



LRN Italy Forum 2023

Improving supply chain sustainability  
and resilience: the Italian way!



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# Building sustainable and resilient supply chains: trade-offs and synergies in implementation of practices



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# Agenda

- Sustainability and resilience - the relevance of the problem
- An empirical study on sustainability and resilience in supply chains
  - Firms' attitude
  - Implemented practices
  - Trade-offs and synergies
- Conclusions

# Sustainability and resilience – the relevance of the problem

- The relevance of both sustainability and resilience is recognised in academic practice and in the literature
- Supply chains need to enhance their level of both sustainability and resilience
- Although they have been studied mostly separately, the two concepts are deeply intertwined (Fahimnia et al., 2019)

- Climate change and ecosystem disruptions will cause more frequent and severe disruptions (e.g. severe weather events, pandemics, resource scarcity, etc.)
- Strategies based on the depletion of natural resources weaken systems' resilience
- Disruptions may open opportunities for sustainable development
- Investments for green objectives may reduce the sustainability risk but increase rigidity and lower resilience



# Sustainability and resilience – the relevance of the problem

- Several approaches have been proposed to link the two concepts and both synergic and detrimental applications have been shown.
- Sustainability originates from the lean paradigm, while resilience from the agile one. The inconsistencies found from a theoretical perspective need to be addressed.
- There needs to be better guidance to practitioners on how to build sustainable and resilient supply chains.



**OBJECTIVE:** Explore the presence of trade-offs and synergies related to the implementation of sustainability and resilience practices



# Sustainability and resilience – the relevance of the problem

	Issues	
	Theoretical	Practical
Concepts	<ul style="list-style-type: none"> <li>➤ There are <b>inconsistencies</b> between the two paradigms</li> <li>➤ There needs to be <b>better integration</b> between the two concepts</li> </ul>	<ul style="list-style-type: none"> <li>➤ The integration should be carried out to provide <b>practical tools</b> to practitioners to improve the level of both sustainability and resilience</li> <li>➤ At times the two objectives can be incompatible</li> </ul>
Practices	<ul style="list-style-type: none"> <li>➤ <b>What</b> practices can be considered both sustainable and resilient</li> <li>➤ <b>How</b> sustainable and resilient practices are characterised and defined</li> </ul>	<ul style="list-style-type: none"> <li>➤ There are detrimental applications</li> <li>➤ There needs to be <b>guidance on how to build sustainable and resilient supply chains</b></li> </ul>
Performance measurement	<ul style="list-style-type: none"> <li>➤ How to <b>integrate performance measurement frameworks and indicators</b> from the two paradigms</li> </ul>	<ul style="list-style-type: none"> <li>➤ Firms need to measure their level of sustainability and resilience in an <b>easy and operative way</b>, accommodating their changing needs</li> </ul>

# Sustainability and resilience – an empirical study

Firm	Production volume	Reference market	Supply chain	Interviewee's role
A	110,000 ton/year	85% Italy 15% Export	<ul style="list-style-type: none"> <li>• Close to end customer</li> <li>• High position of power in the SC due to its size and history</li> <li>• Reference suppliers with dominant position; alternative suppliers. long-term partnerships.</li> </ul>	SC manager
B	250,200 units/year	Global coverage	<ul style="list-style-type: none"> <li>• B2B; production of parts and motors for the boat industry</li> <li>• Distinct position in the SC due to its international outlook</li> <li>• Vertical integration and internal production for most parts (low collaboration)</li> </ul>	SC manager
C	35 million pieces/year	Global coverage	<ul style="list-style-type: none"> <li>• Close to the end customer</li> <li>• High position of power in the SC</li> <li>• Vertical integration and increased internal production; more radical use of e-commerce downstream (10% of total sales)</li> </ul>	Corporate director of the SC
D	2 units/year	Global coverage	<ul style="list-style-type: none"> <li>• Close to the end customer</li> <li>• Distinct position in the SC due to its coverage of the entire life-cycle of the products; small firms downstream</li> </ul>	Impact manager
E	600,000 pieces/year	50% Italy 50% Europa/USA/ Canada/APAC	<ul style="list-style-type: none"> <li>• Strong collaboration</li> <li>• Close to the end customer; both B2B and B2C clients</li> <li>• Smaller volumes compared to other firms due to its operating in a niche market. Small and carefully selected suppliers</li> </ul>	Product and Sustainability manager
F	1.4 billion litres/year	Mainly Italy	<ul style="list-style-type: none"> <li>• Collaboration with its key SC partners</li> <li>• Both GDO and HORECA clients</li> <li>• Strong position of power due to its dimension in the SC and its global outlook</li> <li>• International suppliers for raw materials; smaller suppliers for niche markets. Partnerships with its suppliers.</li> </ul>	HRM SC and industrial relations manager

