improve their sustainability levels.

Keywords: Sustainability performance, ESG scores, Energy sector

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# **Contribution of sustainable value chains: A systematic** review

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#### Abstract

Sustainability enables organizations to work with natural resources and continue to be diverse, and maintain the ecological balance in the long term. It is a new era where customers and employees are becoming more aware of reducing carbon footprints, maintaining sustainable value chains (SVCs), and working on proposals or plans to protect society and the environment. Sustainable value chains have contributed a significant role as a "competitive advantage" at a global level. These value chains have added sustainability impact by optimizing material flow, sharing international strategies and information with trusted partners, and focusing on resilient value chains. In this study, a qualitative methodology was used that provides a systematic review of sustainable value chains based on existing research papers, articles, and conference presentations. This paper discusses how SVCs are addressing different industries in new dimensions and what are the challenges faced by industries, and what still needs to be addressed in the conclusion section.

Keywords: Industries contribution, Sustainability, Value chain.

#### Introduction

The value chain is a framework that defines how to think strategically about activities (valuable activities) related to business, including its cost and contributions; it is also helpful in understanding how businesses can be created, sustained, and maximized value for their valuable customers. The value chain is a concept discussed by Michal Porter in 1985 (Porter, 1985) during his study on competitive advantage. Fearne and Martinez, 2012 discussed SVCs

as a framework that has added an additional perspective on the environment and social impact with the help of eliminating inefficiencies and waste. Sustainable value chains have been widely utilized in identification and prioritization in improving processes by 1) making operations faster, reliable, and efficient, 2) increasing agility and flexibility, 3) improving services for customers, and 4) providing relevant and informative evidence for making better decisions (Engelhardt-Nowitzki 2012; Horne, 2014). Various companies are governing and looking at companies' postures, actions, their attitude and taking actions against them if they are not addressing the ESG (Environmental, Social, and Governance) issues adequately. The covid-19 pandemic has been a turning point and made everyone (companies and customers) realize that they should act innovatively, proactively, and enthusiastically. Every industry and company is different, and their corresponding goals, challenges, and strategies would also be different but will be leading toward the familiar path, i.e. ESG excellence path. Apple and Amazon case studies (Lee and Schmidt, 2016) have discussed how the inclusion of external suppliers and outsourcing required and functional components can bring innovation and more flexibility in the chain. Apple has collaborated with external companies to supply and configure software applications and its systems. Similarly, Amazon has collaborated with large retailers such as Eddie Bauer (for physical distribution of goods) and Procter and Gamble (to deliver products and services directly from their warehouses rather than from Amazon warehouse). In other words, Amazon has implemented innovation using an extended value chain (Ricciotti, 2020).

#### Challenges:

1) The foremost challenge is that the implementation of the SVC should add to the traditional value chains in a way so that the whole process would involve less cost and can provide effective outcomes.

2) Dwivedi et al., 2021 have studied 13 different challenges that are faced under the SVCs where lack of awareness and knowledge towards sustainability has been identified as the topmost influencing attribute using Interpretive structural modeling (ISM) and matrix multiplication applied to classification (MICMAC) methodologies. Therefore, it becomes imperative to identify more and new such challenges so that a wake-up call towards sustainability and its 17 SDGs can be achieved in an effective manner.

#### Conclusion

An SVC shall offer diversified opportunities to the firms so that economic and societal challenges, along with the objective of business benefits, can be achieved significantly. Different strategies for how to implement more sustainable businesses and how to make society more aware of such businesses and their related practices are also required. It is imperative to design and redesign the value chains as quickly and continuously as possible to analyze which are vulnerable, defensible parts, which alliances are making strategic sense, and what are the dangerous threats so that maximum advantage and competitive gain can be obtained.

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# The systemic transition of value chains to the circular economy: a co-created measurement framework to link research and practice

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#### Abstract

**Purpose:** The implementation of Circular Economy (CE) is a sound strategy to foster the transition toward a sustainable society, focused on well-being within planetary boundaries. Circularity assessment frameworks play an important role in supporting public and private decision makers in implementing circular strategies and practices (Saidani et al., 2019). However, according to Calzolari et al. (2022), there are few measurement frameworks able to assess the circularity degree at Value Chain (VC) level. Also, the existing tools do not fully address the deep concept of CE, neglecting its systemic nature (Corona et al., 2019). To address these issues, this study founds a new measurement framework that can investigate the circularity performance of VC and its ability to generate circular value, with the aim of supporting and promoting systemic innovation processes.

**Design/methodology/approach:** To fill this gap, the authors developed a new measurement framework, based on a co-creation approach between practitioners and academics, to measure the circularity of value chains, following the engaged scholarship approach (Bansal et al., 2018). Representatives from nine different companies contributed to the development of the conceptual framework. This had many benefits, including the development of a framework that could reflect the real contribution of companies to the circular transition and guide practitioners in making effective decisions. Thanks to this new conceptual framework a robust measurement tool was co-created, focusing on circular capabilities, collaboration - inside and outside the value chain - and systemic vision - taking into account the broader system in

which circular value is generated and

maintained over time. The measurement framework was then tested in four companies in the food and beverage sector. After the testing phase, it was refined and adopted by the organizations involved in the process (i.e. companies, trade association, research group) with the goal of disseminating it in the real world.

**Findings:** The measurement framework relies on seven pillars: circularity in resource use, ability to innovate, collaborate, be resilient, implement strategies, manage risks and take a systems approach. Linked to the pillars a set of 54 quantitative and qualitative key performance indicators (KPIs) has been designed to assess the capacity of the supply chain and its actors to generate and regenerate circular value. The framework also examines the characteristics of the relationships between different network actors to appropriately assess the level of collaboration. To support a systemic circular transition, the application of the assessment starts with the focal firm, the central VC enterprise, and extends to the other actors in the value chain that contribute to the creation and regeneration of circular value.

**Practical Implication:** The research findings have implications for managers and policymakers. First, the developed tool is based on the use of KPIs to generate an overall view of the VC's ability to generate circular value. Therefore, the implications related to the use of KPIs concern a comprehensive and continuous improvement of decision- making processes over time. Second, the tool application allows companies to identify the weaknesses and strengths of their supply chain. Thus, it encourages practitioners to support the mitigation of the risks deriving from the action of circular practices, the improvement of strategy management, and the implementation of practices for the regeneration of natural capital. Finally, since the tool application requires the direct involvement of relevant stakeholders in the value chain, it promotes – in the reality - a systemic transition toward CE.

**Relevance/Contribution:** This study contributes to the scientific debate on the development of metrics to support circularity by offering a new perspective for measurement at the meso level, currently less developed than at the macro and micro levels. Furthermore, thanks to the Action Research approach, this study contributes to the debate on the research-practice gap (Sharma & Bansal, 2020). Our research, indeed, demonstrates that a co-creation experience between scholars and practitioners is able to create tools that could help managers and organizations in orientating their overall strategy.

Keywords: Supply Chain Management, Circular Economy Measurement, Food and Beverage

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# Cross-industrial relationships for circular economy: how companies manage network distance

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Keywords: Supply Networks, Circular Economy, Cross-industrial collaboration

### Abstract

One response to the environmental crisis is the shift to the circular economy (CE) and recent supply research states that one of the levers for its scale-up could be systemic operations involving collaborations going beyond traditional sectoral or industrial boundaries (De Angelis et al., 2018; Tate et al., 2019). This paper studies cross-industrial circular collaborations, how they emerge, how they function, whether they are relevant from a profitability and environmental performance perspective and how they deal with issues related to network distance. The theoretical approach adopted is the network theory and more particularly the notion of the strength of the weak ties (Granovetter, 1973). It will be coupled with an application of the inter-organisational distance framework (Boschma, 2005) that analyse differences between organisation under 5 dimensions : geographical, organisational cognitive, social and institutional. The research design is a multiple case study of 6 networks and data collection through semi-structured interviews is in process. First results have emerged regarding links between the type of proximities at plays and life cycle stages of the collaboration, industrial sectors compatibilities and specificities resulting from the circular context. A first list of benefits of cross-industrial circular collaboration have been drawn up.

### Background

Collaborative solutions and processes being at the epicentre of the CE (Bressanelli et al., 2022), the context of global awareness of the environmental emergency thus leads many organisations to move towards a more responsible production system, resulting in the adoption of new practices such as the uptake of circular supply chains within collaborative organisational networks. Recent research emphasises the importance of a certain type of these practices: those whose operations go beyond the usual industrial boundaries (Tate et al., 2019). This research will thus seek to answer the following RQs: How does distance (in its different forms) impact cross-industrial circular partnerships? How do the different actions of collaboration manage to establish proximity between partnering organisations? How do these collaborations manage to achieve sustainability and business objectives?

### Methodology

The research design is a multiple case study covering 6 networks formed by a minimum of 3 organisations, which involves circular collaborations within their supply network in the sense of Geissdoerfer et al., 2018 and straddling several different industrial sectors. The cases include 1) an ecopark involving the energy, construction, agrifood, cosmetics and public sectors 2) a JV from the agricultural and automotive sectors 3) a conglomerate belonging to the waste management, furniture, and construction sectors 4) a supply network involving the agrifood, cosmetics and construction sectors 5) a supply network involving the furniture, waste management, aquaculture and sports sector 6) a project financed by the French national environment agency involving private actors from the electronics sector, private non-profit actors and public education and higher education sector.

### Findings

Data collection through semi-structured interviews is in process, so far 13 interviews have been conducted. A first analysis has revealed the following insights.

- The proximities involved in the studied partnerships are different depending on the stage of the collaboration life cycle considered. It seems necessary at the beginning of the relationship that a cognitive proximity is established. Very often, this proximity seems to be created by a third party in charge of the "translation" (by a circularity broker, in charge of the facilitation of the circularisation of organisations (Ciulli et al., 2019)).

- It seems that there are greater compatibilities between certain industrial sectors, with less work on establishing the proximities to be achieved for the partnership to function properly. This compatibility seems to be based on cognitive and organisational proximities.

- Specificities related to the CE context seem to apply. The sustainable vision shared by the management members of the organisations acts as a facilitating factor in establishing an interorganisational distance conducive to performance. This sustainable vision seems to impact geographical and cognitive distances.

- Among the opportunities provided by these circular cross-sectoral collaborations were cited:

1) Access to novel inputs allowing for technical advances or innovations; 2) Once supplies are in place, competition for access to these non-traditional inputs may also be less aggressive. 3) The absence of competition between the partners may allow a more fluid exchange of information leading to innovations or improved performance 4) The opportunity for certain sectors to see some of their (by)products gain additional value 5) In the case where these byproducts replace non-renewable inputs, the reduction of dependence on oil resources and their associated costs, coupled with a more beneficial environmental impact, also potentially translates in a competitive advantage in terms of triple bottom line performance.

### Implications

In a context where the importance of assessing the implications of different collaborative practices in circular supply chains has recently been highlighted (Sudusinghe & Seuring, 2022) this article contributes to the literature by extending our knowledge on the opportunities of cross-industrial circular supply networks. From a theoretical angle, the paper proposes to further apply and extend network theory to the particular context of circular supply networks, as recently initiated (Ciulli et al., 2019).

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## Designing and managing supply networks for circular economy

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### Abstract

**Purpose**: The transition to a circular economy model (CE) requires a focus on partner selection and in particular on assessing capabilities, to ascertain the potential contribution, and on the possibility of aligning interests between parties (Fischer & Pascucci, 2017). The ability to select partners and develop a trustworthy relationship for sharing information and knowledge is rare and has implications for the success and continuity of relationships (Berardi & de Brito, 2021). In the literature there is evidence of what practices can be activated to set up collaboration for circular food packaging (Jäger & Piscicelli, 2021). However, according to the literature review on CE models by Lahti et al. (2018), research on how collaborative alliances are designed and set-up should be complemented by studies on how they are successively governed.

This research intends to contribute on the debate on how CE can be implemented (designed and governed) in supply networks by investigating the role of each partner involved in CE pilot projects. The aim is to improve our understanding of the partner selection mechanisms activated to properly design a supply network for CE and the collaborative governance mechanisms and agreements to sustain collaboration over time.

**Design/methodology/approach**: the study adopts a qualitative research approach consisting in a multiple-case study of three companies that have already implemented CE practices. For data collection, semi-structured interviews are used to focus on the "how" and "what" and to leave room to the participants to produce their own opinions and ideas. The interviews have been coded to drawn out key themes from the data from which information has been successively grouped into categories.

**Findings**: we expect to identify specific selection criteria for partnership creation in circular supply networks base on roles. Also, different governance mechanisms and type of agreements between actors in the same circular supply networks will be investigated and compared with a cross-case analysis. Additionally, the system of incentives and disincentives will be compared in different networks and different causes of collaboration obtained from interviewing all the actors involved in the project will be explored.

**Practical implications**: the ability to select partner based on the different roles needed in the circular supply network, how such collaborations are implemented, the contract management stipulated, and governance mechanism applied to sustain a collaborative relationship with each partner involved in the circular network is crucial to build a durative, resilient circular supply network that has competitive advantage and contributes to sustainable development.

**Relevance/contribution:** the study intends to provide a managerial guideline for partner selection based on their roles in CE projects within supply networks and for the adoption of proper governance mechanisms to sustain collaboration in CE projects over time.

Keywords: circular supply network, collaboration, partnership

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### **Collaboration process of Sustainability-Oriented Innovation (SOI) initiatives: a case study**

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Keywords: Collaboration process, Sustainability-Oriented Innovation, Case study

### Purpose

The need for a sustainability transition at every scale is undeniable. Recognizing that companies control most of the productive resources globally available, an operationalizing framework is needed to allow the implementation of sustainable actions within their businesses. Achieving sustainability goals will require a multifaceted innovation perspective, including the organization's philosophy and values, as well as its products, processes, practices, and business models (Adams et al., 2016).

These reflections suggest that sustainability-oriented innovations (SOIs) will be the natural evolution of the innovation concept, given that all the innovations are required to make their environmental, social and economic impacts explicit (Inigo & Albareda, 2019). The framework proposed by Adams et al. (2016) frames this complex concept that goes beyond traditional market-oriented innovation, also covering new organizational culture and values that have an overall net positive impact by addressing environmental, social, and economic goals. Within this framework, the systems building (SOI-SB) approach endorses the implementation of radical changes that impact not only the internal operations of a company or initiator of the innovative initiative but also the external context, by transforming traditional business practices

and strategies in ways that fully embed the sustainability concept (Ayuso et al., 2011). This fact evidences the imperative need for creating collaboration networks among different stakeholders (Adams et al., 2016; Inigo & Albareda, 2019). The SOI-SB concept is about reframing the purpose of business in society into "doing good by doing new things with others" (Adams et al., 2016, p. 190). Given that the stakeholders involved differ in their nature and purposes (Goodman et al., 2017), it is a complicated task for the initiator to set up and manage the collaboration process on the SOI-SB initiatives. Such innovation processes are recognized to be dynamic and iterative (Carrillo-Hermosilla et al., 2010). However, the literature is scant in describing the stages and the stakeholders involved in developing innovative initiatives. In particular, we refer to collaboration processes as the set of all the activities, stages and interactions that take place among the initiator company and the other companies involved in the development of the innovative product, process or service. Given the novelty of the topic and the need to deepen the understanding of the SOI-SB collaboration process that stakeholders undertake while developing successful initiatives, this research tries to fill in this gap within the related literature. To this end, this study will address the following research questions:

**RQ1**: *How is the collaboration process developed within SOI-SB initiatives?* 

**RQ2**: Who are the stakeholders involved and which are their roles throughout the collaboration process stages of SOI-SB initiatives?

### Methodology

To answer the proposed research questions, a longitudinal embedded cases will be developed. The unit of analysis will be the SOI-SB initiative that simultaneously considers the three dimensions of sustainability in its strategy. Semi-structured interviews will be conducted starting with the initiator of the SOI-SB initiative, the data collection will then be expanded to all the stakeholders involved with ad-hoc protocols depending on the identified roles. The initiator is a textile innovation Hub that implements SOI initiatives in collaboration with different stakeholders for developing its products and processes considering sustainability strategies.

### **Expected findings and Contributions**

The expected findings of this research are a thorough understanding of the collaboration process for SOI-SB initiatives.

The theoretical contributions deal with: (1) shedding light on the collaboration process that companies undertake to pursue sustainability-related innovation initiatives; (2) enriching the knowledge of the role of stakeholders in developing SOI initiatives. Additionally, this work provides some practical implications that can guide practitioners manage the SOI-SB initiatives collaboration process considering the diversity of stakeholders and their roles within the collaboration.

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# Structural changes in the energy value chain to achieve decarbonization through digitalization

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### Abstract

### Purpose

The European and global energy production have always been dominated by fossil fuels that are the main source of global warming. In order to achieve the climate protection goals, it has been decided to phase out coal-fired power generation and to start structural development in the affected regions. To this aim, this paper presents the energy value chain and shows how it can be decarbonized through structural changes. The actions and possibilities for decarbonization as well as the issues and consequences faced by the companies and regions are highlighted.

### Design/methodology/approach

This paper reports on data from a series of expert interviews which are organized among the companies expected to be affected by the coal phase-out i.e. lignite operators, service companies, buyers of by-products, and suppliers.

### **Findings**

One of the significant findings to emerge from this study is that digitalization enables energy value chain to be designed more efficiently than ever before by linking producers, suppliers and customers more closely. The linear energy value chain is increasingly becoming flexible value networks, which aims to improve resource and energy efficiency and makes it possible to develop new business models.

### **Practical implications**

The study support actors from small and medium-size enterprises to develop their new strategies and concepts by making new cooperation between actors as effective solutions. Based on this cooperation and with the combination of the available digital resources, it enables the involved actors to develop new climate-friendly products, technologies, and business models for a sustainable energy transition.

### **Relevance/contribution**

This study set out to gain better insight on prevalent perceptions of the future energy value chain

and to find out what obstacles regions and companies have to overcome on their way to a decarbonized energy sector in order to limit the impact of climate change.

Keywords: structural changes, energy value chain, decarbonization

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## Can low-carbon technology adoption influence sustainable performance? New evidence using panel data in the manufacturer sector

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### Abstract

With the looming climate risk, enhancing sustainable performances and transiting to carbon neutrality in the supply chain has been an important task for manufacturers. Companies have made various approaches to advance sustainable goals, including the adoption of modern technologies. Existing literature has primarily studied the role of generalised technologies in the company's economic or environmental aspects while rarely focusing on the impact of lowand zero-carbon technologies on firms' sustainable performance. This paper is one of the first to examine how adopting low-carbon technologies affects a firm's environmental, social and governance (ESG) performances in the manufacturing sector. Drawing from multiple data sources (SNSI ESG Ratings, CNRDS and CSMAR databases), we investigate the relationship between adopting decarbonisation technologies and sustainable performance with a panel dataset of 2540 manufacturing companies from 2009 to 2021 in China. The hypotheses are tested using econometric panel data techniques. Considering the size of companies, the findings confirm that low-carbon technologies can improve sustainable performance for large firms. However, small- and medium-sized (SME) companies show opposite results. In addition, contrary to the assumption, a higher ratio of green patents does not indicate better sustainable performance. The results also show that industry competitiveness plays a positive moderating role in the relationship. The results are robust, with endogenous issues, industry cluster analysis, and years of critical international and domestic incidents being accounted for. The results show that the outbreak of the COVID-19 pandemic had negative impacts on firms' sustainable performance since 2019. This paper provides new insights for research and lowcarbon practices in sustainable supply chain management.

Keywords: Sustainable supply chain, Low-carbon, Sustainability performance

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## Approaches to simulate resilience strategies in food supply chains on strategic, tactical, and operational decision level

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### Abstract

### Purpose

Due to external triggers (Covid-19 pandemic, the war in Ukraine, etc.), supply chains witnessed severe disruptions on multiple ends, demanding a more significant focus on resilience management (Ivanov, 2021). Especially food supply chains (FSC), as part of food security, play a vital role in avoiding negative impacts on society. Therefore, FSC actors need to develop strategies to prepare for disruptive events while having tactical and operational plans in place for the moment the disruption hits to mitigate its impacts. This research project aims to provide a basis for comparing different resilience strategies using simulation and presents a framework that supports future simulation models to integrate resilience strategies with a shared perspective on decision-making among supply chain actors.

### Design/methodology/approach

One way of comparing such strategies is by analysing them with simulation models to assess the effects of different strategic, tactical, and operational decisions on supply chain performance. We outline a three-step research process to create a simulation framework: (1) using existing literature to identify connections between strategic, tactical, and operational decision levels and resilience strategies (flexibility, visibility & transparency, collaboration, redundancy, multiple sourcing & flexible contracts, postponement (Kilubi, 2016); (2) followed by the identification of intervention points along a generic FSC and recommendations for incorporating these strategies in simulation models; (3) the connection of the identified strategies and potential interventions that subsequently result in a framework.