# Firms' attitude towards sustainability and resilience

Firm	Approach to sustainability	Approach to resilience
A	<ul style="list-style-type: none"> <li>Proactive: investments in sustainability began years ago</li> <li>They value employees' welfare and stakeholders' requirements</li> <li>Constant monitoring of carbon and water footprint</li> </ul>	<ul style="list-style-type: none"> <li>Resilient by definition because of the high seasonality of its products (high increase in production volumes in a short period)</li> <li>Regular training to employees to create a resilience culture</li> </ul>
B	<ul style="list-style-type: none"> <li>Transparency: report publication to answer to stakeholders' concerns</li> <li>Product and process innovation</li> </ul>	<ul style="list-style-type: none"> <li>Investments in long-term partnerships to reduce risks and increase their bargaining power</li> <li>Risk identification and management</li> <li>Learning from the past</li> <li>Risk management activities</li> <li>Anticipation of disruptions</li> </ul>
C	<ul style="list-style-type: none"> <li>Regulation required them to start reporting sustainability performance</li> <li>Low proactiveness</li> </ul>	
D	<ul style="list-style-type: none"> <li>B-corp certification</li> <li>Sustainable operations are part of its DNA</li> </ul>	<ul style="list-style-type: none"> <li>Operates in a difficult environment, so resilience is a core element</li> </ul>
E	<ul style="list-style-type: none"> <li>Key characteristic of the firm</li> <li>Cruelty free and recycled products</li> </ul>	<ul style="list-style-type: none"> <li>Not explicitly included in the decision-making process</li> <li>Interviewee believes resilience is a natural consequence of being sustainable</li> </ul>
F	<ul style="list-style-type: none"> <li>Extreme exposure to customers and stakeholders</li> <li>Sustainability needs to drive all decisions</li> <li>Performance monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Explicit programme to incorporate resilience at the corporate level</li> <li>Risk identification and management</li> <li>Constant monitoring</li> </ul>

# Implemented sustainability practices and their impact

Practices	Sustainability			Resilience		
	Ec	Soc	Env	Risk	Imp	L&G
Sustainability practices Cat. 1: Internal Environmental Management (IEM) Environmental management systems—ISO 14001 certification Use of Ecolabels, taking into account environmental criteria Green Manufacturing	A	A	A		A	A
	F		F			F
			B			
Cat. 2: Green Purchasing (GP) Local sourcing Green Purchasing or Buying environmentally friendly materials Establish standards for raw materials that do not contain prohibited substances	D		F	D		F
	A		A	A		
	E	E	E	E		
Cat. 3: Cooperation with customers (CC) Cat. 4: Ecodesign (ECD) Design products to reduce the consumption of raw materials and energy	E		E			
	F		B	F		F
	C		C	C	C	
Design products for reuse, recycling, recovery of materials and components Design products to avoid or reduce the use of hazardous products in the manufacturing process Design product for environmentally friendly objectives	C	C	C	C		
	E	E	E			
Cat. 5: Investment Recovery (IR) Cat. 6: Environmental Innovation (EI) Cat. 7: Environmental Performance (EP) Third party certification of environmental practices Sustainability reporting	E	E	E			E
	A	A	A		A	A
Cat. 8: Green Compliance (GC) Cat. 9: Green Marketing (GM) Cat. 10: Suppliers Relationship (SR) Require Supplier Certification Collaborate with suppliers						
	D	D	F	F	D	
Cat. 11: Logistics (RL) Green Logistics	A	A	A		A	
	B		B	B	B	B
	C		C			C
Cat. 12: Social practices Philanthropy and social welfare Employee welfare	F		F	F	F	F
	B	B		B		
	D	D		D	D	D

Green cell: positive impact highlighted; yellow cell: neutral or ambiguous impact highlighted; red cell: negative impact highlighted.