### Findings

The first findings indicate possible intervention approaches to include the various resilience strategies in a simulation context. The framework incorporates strategies for different decision

levels (strategic, tactical, operational), their relationship, and the relevance for heterogeneous supply chain actors (processors, distribution centers, retailers). On a strategic level, these strategies include excess capacities and collective decision-making; on tactical and operational levels, they involve postponing decisions, and flexibility regarding sales channels, transportation modes, and suppliers; and on an operational level, sharing inventory positions. Connections between the strategies include the effects of excess capacities on flexibility measures, the link between collaborative planning and postponing decisions, and both impact inventory position sharing. Expected future findings compare the various resilience strategies implemented in a simulation model under different disruptive scenarios. Furthermore, the simulation results will assess the impact of varying resilience strategies in connection to the respective decision levels on the overall supply chain performance.

### **Practical implications**

The implications for decision-making in supply chains are relevant for food industry actors and policymakers by providing better insights into FSCs to increase their resilience and provide a basis for researchers to develop more comparable FSC simulation models. The increased resilience should further increase food security, help the industry better prepare for unexpected disruptions, and allow policymakers to support organizations in preparing for and managing disruptions.

### **Relevance/contribution**

The developed framework fills a research gap by incorporating different approaches to resilience in FSCs. First, integrating resilience strategies in simulation models allows the evaluation of different scenarios and the subsequent outcomes, such as costs or demand fulfillment. Additionally, the developed framework closes a research gap by presenting a joint view of varying decision-making levels and intervention possibilities for increasing resilience. All these results contribute to the field of FSC resilience and extend simulation applications in supply chain disruption management.

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## Short Food Supply Chains Intra-firm Resilience to External Shocks: a Scoping Review

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### Abstract

**Purpose**: Short Food Supply Chains Intra-firm Resilience (SFSCR-farm), including socioecological systems approach, is gaining traction across disciplines. Given their capacity to withstand external shocks and support supply chain sustainability priorities as a result of reconnecting market demands for consumers with the farming process (Benedek et al., 2022). Face with the pandemic outbreak of COVID-19, SFSCR-farm presents an exciting research agenda. In light of this, the present scoping review aims to identify concepts and current theoretical foundations and close the research gaps.

**Design**: The PRISMA Extension for Scoping Reviews (Tricco et al., 2018) scoping review method was utilized to map the available evidence on topics such as short food supply chains, agrifood supply chain resilience, and agricultural entrepreneurship research. A scoping review facilitates examining the breadth (i.e., size), variety, and nature (characteristics) of evidence on a particular topic or question. In this instance, it is a helpful instrument for monitoring the nature and scope of available evidence on the intra-firm resilience of short food supply chains. Identification, selection, eligibility, and inclusion were carried out in four steps. This work was supplemented by bibliometric analysis in R and content analysis in NVivo.

**Findings**: This study examined 29 journal articles from a variety of disciplines that dealt with short food supply chains, agri-food supply chains, and agricultural entrepreneurship. The variety of sources offers a thorough summary of the body of knowledge already available in these fields, and knowledge gaps have been noted (Coopmans et al., 2021; Benedek et al., 2022; Zimmerer, Karl S., et al., 2022; Schiller, Katharina J.F., et al., 2022). These studies suggest that additional study on small-scale producers in short food supply chains in Latin American socio-ecological systems during the COVID-19 crisis is necessary to comprehend the resilience of the agrifood system and concerning the sustainability transition.

**Practical implications**: As a starting point, this study provides a framework for practitioners to assess the resilience of small-scale producers (the main actors in the SFSC) participating in short food supply chains and their determinants to continue system operations. Actors in the agri-food system may be forced to deal with the effects of the COVID-19 crisis if they are exposed to them and continue with food distribution. These may cause them to take specific actions to be resilient, depending on the system's resources, resilience attributes, and

resilience capacities. (Coopmans et al., 2021; Meuwissen et al., 2021).

**Relevance/contribution**: A scoping review of relevant literature about Short Food Supply Chains and Intra-firm Resilience to external shocks over the last ten years (2011 -2021) was conducted to identify and research concepts and current theoretical underpinning, such as Resource-Based View in Socio-Ecological Systems.

Keywords: Short Food Supply Chains, Intra-firm Resilience, The COVID-19 pandemic

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## A methodology for a sustainable transition in wine supply chains

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### Abstract

Reducing the environmental impact by guiding companies towards a sustainable transition is one of the main objectives of the European Green Deal. Within the Food & Beverage sector, wine supply chains are among of those with the highest environmental impact being major users of plant protection products and because of their significant carbon and water footprints. They are also characterized by significant and discontinuous energy consumption profiles. The goal of this research is to develop a methodology to support decision makers in wine supply chains to systematically adopt and improve sustainable practices and performance.

The proposed methodology is grounded on the integration of Lean Management, Industry

4.0 and Circular Economy concepts. The present study is part of a broader research project that addresses all the phases of the wine supply chain (i.e., vineyard management, winemaking and wine distribution). This paper focuses on winemaking processes. The methodology has been conceptually developed and then tested in a real wine supply chain to ascertain it efficacy as decision support system. The theoretical contribution of the study lays in the identification of the synergies among Lean/Six Sigma, Industry 4.0 and Circular Economy domains which are generally considered separately or in pairs in previous studies. The practical contribution is the decision support system that decision makers in wine supply chains can use to simultaneously and coherently adopt circular supply chain practices, use of advanced process control technologies, improve process efficiency and reduce process and outcome (i.e., wine) variability.

Keywords: Sustainable production, Circular Economy, Winemaking

# Experiential Learning Approaches and Assessment for Teaching Sustainable Supply Chain Management

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### Abstract

#### Purpose

The United Nations (UN) 2030 Agenda for Sustainability formulates seventeen Sustainable Development Goals (SDGs). Advancing these goals requires that decision-makers are educated in the concepts and frameworks on which sustainability is based. Higher Education, therefore, has the major responsibility of developing future leaders to support the necessary change towards sustainability (OECD, 2019). Success in this may also depend on facilitating a needed mind-shift, away from the paradigms that have informed business and business education thus far, towards a more sustainable mindset (Rimanoczy & Llamazares, 2021). Salinas-Navarro et al. (2022) argue, based on a case study of education for sustainable supply chains, that a combination of experiential learning methods can enable the needed learning processes. Similarly, the research presented here showcases the teaching approaches used for a sustainable supply chain management course. Taking the approach of the Experiential Learning Model (ELM) and Action Reflection learning (ARL), the course integrates various experiential components using simulation gaming, reflective experiences, teamwork, and other exercises that target the development of the so-called Sustainability Mindset (SM). This framework aims at moving individuals toward the aforementioned paradigm shift (Rimanoczy, 2020). The effects of this pedagogical approach are assessed using the Sustainability Mindset Indicator (SMI, Rimanoczy & Klingenberg, 2021), a tool that maps an individual's progress towards such a mindset.

### **Research design**

This research represents an explorative case study for developing a sustainable supply chain management course. In particular, we use the "Sustainable and Global Supply Management" course, taught in the second (and last) year of the Master of Science program in Management Engineering at the University of Bergamo in Italy. This course uses various experiential learning methods, such as the Blue Connection on Circular Economy Simulation, and exercises that stimulate the development of thought processes along the principles of the Sustainability Mindset (SMPs). Each exercise had specific objectives that aligned with the SMPs. Using the SMI, a prepost assessment of students' position towards the SM is performed, together with an evaluation of students' experiences, to determine the effects of the combined teaching methods. The findings are mapped against the objectives of the various experiential learning methods.

### **Findings**

As of the writing of this abstract, the course is ongoing, with the final students' assessment scheduled for the third week of December. Early reactions to the teaching method show a high level of student engagement. The results of the pre-post analysis and the mapping of the various experiential learning approaches to these results will be presented.

### **Practical implications**

Educators can find inspiration in the presented teaching approaches and learning methods employed throughout the course. In addition, the SMI, a new assessment tool to measure the effectiveness of teaching interventions, is introduced.

### Contribution

This research adds to the literature on teaching approaches for sustainability in general, and sustainable supply chains specifically. A new assessment tool, the Sustainability Mindset Indicator, is used to evaluate the relevance and effectiveness of various pedagogical tools employed throughout the course. The applicability of this new tool is therefore also tested.

Keywords: Sustainable Supply Chains, teaching, Sustainability Mindset, experiential learning

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# Making sense beyond words: The role of visuals in supply chain sustainability research

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**Purpose:** Although the supply chain sustainability (SCS) literature has recurrently called for new theories that explain the challenges faced by organisations regarding climate change (e.g., Touboulic and McCarthy, 2020; Wieland, 2021), little attention has been done on which methodologies should be used in this regard. Scholars cannot continue using the same methodological tools when using new lens of research. Therefore, the aim of this study to provide a practical guidance on how SCS scholars should increase and diversify their methodological tools to gather and interpret visual data (e.g., images, social media) within interpretive research. To this end, we shed light on the relevance of adopting visuals, beyond words, in SCS research. In doing so, we discuss the need for scholars have to sensemaking sustainability (see Weick, 1995) according to diverse voices and perspective globally.

**Design/Methodology/Approach:** This is a methodological article. Therefore, to provide a framework to gather and interpret visual data, a conceptual perspective is taken. We assume that the study of visuals may be a valuable approach within the SCS field because it reveals underlying structures and power dynamics at play in the transition to sustainability. The provided framework is a powerful tool for unpacking narratives and counter-narratives and, thus, for revealing the dominant and suppressed voices. To develop this proposal a critical discourse analysis was necessary.

**Findings:** The development of the framework highlights the role of a multiple types of sources (i.e., multimodal approach) in the research to extend the analysis beyond textual sources. To illustrate how to use this methodological framework, examples are provided to show how visual analysis can support SCS scholars to better understand the practices of sustainability.

**Practical implications:** The framework proposed in this research provides implications to the practice of research in which interpretive scholars will have a comprehensive understanding on how to use visuals.

Originality: This paper offers a methodological framework as a tool for SCS scholars to

recognise the importance of going beyond the analysis of textual data and adopting visuals as a valuable data source. In doing so, this paper responds to a recent call to diversify the methodological "toolbox" of the SCS field in order to include interpretive research (Darby et al., 2019; Hardy et al., 2020).

Keywords: Sustainability, Supply Chain, Methodology, Visuals.

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# Sustainable Supply Chain view of Long-term Low Emissions and Development Strategies

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### Abstract

**Purpose:** In accordance with the Paris Agreement on Climate Change, all nations were supposed to formulate and encouraged to communicate their Intended Nationally Determined Contributions (NDCs) and a Long-term, low emissions and development strategies (LT-LEDS) document to the United Nations (UN) secretariat by 2020. Through this document, each of the 193 countries which signed the accord, provide strategies to decarbonize their various operations and limit the global average temperature increase to less than 1.5 degrees Celsisus. However, as on today, only 53 nations have submitted their LT-LEDS document. The purpose of this study is not only to analyze the existing LT-LEDS documents available from the point of view of sustainable supply chains, but also to provide a guidance to developing economies such as India.

**Methodology:** In this study, using content analysis, we would like to study these submissions and individual country strategies from a supply chain perspective and suggest ways forward for refining or developing policy documents for other nations. Content Analysis has been used in the extant literature (e.g., Saeed & Kersten, 2017) to analyze public documents to arrive at policy recommendations.

Findings: This is a research in progress and we do not have any findings to report.

**Practical Implications**: As a few LT-LEDS documents suggests, industries play a significant role in decarbonizing the operations of the nations. Several solutions to achieving the paris accord targets have been discussed from supply chain point of view in extant literature (e.g., Hsu et al., 2016; Montabon et al., 2016). In this study, we will suggest supply chain based solutions related to circular economy, greener manufacturing, logistics optimization and sourcing strategies.

**Relevance**: Extant literature (Jaber et al., 2020; Mace et al., 2021) have looked at analyzing LT-LEDS documents and discuss gaps and suggest way forward. However, academic discussions from supply chain point of view in this field are sparse.

Keywords: Decarbonization, LT-LEDS, Climate Change

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# Supply chain collaboration to foster circular economy: a multiple case study in the textile industry

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Keywords: Circular economy, supply chain collaboration, multiple case study

### Purpose

This study aims at widening the knowledge about the relationship between circular economy (CE) and supply chain (SC) collaboration. The ultimate goal is to shed light on how collaboration practices (Cao *et al.*, 2010) affect the progress of the new paradigm in the Italian textile industry. In detail, the paper focuses on recognizing the key factors driving the supplier selection process, as well as identifying the most prevalent collaboration practices along the supply chain. Furthermore, the study identifies the main challenges before and after implementing SC partnerships among the actors who established circular systems.

### Design/methodology/approach

This paper is based on a qualitative study. Specifically, the multiple case study approach has been identified as the most appropriate methodology to achieve the study objectives. Multiple techniques have been applied to achieve external validity and reduce the risk of relying on biased information (Voss, Tsikriktsis and Frohlich, 2002). Nine cases were selected within the Italian textile industry through a purposive sampling technique (Yin, 2009). Start ups and incumbents have been investigated to provide generalizability to the results. Data were collected through semi-structured interviews developed around a research protocol and then triangulated with several secondary sources.

Data analysis was structured into two main parts: the within-case analysis and the cross-case analysis. The cross-case analysis was implemented to highlight emerging patterns by focusing on differences and similarities concerning the topic under investigation among the selected cases.

### Findings

The analysis confirms that establishing valuable SC collaborations is crucial to successfully

implement circular practices (De Angelis, Howard and Miemczyk, 2018). Moreover, this study identifies the various challenges that may arise during the implementation of a partnership, dividing them according to the stage of collaboration in which they may occur.

Besides, the main drivers guiding the selection process of business partners are underlined, and the shift from economic to environmental and accountability factors, namely geographical proximity, goal congruence, high transparency among partners and the compliance with international certifications, is highlighted. Furthermore, information sharing and resource sharing are the two most relevant collaboration practices that foster the effective implementation of CE in the textile industry. Finally, these findings are summarized in an original and innovative framework, the so-called *Temple of Circular Economy*.

### **Practical implications**

Practical implications arise for companies that aim to implement a successful circular system. Practitioners could exploit the findings of this study to carry out the supplier selection and the management of SC collaborations. Indeed, assessing the factors discussed within this paper could help them avoid or overcome the typical collaboration issues that prevent companies from a successful CE development.

### **Relevance/contribution**

First, this study highlights that the most significant challenges that may affect the successful creation of partnerships along the SC are time-dependent, which was not debated in the literature yet. Moreover, it applies a methodology not so frequently used regarding CE implementation in the textile industry.

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# **Building a Circular Accommodation in the Hospitality Sector: A SME Journey in Transition to Sustainability**

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### Purpose

Circular Economy, is considered as a holistic approach, driven by the development and application of different circular business models (Geissdoerfer et al., 2020), The transition from a linear to a circular model requires revolutionary steps and resources which is a particularly challenging journey for SMEs. There is little understanding of how hotels, resorts, and campsites could operate more sustainably, especially during the phase of building new accommodation stocks. A successful transition in the hospitality sector requires a radical change in systems thinking to foster innovative process approaches (Wang et al., 2021). This study, therefore, aims to develop a framework for the transition process, which acts as a guide for tourism SMEs and entrepreneurs in their effort to move away from business-as-usual practice to providing a circular accommodation provision.

### Design/methodology/approach

The study applied a single case study design based on qualitative research methods. The selected case is a medium size Dutch resort business, which went through a transition process of building an entirely circular accommodation for their holiday park. The case spanned over five years from idea generation to construction and operation. Data was collected via a wide range of semi-structured interviews during all three transition phases of idea generation, construction, and operation. The data from the interviews was supported by additional site visits. Collected data were analysed with a thematic analysis by examining the 4 dimensions of time, network, activities, and challenges.

### **Findings**

This study proposes a three-phase transitioning framework to demonstrate a successful transition from linearity to circularity. Identified phases include Pre-implementation phase (Idea-generation; Idea Confirmation; and Detailed design), Implementation/Construction phase, and Post-implementation/Operation phrase. A stakeholder map was created, to identify the types and nature of the collaborative network with each stakeholder in the respective transition phase. The main challenges were collaborative, such as identifying partners with

expertise in innovative approaches for circular buildings. In addition, design challenges around incorporating the circular accommodation in their natural habitat and identifying suitable materials and technologies accompanied the early phases of the building process. Based on the findings, key activities and steps for each phase were identified and ultimately aided in the development of a set of toolkits to foster the transition journey of SMEs in holiday accommodation providers.

### **Practical Implications**

It is essential for the tourism and hospitality sector, to start embracing circular practices. This study is particularly relevant for holiday accommodation providers, offering a framework to guide their transition to circularity. The findings provide rich information and practical tips for SMEs in their journey to build circular accommodations.

### **Relevance**/ contribution

The study contributes to the circular movement by proposing a transition framework for circular innovation and implementation, based on a real-world rich case study of a holiday accommodation provider. The framework can be applied in a wider context of transitioning from linearity to circularity.

Keywords: Circular Construction, Innovation, Transition Framework

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# Past, present, and future of circular supply chain management: a bibliometric and science-mapping analysis

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### Abstract

### Purpose

The undeniable need to tackle the biggest global challenges of our times -waste, climate change, overconsumption, and decarbonization- has led to the extension of Circular Economy (CE) principles and practices to the Supply Chain Management (SCM) field (Zhang *et al.*, 2021). The notion of Circular Supply Chain Management (CSCM) has emerged in the last few years in a context in which sustainability is attracting increasing attention from the scientific community (MahmoumGonbadi *et al.*, 2021; Sudusinghe and Seuring, 2022). The recent Covid-19 pandemic has posed significant challenges to supply chains around the world, emphasizing the benefits of the CE (Adelodun *et al.*, 2021). The purpose of this paper is to analyze the research conducted on CSCM to date. Particularly, two research questions can be raised: (RQ1) How has CSCM research evolved and what are the main issues addressed by the research literature on this topic? and (RQ2) What is the future of CSCM research and how can scholars, managers, and policymakers advance toward its development?

### Design/methodology/approach

A systematic bibliometric and science mapping analysis is carried out to answer the proposed research questions. Web of Science and Scopus databases have been used to locate all the documents addressing CSCM. A total of 1,254 documents have been analyzed to find the most contributing and influential actors in the field, the main topics addressed in the literature, the evolution of the conceptual map of research, and the unexplored areas that deserve thorough consideration.

### **Findings**

Our results provide an extensive overview of CSCM research to date. The bibliometric performance analysis identifies the publication and citation trends, and the principal authors,

journals, papers, institutions, and countries in this area of knowledge. The science mapping analysis digs deeper into the thematic structure of the CSCM field, revealing the most relevant themes and their evolution over time. Additionally, a content analysis of the research areas in the CSCM field has enabled to pinpoint the research gaps and propose decisive directions for future research.

### **Practical implications**

This study offers several useful insights into CSCM research that can encourage managers and practitioners to implement CSCM practices and tools in an informed way. It also provides valuable information that can facilitate collaboration and bridge- building between academia and practice.

### **Relevance/contribution**

This study contributes to dynamically characterizing CSCM research by combining bibliometric and science mapping analyses. An agenda for future research opportunities is provided that can inspire academics and practitioners to advance in the development of this field.

**Keywords:** supply chain management, circular economy, bibliometrics

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# Digitalization-enabled Supply Chain Redesign for More Sustainability in the Apparel Industry

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### Abstract

Purpose:

In apparel supply chains, the decoupling point, which defines the depth of customer integrating in the customisation of finished products, is typically found at retail level. The aim of this research is to analyse how the introduction of *virtual try-on using personal 3D avatars* impacts possibilities to change the supply chain design of apparel manufacturers to reduce apparel waste and increase sustainability. More precisely, we analyse whether digitisation at the end customer allows to move the decoupling point more upstream, having a higher share of pull production in apparel supply chains. The research question analysed is the following: *How does the introduction of a virtual try- on enable the possibility to move the decoupling point more upstream to increase sustainability in apparel supply chains*?

### Design/methodology/approach:

To answer the research question, a qualitative research design is applied, containing supply chain analyses of three companies in the apparel industry. Semi-structured interviews with several key stakeholders, including apparel manufacturers, manufacturing technology providers, associations and research institutions for fashion, textiles and apparel were conducted. Data analysis was done following Miles and Huberman's (1994) four-step approach.