- Green logistics, certifications and ecodesign are the most implemented practices and seem to have a synergic effect on sustainability and resilience
- In some cases companies highlight a trade-off with economic sustainability, as the resulting processes are more onerous and complex
- The impact on resilience of social practices is not clear from the collected evidence
- Most sustainability practices have a positive impact on the risk of the supply chain. They might entail higher initial costs but these are usually paid off in the long term



# Implemented resilience practices and their impact

Practices		Sustainability			Resilience		
		Ec	Soc	Env	Risk	Imp	L&G
Resilience practices	Cat 1: Supply chain Disaster readiness --> risk management						
	Forecasting			B		B	
	Cat 2: Flexibility						
	Flexible supply base	A	A	A	A	A	A
		F	F		F	F	
	Cat 3: Reserve capacity						
	Cat 4: Integration						
	Vertical Integration	B		B	B		
		C		C		C	
	Sharing information with supply chain partners	B				B	
	Cat 5: Increase efficiency						
	Cat 6: Market strength						
	Buyer and supplier satisfaction/selection of more reliable suppliers	D	D				D
Cat 7: Financial strength							
Cat 8: Node density							
Cat 9: Complexity reduction							
Cat 10: Criticality reduction							
Cat 11: Response							
Cat 12: Increase recovery							
Reduction of impact	D			D	D	D	
Cat 13: Agility practices							

Green cell: positive impact highlighted; yellow cell: neutral or ambiguous impact highlighted; red cell: negative impact highlighted.

- The resilience practices that emerged during this study are SC disaster readiness, flexibility, integration, market strength, increase recovery
- Resilience practices have in many cases a positive impact on sustainability
- A negative impact reported for flexibility practices is found for the environmental pillar, as having different suppliers might lengthen the average supply routes and result in higher emissions
- Sharing information is implemented to ensure competitiveness and continuity, even if it is associated sometimes to increased costs due to the need to protect the information with additional security

# Implemented sustainability and resilience practices

- The interviewees acknowledged the importance of both sustainability and resilience and began to realize the importance of developing them together
- Sustainability practices are more implemented than resilience practices: longer tradition of stakeholders' pressure on firms
- Cost is only a secondary consideration when implementing resilience, while it is a serious discussion for the sustainability sphere
- Not all firms measured the impacts or outcomes (some only mentioned their perceived impact)
- The selected firms tend to measure the performance where they would like to see improvements, and they hardly ever measure the indirect impacts

# Trade-offs and synergies in implementation of practices

Sustainability			Resilience		
Economic	Social	Environment al	Risk reduction	Impact mitigation	Learning & growth

Practice	Sustainability			Resilience		
	EC	SOC	ENV	RISK	IMPACT	L&G
Internal environmental management	?	↑	↑	↑	↑	↑
Green purchasing	?	↑	↑	↑		
Eco-design	↓	↑	↑	?	↑	↑
Environmental performance	↓	?	↑		↑	↑
Supplier relationship	↑	↑	↑	?		
Logistics	?	↑	↑	↑	↑	↑
Social practices	↑	↑		?	↑	↑
Disaster readiness			↑		↑	
Flexibility	↑	↑	↓	↑	↑	↑
Integration	?		↑	↑	↑	
Market strength	↑	?				?
Increase recovery	↑			↑	↑	↑

- A synergic relationship between sustainability and resilience is almost in all cases highlighted
- The two concepts seem to be more synergic when having a long-term perspective
- The interviewed firms showed a lack of quantitative knowledge of the outcomes. This is especially true for cross impacts between sustainability and resilience
- The interviews show that the sector in which the firm operates highly influences the way they approach sustainability and resilience
- The role inside the SC influences the perception and impact obtained

➤ This is a preliminary study on the synergies and trade-offs between sustainability and resilience:



- The longer the considered time horizon, the more synergies were identified
- The importance of engaging with supply chains emerged as pivotal

➤ It seems that practitioners still have little knowledge of sustainability and practices implementation, as well as performance measurement.



- Although practitioners start understanding the value of studying sustainability and resilience jointly, there is still much to do to arrive at a more complete awareness
- Substantial awareness-raising work should be carried out to improve practitioners' capability of performance measurement



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Thank  
You

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