Findings:

Our results show that virtual try-on enables the apparel industry to shift the decoupling point upstream to the manufacturing stage of fabrics due to long lead times of yarn (of which the fabric is woven) and large batch quantities (required for economic production). All process steps upstream of fabric manufacturing need to remain in a push production system. Subsequently, overproduction cannot be fully avoided and resource conservation due to minimal inventories cannot be achieved, as supply chains cannot be entirely demand driven.

### Practical implications:

The shift of the decoupling point to fabric manufacturing allows a late creation of variants of apparel sizes, and consequently lower safety stocks and reduced waste due to reduced demand fluctuations at this aggregated level. The introduction of virtual try-on allows to further reduce waste as finished goods production can now be based on actual instead of gross sales (which include returns). Wider practical implications are a downstream sustainability increase. Fewer returns will be made, as only fitting apparel will be ordered as confirmed in the virtual try-on. The consequences are less returns, less energy use for return handling, and lower clothing waste.

### Relevance/contribution:

The fashion industry is the second-most polluting industry after oil and accounts for about 10 percent of global carbon emissions. Two main factors lead to substantial environmental impacts in the apparel industry: Decentralised supply chains and unsustainable resource consumption through consumers but also through disposal of returns in e-commerce. Results of the study at hand show that a shift of the decoupling point towards a higher share of pull production in the apparel industry is possible. The choice of decoupling points is a key factor determining customer lead times, warehousing and logistics configuration, and thus significantly impacts the sustainability of the supply chain (Alinezhad et al., 2019). If results of this study are implemented in the apparel industry, the whole industry could turn to more sustainability.

Keywords: Digitalization, sustainable supply chain design, apparel industry

## Developing a novel supply chain digital twin integrating the carbon element: a case study

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### Abstract

The idea of digital twins has gained popularity in the last few years (Singh et al., 2021), not only in researching its main characteristics, foundations, and potential advantages but also in its rapid adoption by businesses. Supply chains have not escaped this trend, and in particular, manufacturing companies are starting to adopt it to leverage capabilities and embrace a digital transformation. As such, we can see some companies like anyLogistix, Coupa and many others that have started offering solutions that can replicate the assets, products, and parameters from a supply chain. Consequently, a business can use the digital tool to model different scenarios, giving an ideal best outcome based on cost that can enable better decision-making.

In parallel, sustainability is a concern for more and more companies as the world tries to reduce emissions to limit global warming to 1.5 C by 2050. Manufacturing companies in particular are keen to understand their contribution as they account for 20% of global carbon emissions (World Economic Forum, 2022). Additionally, different companies have tried to propose methodologies for carbon accounting, hence businesses can understand accurately the true impact of their operations.

Despite being already proposed to evaluate the sustainability impact for the planning of housing and urban developments (Tagliabue et al., 2021), digital twins have not specifically been used to assess the environmental impact of decisions in supply chain planning. Therefore, there is an opportunity to analyse how supply chain digital twins can be developed not only by focusing on productivity improvements (e.g., reduction of inventory, an increase on service level) but also assessing the carbon impact of these decisions to understand the trade-offs between cost, quality, time, and carbon.

This paper aims to present a case study that tried to test the concept of a digital supply chain that can optimise end-to-end productivity not only based on cost but also on carbon, using a novel approach in which each step and process in the supply chain is associated with a carbon value. Hence, the supply chain digital twin could model different scenarios by varying planning

parameters and building an aggregated figure of supply chain cost and carbon.

The research process started by defining the boundaries of the supply chain to evaluate and understanding its current state and challenges. In parallel, the team defined the requirements for the digital tool and the use case, following a series of meetings to refine the final version. The solution will be fully tested and deployed in a big manufacturing company from the UK, in order to understand the implications for the planning of its supply chain processes and the different outcomes that can derive from its use.

Managerially, the novel solution could help manufacturing businesses model and evaluate different scenarios around how to improve their scheduling and planning considering the carbon impact, a necessary approach due to the urgency of achieving net zero. Theoretically, it could help to evaluate whether the most productive scenario in terms of cost is also the less carbon pollutant, a trade-off that has not been properly researched yet.

Keywords: Digital twin, Supply Chain, Manufacturing

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# Data Mining Techniques in Smart Meter Applications for Sustainable Future

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### Abstract

Smart meters are cornerstones of future sustainable energy systems. These devices collect, record, and transmit energy consumption and diagnostics data. Smart meter data is used beyond billing to provide important insights for both consumers and energy suppliers. From the supplier perspective, smart meter data is used to understand consumer behaviour, forecast future consumption, manage loads, and design tariffs. This study aims to provide a review and framework for the application of data mining methods to analyze smart meter data. Current papers and industrial applications are examined based on the application area, target energy problem, data mining methodology, and utilized data type.

Keywords: sustainable future, data mining, smart meters

# Are Alternative Food Networks (AFN) built on sustainability? A multiple case study in Italy: definition, practices and assessment

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**Keywords:** Alternative food networks, sustainable food networks, sustainability performance measurement

### Purpose

Alternative Food Networks (AFN) have become a trend in the recent years, under the assumption that these networks are intrinsically more sustainable than the conventional food retail channels (Schmitt et al., 2016; Loiseau et al. 2020). The aim of this study is to investigate if sustainability plays a role in the will for participating and building an AFN and to explore how sustainability is addressed and assessed in these networks given its potential conflicting objectives (Beske et al. 2015; Kirwan et al. 2017).

### Methodology

This study followed a mixed methodology approach, a systematic literature review (SLR) and a multiple case study analysis. The former was developed in two steps. Firstly, a SLR with the aim of finding a definition that encompasses the distinctive features of alternative networks. Secondly, a literature review on the sustainability performance measurement (SPM) in food supply chains, with the aim of finding if the tools proposed in the literature could be appropriate and interesting for AFNs (Beske et al. 2015, Kessari et al. 2020).

For the latter, four case studies were selected in the Italian AFN context, considering the perspective of multiple actors per case: organizers and producers. Data were collected mainly via semi structured interviews and on-site visits. Two levels of analysis were performed: within-case and cross case, where the participants were grouped according to their position in the network.

### Findings

The results from the SLR allowed to formulate a wholesome definition of AFNs considering their specificities and objectives. Following, the multiple cases analysis led to the identification of drivers, barriers and the approach towards sustainability in these networks. The cases'

analysis also evidenced that the drivers and barriers for participation to AFN and the way of addressing sustainability depends on the role of the participants in the network. While producers address sustainability by prioritizing low environmental impact practices and assuring legal and fair working conditions to their workers; the organizers focus on setting up sustainability policies for the network and educational/assistance projects for the local community. Findings also suggest that sustainability is an important feature of AFN, tough not their *raison d'etre*, and its performance currently not assessed: while the organizers are interested in the implementation of SPM, the producers aren't.

### **Relevance and contribution**

The contributions of this study to literature and practice are threefold. First, a formal definition of AFN was proposed. Secondly, a conceptual framework was developed considering the findings of the case studies that allows to identify the role of a network participant, its approach towards sustainability and to SPM. Thirdly, a SPM proposal was defined for these AFNs. This SPM system consists of four key performance indicators as an initial tool for the organizers to assess and monitor their environmental, social and economic sustainability performances, considering the needs of AFNs.

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# Unpacking sustainability practices of Western Cape wine supply chains: a practice-based view

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## Abstract

**Purpose**: Although sustainable supply chain management (SSCM) has become an important field for several industries, little is known in the wine industry (Bandinelli et al., 2020). To fill this gap, this paper investigates intra- and inter-organizational sustainability practices implemented in Western Cape wine supply chains. In doing so, the practice-based view (PBV) is used to understand why, how, and by whom these practices were implemented (Silva et al., 2022). South Africa was chosen because it has a robust wine sustainability scheme that includes three-quarters of the country's wineries (Hamann et al., 2017).

**Design/methodology/approach**: Multiple cases were conducted from May to September 2022 through semi-structured interviews with nine wineries and one cork supplier located in Western Cape. 14 interviews were carried out with an average duration of 90 minutes and transcribed for analysis. Observations were made in short vineyard and cellar tours. The data were analyzed within and across-cases. A cycle of provisional coding based on existing literature using the Atlas TI software was developed. In this process, new codes emerged and were included in the analysis.

**Findings**: All analyzed wineries have a vertical supply chain; they are responsible for all production stages, from growing grapes to bottling wine. Most wineries focus on intraorganizational sustainability practices such as alien-plant clearing, setting aside land for conservation, using natural predators to control pests, using drip irrigation, making carbon footprint calculations, installing solar panels, and offering employee assistance and upskilling projects. These practices are adopted in order to reduce environmental impact, decrease production costs and promote social sustainability. The practices are led by wine company owners, viticulturists, and/or wine cellar masters, who usually have a personal tie to the surrounding environment, are motivated to solve environmental and social problems, and are responsible for ensuring sustainability certification for their business. This aligns with previous research conducted by Gbejewoh et al. (2021), which reported that small and medium South African grape farms are family-owned businesses. Moreover, expertise, and human and financial resources are necessary to implement sustainability practices along the wine chain. This was also seen in Bandinelli et al.'s (2020) study. However, the present study investigates the reasons and motivations for adopting sustainability practices. Notwithstanding, agricultural inputs, glass, cork, and packaging suppliers are crucial for the focal company to attain its finished wine product, and therefore some inter- organizational sustainability practices are observed. These include the requirement of environmental and fair-labor certifications and collaborating in bottle design and recycling.

**Practical implications:** By showing intra- and inter-organizational sustainability practices, this paper reveals the necessary resources needed to adopt these practices and maintain sustainability goals.

**Relevance/contribution:** This study contributes to current literature as it was observed that resources play an important role in determining the sustainability practice adopted (Silva et al., 2018). Lastly, managers from food and beverage industries could employ the investigated practices in their respective supply chains.

Keywords: wine supply chain, sustainable supply chain management, practice-based view.

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# Navigating trade-offs in food supply chain: SME study in food supply chain based in North-West UK

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Keywords: Supply chain, Net Zero, Routing factors

### Abstract:

As the world is overcoming the ripple effects of the pandemic, SMEs who are primarily dependent on logistics, are now faced with rising fuel costs and the Government's environmental regulations [1]. Climate change has endangered the balance of natural ecosystems and threatened the human food supply and living environments and thereby has become an essential concern for the international community [2]. Greenhouse gas emissions produced globally cause 4.2 million deaths owing to chronic diseases caused by air pollutants [3]. Consequently, reducing emissions has become one of the most significant international discussions and responsibilities and is being shared between regions, countries and individuals [4]. Notably, the global transition for cleaner air and low-carbon economies is firmly embedded in the UN. Sustainable Development Goals (SDGs), thereby offer a shared blueprint for people, the planet, prosperity, peace and partnership.

Many major economies the US, EU and UK have committed to net zero GHG emissions by 2050. Current commitments are, however, unmatched by action. The UK government for example, though among the first to set a legally binding target of net zero by 2050 has implemented only 11 of the 92 policy recommendations from its climate change committee and is not on track to meet the net zero or the medium-term carbon budgets. Similarly, the authors feel that attaining carbon net zero or following regulations of the government for SMEs is unrealistic. To overcome this scenario, researchers are setting achievable goals and realistic feasible action plan.

In this research, we focus on the transport sector, a significant and stubborn emitter. Decarbonization of transport has wider ramifications beyond the sector as large amounts of society depend on transport to function. There are umpteen numbers of research published and several solutions available to offset the carbon footprint. Often the solutions like investment in green projects namely solar and planting trees are not feasible for the business for two reasons.

Firstly, they are expensive. Secondly, they are not effective for the effort and finances involved. As per the data, offsetting carbon of one car requires 730 trees equivalent to 7 acres of plantation. Especially for SMEs in the supply chain or logistics sector who run on low margins, this may be even more challenging. Typically, they have a large fleet primarily dependent on fossil fuels.

This study is based on research done in an SME based in one of the deprived areas of the UK offering employment to nearby residents. This SME offers food products to local and regional educational and social organizations. So this is a piece of the first stage of research where synergy, trade-offs and conflicts between supply chain and sustainability were studied. In the second stage, this would further be tested at other major wholesale suppliers based in other regions of the country.

This research attempts to provide a framework for SMEs primarily offering logistics services. The framework and actions related to routing factors could be implemented to reduce fuel consumption. This approach is more relevant in the current scenarios where the global pandemic has challenged all organizations financially and the political situations have resulted in a substantial rise in fuel costs. This approach of focusing on low-hanging fruits would ultimately help the SMEs to start their journey towards sustainability relatively more realistically and feasibly.

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# Sustainable Supply Chain Maturity Model: A Proposed Framework for Developing Countries

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### Abstract

Sustainability is institutionalized in many organizations which have their core business activities around supply chains (SC). The operationalization of sustainability in SC context brings its own set of complexities to gauge its performance sophistication levels and strategic actions to keep the progress on track. The purpose of this paper is to present and conceptualize the knowledge and information by reviewing the literature of sustainable supply chain management (SSCM) maturity models. These conceptualizations are then transformed into a maturity model proposition. The literature review presented, explains maturity models (MMs) developed especially with inclusion of TBL (Triple Bottom Line) concentration. While SSCM maturity model research has evolved more theoretically, it is studied here that methodologically opportunities yet exist for valid, practical, and easy to implement SSCM maturity model framework. Addressing the gap identified, a "6Cs framework" is proposed in this study with six levels of sustainable SC maturity. The paper intends to present a framework easy to be adopted by management of an organization viz in a developing country, which either has just started to realize the significance of sustainability for their business or they are in mid-flight of their SC operations geared for sustainability processes implementation.

Keywords: SSCM, Maturity Model, 6Cs Framework, Pakistan.

# Making green supply chain management more robust – A multi-level uncertainty methodology

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### Abstract

### Purpose

Life cycle assessment (LCA) forms the backbone of the environmental debate in the field of green supply chain management (GSCM) (Seuring, 2013). However, LCA may give rise to ineffective GSCM decision-making when uncertainty is not adequately considered (Huijbregts, 1998a). This is particularly critical given that uncertainty is always present in an LCA (Björklund, 2002). One source of this uncertainty is the large amount of data needed when conducting an LCA. The uncertainty associated with this data causes LCA parameters (i.e., inventory, characterization, normalization, and weighting factors) to be uncertain and, consequently, causes uncertainty in the outcome results (Huijbregts, 1998b). To increase decision-makers' confidence in LCA results supporting GSCM strategy development, parameter uncertainty should be considered when using LCA to support GSCM. Hence, the main goal of this study is to present an innovative multi-level methodology for integrating parameter uncertainty in an LCA conducted to assist GSCM.

### Design/methodology/approach

The methodology developed involves: 1) conducting a traditional deterministic LCA that does not consider uncertainty; 2) conducting a stochastic LCA using Monte Carlo simulation, which considers the uncertainty associated with the inventory collected in the second step of an LCA and the characterization, normalization, and weighting factors used in the third step of an LCA; and 3) a comparison of both analyses.

### Findings

The proposed methodology was applied to the Portuguese natural cork stoppers supply chain to illustrate its applicability. Suggestions were provided on how to improve the environmental performance of the supply chain based on the identified most relevant environmental impacts and supply chain processes that most contribute to these relevant impacts. Further analysis of the results revealed that the identification of the most pertinent environmental impacts is the most affected by parameter uncertainty. For this reason, an effort should be made to improve the reliability of the normalized and weighted results of the different impact categories.

### **Practical implications**

Given that parameter uncertainty is always present in an LCA, it is crucial to consider this uncertainty when using LCA to assist GSCM since only by considering parameter uncertainty can a robust GSCM decision-making process be performed.

### **Relevance/contribution**

The two main characteristics of the innovative methodology proposed in this study that differentiate it from other methodologies are the fact that it is multi-level (i.e., considers the uncertainty associated with the parameters used in different LCA steps) and multi-purpose (i.e., it can be used in the field of GSCM but also in various LCA applications). This last characteristic makes the proposed methodology valuable to decision-makers, policymakers, and academics conducting research in LCA since it addresses one of the current gaps and challenges for LCA, i.e., uncertainty (Finkbeiner et al., 2014).

Keywords: Sustainable supply chain management, Life cycle assessment, Uncertainty

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# Distribution of power as moderator between supply chain integration and environmental performance

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# Abstract

**Purpose:** Within the supply chain literature, the role of supply chain (SC) integration and its influence on performance is a central topic (Van der Vaart and Van Donk, 2008). Two forms of integration are discussed: (1) Internal integration is understood as a process of interaction and collaboration between one focal subsidiary and the respective up- and downstream entities of the same legal entity. (2) External integration is the process of interaction and collaboration in which a focal subsidiary works together, shares information, and makes joint decisions with its external SC partners (i.e. suppliers and customers) to achieve results that would not be achievable by the focal subsidiary alone (Golini et al, 2016).

Studies show that vertically integrated (i.e., internally integrated) SCs that belong to the same legal entity have a higher potential for achieving sustainability objectives than externally integrated SCs that span over different, independent companies (Xie, 2015).

The objective of this paper is to explore whether the finding from Xie (2015) is true or not. We propose that the achievement of sustainability goals and sustainable SC performance does not only depend on the degree of vertical integration, but also on the distribution of power within the SC, which acts as a moderator variable (Figure 1).



**Design/methodology/approach:** A literature review is conducted on the impact of internal and external SC integration on the successful implementation of sustainable supply chain

management (SSCM) and corporate sustainability performance. These findings from literature are contrasted with the findings from three case studies in the food industry.

**Findings:** Our results show that internal SC integration is not the only successful strategy in SSCM. Strong and long-standing external partnerships up- and downstream of the SC can also be successful as long as the distribution of power in the SC is in favour of the focal subsidiary.

**Practical implications:** This research supports companies in their decision-making regarding the design and configuration of their SCs towards more sustainability through the comparison of benefits of internal and external integration to achieve sustainability goals.

**Relevance** /contribution: In recent years, the importance of sustainability has steadily increased for companies while they seek to gain competitive advantage in the globalised business environment, prompting them to pursue environmental differentiation strategies (Kang et al. 2018, Kirchoff and Falsaca 2022). Despite the growing research in SSCM, it is still unclear how manufacturing companies collaborate with their SC partners to achieve their desired environmental performance and what the role of the distribution of power in this process is (Kang et al., 2018). Therefore, this study seeks to understand the relationship between internal and external SC integration and the successful adoption of sustainability practices along the SC.

Keywords: SC integration, Distribution of power, Sustainability performance

References Will be provided upon request.

# Additive Manufacturing for extending product life cycles – A theoretical framework how to facilitate maintenance

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# Abstract

**Purpose:** With our research, we aim to explore and find use cases for Additive Manufacturing (AM) for extending product lifecycles for aftersales operations (Song & Zhang, 2020). We assesses how AM can be used to facilitate maintenance and maintain products, that are not maintained today. Maintenance extends the product's life and increases its use intensity leading to reduced primary resource demands and ultimately facilitating a more Circular Economy (Stahel, 2016; Whalen, 2019).

**Design/methodology/approach:** Following an exploratory research design, we employ a multiple case study approach (Eisenhardt, 1989; Yin, 2018). In total, 17 manufacturing firms with main operations in Germany were included. Data was analyzed based on 31 semi-structured firm interviews, 12 additional expert interviews, publicly available data, and internal firm data.

**Findings:** We find three approaches for firms to implement AM to maintain products, that are thrown away today: (i) The corrective approach to improve their immediate aftersales operations, (ii) the preventive approach to use for low demand, and (iii) the anticipating approach to meet customer demands and regulations. We find that for those situations, AM can be a convenient alternative and contribute to a more economic and sustainable business. However, we also find that implementing AM in aftersales comes with challenges that firms need to overcome. Those challenges relate to the AM integration into the firm, the AM maturity level in general, and the decision-making processes in aftersales operations.

**Practical implications:** With our research, we offer practical recommendations for aftersales experts and political actors seeking to extend maintenance activities within their firm. The findings enable managers to understand and find use cases for AM in aftersales. By structuring and discussing use cases, approaches, and influencing factors, we enable decision makers in practice to take profound decisions in aftersales. Finally, our research serves as an in-depth analysis for AM experts who want to further roll out the application of AM in maintenance and spare parts operations in practice.

**Relevance/contribution:** We add to the existing literature by gathering primary empirical data on maintenance activities and the role of AM in maintenance and spare parts operations. We contribute to the general field of operations management and show how AM can positively influence aftersales operations and reduce complexity. While AM could be used simply as a different production technology, its real value emerges if it is integrated into aftersales operations, processes, and supply chain properly. We support other study's findings that implementing AM into the aftersales operations presents tremendous potential for firms to enhance their aftersales operations, increase operational success, and facilitate more sustainable business. We expand the existing knowledge of AM applications by adding three distinct approaches how firms proceed to implement AM and identify use cases that are new to the literature (e. g., "counter wrong last call estimations", "create spare parts in hindsight", and "provide eternal spare parts"). To the best of our knowledge, our study is one of the first to explore ways to use AM to maintain products, that today are not maintained, and to connect these potential use cases for AM to implementing a Circular Economy.

Keywords: Circular Economy, Maintenance, Additive Manufacturing

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# Supply Chain Collaboration for Improving Sustainability in Circular Economy Context: A Case Study

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## Abstract

**Purpose**: Production-based supply chains (SCs) are changing operations to facilitate circular economy (CE) implementation strategies. These operational changes can be smoothened by managing good relationships with different SC actors. Hence, understanding how SC collaboration can be integrated into these circular supply chains (CSCs) is an upcoming topic in the scholarly discussion, while empirical evidence on how SC collaboration contributes to improved sustainability performance is lacking (Farooque et al., 2019). Against this background, this study addressed these research questions: (1) What are the SC collaboration practices adopted for CE implementation? and (2) How do different configurations of SC collaboration improve the sustainability outcomes of a CE implemented SC? The purpose of this study is to develop a framework that links SC collaboration to CE implementation strategies and advances sustainability performance in CSCs.

**Design/methodology/approach**: An in-depth case study method was adopted to answer these research questions. Semi-structured interviews were conducted with 20 practitioners from manufacturing industries such as steel, electronics, and food. The transcribed interviews were content analysed coding against well-established research frameworks derived from Cao & Zhang (2011) (SC collaboration dimensions), Chen et al. (2017) (SC collaboration practices), Reike et al. (2018) (CE implementation strategies) and Korhonen et al. (2018) (sustainability performances).

**Findings**: The analysis identified that practitioners strive to integrate 'reusing' and 'reducing' as CE implementation strategies despite the popularity of 'recycling'. While SC collaboration practices such as collaborative communication and information sharing are mostly applied, collaboration beyond SC boundaries is also gaining attention in practice. Further, the narrow sustainability achievement on environmental and economic performance is also highlighted through a framework comprehending the links among SC collaboration, CE implementation and sustainability performance.

**Practical implications**: This study assists practitioners in understanding how redefined relationships in collaboration assists in successfully implementing CE and improving sustainability performance in SCs.

**Relevance/contribution**: This study contributes to the growing SCM scholarly debate on CSCs by empirically validating the role of SC collaboration for CE implementation and advancing sustainability performance in CSCs.

Keywords: Supply Chain Management, Collaboration, Circular Economy.

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# Exploring circular supply chains in B- Corps: The role of flows and capabilities

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## Abstract

### Purpose

Research on sustainable supply chain design has highlighted that all three – material, information and financial flows – are needed in order to arrive at sustainable supply chain designs with sustainable outputs and outcomes (Rosca et al., 2022; Bals and Tate, 2018). Current SCM practice contains mostly additive, corrective and symbolic practices regarding sustainability, while very few firms engage in substantial sustainability-driven supply chain modifications (Busse, Meinlschmidt and Foerstl, 2017). In order to study radical changes toward sustainable supply chains, large firms with exceptional environmental orientation are particularly promising suitable. B-Corps have been used in previous literature as a sample of firms with exceptional sustainability missions and performance (e.g., Gamble, Parker, and Moroz, 2020). This research presents the results of a study on supply chain designs in exceptionally sustainability-driven firms (B-Corps) and the role of capabilities for enabling restorative and/or regenerative supply chains (Batista et al., 2018) in the context of a circular economy.

### Design/methodology/approach

Ensuring environmental, social and economic viability, the award winners of both environmental and social awards of the B-Corp certification have been analyzed. This entails data from 200 B-Corps in a secondary data analysis as well as a qualitative data analysis of 15 interviews plus additional materials around six case study firms. While the use of secondary data may have limitations due to data availability, the analysis of this sample suffers less from this issue because B Corps usually pride themselves for being very transparent and open in their communication. Moreover, they proudly display the practices they employ on their websites via different means, namely podcasts, blogposts, case studies, impact reports and interviews.

### **Findings**

The results highlight the need for integrative designs of all types of flows, as well as the paramount role of capabilities, e.g. related to stakeholder relationship management as well as systemic thinking.

### **Relevance/contribution & practical implications**

The research adds a number of additional capabilities to the extant capability literature, of interest to the supply chain management, entrepreneurship and business model research communities, such as, for example, "systemic thinking" and "supply chain collaboration for supply chain transparency". For practice, it highlights paths to devise supply chain designs and build capabilities that helped the companies in the sample become "best for the world" in both environmental and community terms.

Keywords: Circular economy, sustainable supply chains, supply chain design

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# Design and Planning of Sustainable Supply Chain using Monetization of Environmental and Social Impacts while integrating Risk Measures

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## Abstract

**Purpose:** Currently the increasing market competitiveness and legislative pressures led companies to expand their focus on economic profits to address environmental and social concerns as well. However, managing the supply chain towards these efficient and sustainable goals is a challenging task, not only because of the complexity associated with the number of decisions involved but also with the current pressures related to market uncertainties and associated risk minimization. For this reason, we develop a decision-supporting tool to help the decision-making process.

**Design/methodology/approach:** This paper presents a mixed integer linear programming model (MILP) that accounts for the economic, environmental, and social concerns in the same objective function by monetizing environmental and social impacts, as well as considering a risk measure. The goal is to maximize the difference between economic, environmental, and social performances while simultaneously minimizing the associated risk. The augmented E-constraint method is used to generate a Pareto-optimal curve in order to determine the trade-off between the objective functions considered.

**Findings:** Monetization allows a better comprehension of environmental and social impacts by decision-makers. Also, the developed study allows a better comprehension of the adequacy of the risk measure used, and, therefore, conclusions can be drawn on decision-makers risk profiles. Finally, we can conclude how the supply chain should be designed to reduce risk.

**Practical implications:** This paper highlights how monetization can support the decision maker's decision while accounting for the final risk associated.

**Originality/value:** This work contributes to providing a monetization of environmental and social impacts, which is helpful to understand the cost of environmental and social impacts.

Furthermore, it presents a mathematical optimization model with a single objective function for the economic, environmental, and social pillars of sustainability. In addition, since environmental, and social impacts are in a monetary unit, it allows us to study the risk associated with the three sustainability pillars, and consequently the minimization of risk is targeted. An innovative model that can support decision-makers when designing and planning supply chains is proposed.

Keywords: Sustainable supply chain; monetization; uncertainty; risk management

# Social and Environmental Risks Analysis as a prerequisite of the European Supply Chains Due Diligence Directive: A Systematic Literature Review

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## Abstract

#### **Purpose**:

Global supply chains are subjected to human rights violations and negative environmental impacts resulting in the demand for sustainable supply chains (Clarke and Boersma, 2017; Freise and Seuring, 2015). Social pressure and the work of Non-governmental organizations are reflected in legislation and oblige companies to make their supply chain more sustainable. This resulted in the European Supply Chain Due Diligence Directive (ESCDDD), which is currently under preparation by the European Commission (EU Commission proposal, COM/2022/71). To meet the legal requirements, companies need an informed, appropriate, and effective supply chain risk analysis as a foundation for further measures. The risk analysis aims to review the supply chain for human rights and environmental risks, initiate appropriate countermeasures, and avoid future consequences of legal violations. Furthermore, risk analysis is the basis for all subsequent measures.

Against this background, the paper reviews existing approaches for risk analysis and addresses the following research questions: (1) How are social and environmental risks identified and as- sessed in supply chains? (2) What are existing approaches' inherent potentials and limitations? This aims to develop a framework that offers an advanced risk analysis procedure to enhance sus- tainability performance in light of the ESCDDD.

**Design/methodology/approach**: A systematic literature analysis was applied using a systematic procedure by vom Brocke et al. (2009). 141 publications were identified, and 37 publications were finally analyzed and synthesized. For the synthesis, an abductive approach was utilized following the concept of Kovács and Spens (2005).

**Findings**: The systematic literature analysis identified which techniques are established for social and ecological risks in various business industries. It has been shown that an established approach to assessing ecological risks in manufacturing industries is auditing. Furthermore, it has been found that the analytical hierarchy process is used to prioritize social and environmental risks. It can be concluded that most risk analysis techniques are applied to both - social and environmental

risks that could be used to meet the requirements of the ESCDDD. Most risk analyses can be found in the manufacturing, agriculture, and mining sector.

**Practical implications**: This paper provides practitioners guidance and systematic recommendations for successfully implementing risk analysis for regulatory requirements in relation to the ESCDDD.

**Relevance/contribution**: This paper contributes to the advanced implementation of risk

analysis and sustainability performance in supply chains towards ensuring human rights and environmental protection. Furthermore, the insights gathered in this paper give guidance for practitioners implementing future due diligence laws.

**Keywords:** Supply Chain Risk Management, Social and Environmental Risks Analysis, European Supply Chain Due Diligence Directive

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# Carbon emissions in transportation: Why do companies not share their data?

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# Abstract

**Purpose:** European sustainability initiatives such as the European Green Deal set ambitious targets for carbon reduction across industries. Representing six percent of European emissions (European Commission, 2020), the road freight sector is considered hard to decarbonize. Hence, playing a crucial role in decarbonization. Furthermore, new legislation like the Corporate Sustainability Reporting Directive increases the pressure on companies to account for the environmental impact of their business and supply chain. While companies commonly outsource their freight transport to suppliers, those emission belong to the third Scope, usually representing the majority of a company's carbon footprint. Therefore, to consistently determine a company's carbon footprint and its decarbonization measures, inter-company emission data exchange is crucial.

Additionally, research indicates that information sharing in the supply chain improves overall supply chain performance. Incentivizing information sharing can further increase the positive impact on performance, indicating that information transparency can be beneficial for both parties (Inderfurth et al., 2013). However, in the case of emission data, the practice of information sharing is still developing. While common emission reporting frameworks encourage shippers to use measured data from carriers, assumptions are permitted and currently most common - if recorded at all (Petersen & van Almsick, 2022).

Given these information, the questions arise why companies do not engage in inter-company emissions data sharing and what could incentive stronger engagement. Finally this poses the question, what impact emission data sharing has on the competitive environment.

Hence, in our research, we consider both the perspective of shippers who are required to report their supply chain's environmental footprint and the carriers who need to report their emissions to their customers. We focus specifically on the challenges of small and medium-sized carriers as they operate 99% of the transport within the European Union (Tölke & McKinnon, 2021).

**Design/methodology/approach**: To address these questions, we conduct semi-structured expert interviews with sustainability managers and decision-makers. Given the explanatory nature of the study, interviews are a suitable method to capture practical insights (Saunders et al., 2016). We analyze the interviews by coding and identifying themes following an inductive grounded theory approach.

**Findings**: We are currently in the conceptual and development stage of our research and have conducted an initial scoping study. Interviews with sustainability managers from different industries underlined that shippers face limited access and low reliability of carriers' emissions data. In these cases, shippers tend to fall back on assumptions instead of engaging with their carriers.

**Practical implications**: Our study aims to understand barriers to emission data sharing in the transport sector and potential measures to overcome these barriers. Finally, we assess how data sharing could impact the competition among carriers.

**Relevance/contribution**: Our research contributes to the literature by considering the aspect of information sharing in ESG accounting. While ESG accounting mainly focuses on comparability and accuracy of data, our study focuses on how companies deal with these issues given the current political momentum, thereby offering a new perspective. We select carbon accounting as one aspect of ESG reporting as this is the current focus of practitioners.

Keywords: Transportation, Logistics, Carbon Accounting, Information Sharing

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# Sustainable food production: mapping organic waste in apple supply chains

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## Abstract

Transition to sustainable food production systems is critical to reducing the impact of human activities on the environment whilst contributing to the livelihoods (Galli et al., 2018). Currently, food production accounts for 26% of global greenhouse gas emissions, 50% of global habitable land and 70% of global freshwater withdrawals (Ritchie & Roser, 2020). Thus, there is a real need to move towards circularity in agriculture. This research explores organic waste management as an opportunity to realise UK circular agriculture, to empower producers to make decisions that benefit them, and foster care for the environment. Through narrative interviews with players in the agricultural supply chain we seek to identify opportunities to transition towards circularity in agriculture.

### Purpose

The purpose of this research is threefold. Firstly, we address a major gap in UK agriculture organic waste management practices by reviewing literature and identifying current waste management practices. Subsequently, we seek to empower farmers through co-identifying opportunities for synergies across the supply chain, specifically, in waste management practices by a reduction in waste and/or minimizing the environmental an ecological of waste management activities. Finally, we seek to amplify the voices of primary food producers as critical actors in the transition to sustainable food systems.

### Approach

The approach adopted in this work can be broken down into three key stages as shown in Figure 1. The first stage recognizes the importance of cultivating relationships with research participants in order to draw out participants' experiences (Beech & Broad, 2018). In our case, participants range from apple growers, cider and juice makers through to policy makers and governmental departments. The second stage invites participants to share their stories through a narrative approach, allowing the participant to draw upon events or experiences that contribute to their story of waste management (Roulston, 2008). The final stage of the research seeks to co-identify and create solutions and opportunities for better waste

management in the agricultural supply chain.



Figure 1 Three Stage Research Approach

### Findings

The initial findings of the research reveal several trends in agricultural waste management. The participants shared common practices of waste management that can be categorized as 1) doing nothing, 2) giving away locally and 3) repurposing in own operations.

Waste management practice	Description
Doing nothing	Waste is left on site, with little to no processing
Giving away to local contacts	Waste is given away to local contacts who will make use of waste in their operations
Repurposing in own operations	Waste is repurposed e.g., feedstock for anerobic digestion.

### **Practical implications**

This research has significant implications for practitioners. Firstly, it enables practitioners to realise the environmental and economic benefits of adopting synergistic waste management practices and move towards circular agriculture.

### Relevance

This work is highly relevant to achieving a net-zero society by contributing to the circular agriculture literature and further highlighting the need to investigate agricultural organic waste management practices.

Keywords: Sustainable food systems, Circular Agriculture, waste management

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# Technological and operational approaches for sustainable food supply chains – a critical review

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### Abstract

The increase in world hunger, food insecurity, and global malnutrition as well as global conflict issues have led to multiple disruptions in the food supply. This has resulted in unsustainable food supply chains (FSC) that are unable to fulfil the social, environmental, and economic balance required to meet the triple bottom line. In this paper, we investigate the interdependencies between FSC and sustainability. We also examine such technologies and operational approaches at each stage of the FSC and evaluate their advantages and challenges from the perspective of carbon footprints and sustainability.

Keywords: Food supply chains, Sustainability, Decarbonisation

### Introduction

The food supply crisis is among the top near-term risks of 2023 with a significant global impact (Report, 2023), (Alexander *et al.*, 2017). Women and child health have shown sharp deterioration, with widespread anaemia among women and undernourishment, wasting, stunting and mortality rising among children.

Therefore, it is important to understand the complex relationships between the FSC and the environment, people, and economy. An FSC has the following subsystems: food production, processing, distribution, consumption, and disposal. It is difficult to break down the FSC into silos when considering their impact on sustainability, since each level borrows from or contributes to, the preceding and succeeding levels, respectively.

This work is an effort to highlight the multi-dimensional interdependencies between food systems and sustainability and thus stress the importance of FSC for sustainability. The role of technological and operational innovations for decarbonising and optimising the processes in

the FSC has also been investigated at each stage. Additionally, the role of governments in policy formulation and consumer behaviour in favour of responsible consumption has also been stressed. (McGreevy *et al.*, 2022).

### The footprint of FSC on sustainability

The global food production systems exert tremendous pressure on natural resources- using 50% of habitable land, 70% of freshwater resources and emitting 30% of anthropogenic greenhouse gases (GHGs) (Halpern *et al.*, 2022). Processed foods have adverse health effects in addition to hazardous packaging and, misleading and even false marketing strategies. Food distribution comprises temperature control, hygiene, and shelf-life considerations in addition to inefficient routing operations. Consumer preferences for processed and animal-based foods, without consideration given to the nutritional value or environmental impact of such foods, adds to the existing problem. Also, the economic consequences of food waste run to the tune of \$750 billion annually. The exploitation of farmers, including women and migrants, is an unfortunate reality in most developing agricultural countries, due to poor policy frameworks.

A deeper analysis reveals that 11 out of the 17 SDGs are intricately linked to food systems: SDG 1 (end poverty); SDG 2 (zero hunger); SDG 3 (good health and well- being); SDG 5 (gender equality); SDG 8 (decent work and economic growth); SDG 10 (Reduced inequalities); SDG 11 (Sustainable cities and communities); SDG 12 (responsible consumption and production); SDG 13 (climate action); SDG 14 (aquatic life); and SDG 15 (life on the land). This implies that almost 65% of Agenda 2030 is linked to food systems directly or otherwise, and hence highlights the importance of research in this area.

### Technological and operational solutions

FSC consists of multiple actors and stakeholders at each level and hence there is a huge scope for improvement and optimisation supported by technological innovation and operational research.

Sustainable human interventions, augmented by technologies such as artificial intelligence, IoT, biotechnology, blockchain and quantum computing can lead the way towards greener FSCs. Some advances in this sphere include digital agriculture; genetically engineered crops for better yield, pest resistance and improved quality; eco- friendly packaging materials such as bamboo; IoT technologies for efficient monitoring and control; demand forecasting to prevent overproduction and block-chain based efficient traceability of food products. Operational approaches include precision agriculture, vertical farming, drip and spray irrigation, sustainable agricultural intensification such as soybean cultivation in Brazil; and optimised routing systems for food distribution using modern algorithms in AI and quantum computation. On the demand side, a shift in consumer behaviour towards healthy and sustainable food can scale down the production of highly unsustainable foods like beef. Home composting is an alternative to food landing up as municipal solid waste with multiple advantages such as organic manure. Policy formulations should ensure global cooperation, fair distribution of profits, strengthening of cooperatives, encouraging local production and distribution, and reduction of the distance between the farmer and the consumer.

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# How to influence consumer food waste behavior with interventions and contribute to the decarbonization of the food supply chain?

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### Abstract

**Purpose:** The purpose of this work is to understand how to influence consumer food waste behavior with interventions. Since consumers are responsible for more than 50% of the food waste in the supply chain and the disposal of food waste represents between 8 and 10 % of global greenhouse gas (GHG) emissions, designing interventions that effectively reduce food waste is crucial to the decarbonization of the food supply chain.

**Design/ methodology / approach:** This work conducted a systematic literature review in the field of consumer food waste behavior following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol. 96 papers were analyzed. Factors contributing to consumer food waste behavior were classified as barriers or driver, interventions designed to trigger behavior changes and reduce food waste were compiled and a conceptual map connecting drivers and barriers with interventions was created.

**Findings:** This work found that consumer food waste needs to be addressed as a highly transdisciplinary issue. The main drivers of consumer food waste behavior are: (i) moral concerns associated with guilt by wasting food, concerns about (ii) saving money and the (iii) environmental impacts of food waste, (iv) routines and habits such as meal planning, doing a shopping list, leftover reuse, supply check and good storage and cooking skills, and (v) preference for suboptimal products' purchases. The main barriers are: (i) health and (ii) food safety concerns, (iii) routines and habits such as eating out, promotions, overbuying, date labels, lack of time, online purchases and poor storage and cooking skills, and (iv) preferences associated with the taste and appearance of food. Socio-demographic characteristics and culture and religious factors can be used for consumer segmentation to design more targeted interventions. Social norms may be drivers or barriers depending on how food is valued: for some consumers, the social norm is to consider wasting food a financial loss, a deviation from norms of household financial prudence or an action compromising the environment and future generations; for other consumers food is associated with financial stability (e.g., earning enough money to be able to waste food), successful dieting (e.g., wasting food instead of eating it), or being organized (e.g., wasting food instead of having a disorganized kitchen). Although interventions that provide information and raise awareness are key to promote food waste reductions and GHG emissions' reductions, they need to be complemented with other types of interventions to trigger effective behavior changes.

**Practical implications:** With the conceptual map, it is possible to design and implement better interventions that will reduce consumer food waste and decrease GHG emissions in the food supply chain, contributing to its decarbonization.

**Relevance** / contribution: The conceptual map facilitates the design of more effective and targeted interventions, helps policymakers design integrated instruments that can contribute to reductions of food waste and GHG emissions, stimulates the involvement of all stakeholders and creates synergies towards a more sustainable and decarbonized food supply chain. Future research is recommended to identify the partnerships and expertise needed to stimulate long-term consumer food waste reductions.

Keywords: consumer food waste behavior, interventions, decarbonization

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