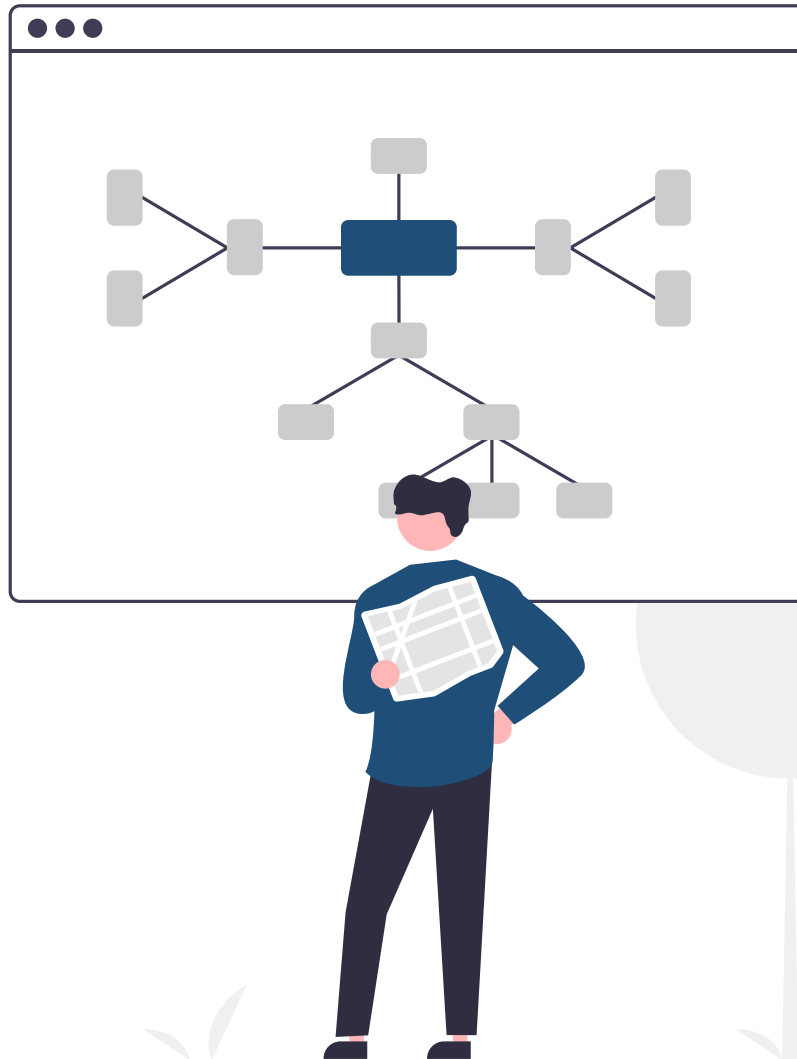




Mapping Trade-offs in Supply Chain Viability

Report 2

Executive Summary



Trade-offs are a
**Strategic
Priority**



Make **better
decisions** based
on clear
frameworks



**Leadership and
communication**
are key for success

Trade-offs in the supply chain are not new, but they have changed. In the past, the focus was on cost optimization; today, companies must take resilience and sustainability more than ever into account.

Improvements in these dimensions often come at the expense of efficiency. Therefore, a responsible corporate strategy is necessary to achieve a balanced trade-off strategy. If resilience and sustainability are not integrated into a corporate strategy, it will be difficult to assess the trade-offs comprehensively and in favor of the common good.

Sustainability can only be successful if it becomes part of the core business. Sustainability strategies that are seen as isolated CSR measures and implemented only for the sake of compliance are not enough. Driving change on a completely different level, e.g., by designing business models that see responsible action as the highest aspirational goal, could be a starting point.

Dealing with trade-offs will remain difficult because the biggest obstacles are still financial hurdles due to the more difficult market environment, complex structures, and resistance from top management. Try to find ways to position sustainability as a business imperative and communicate it simply and convincingly. This requires clear KPIs, measurable arguments, and clear goals for employees and managers.

The New Supply Chain Equation

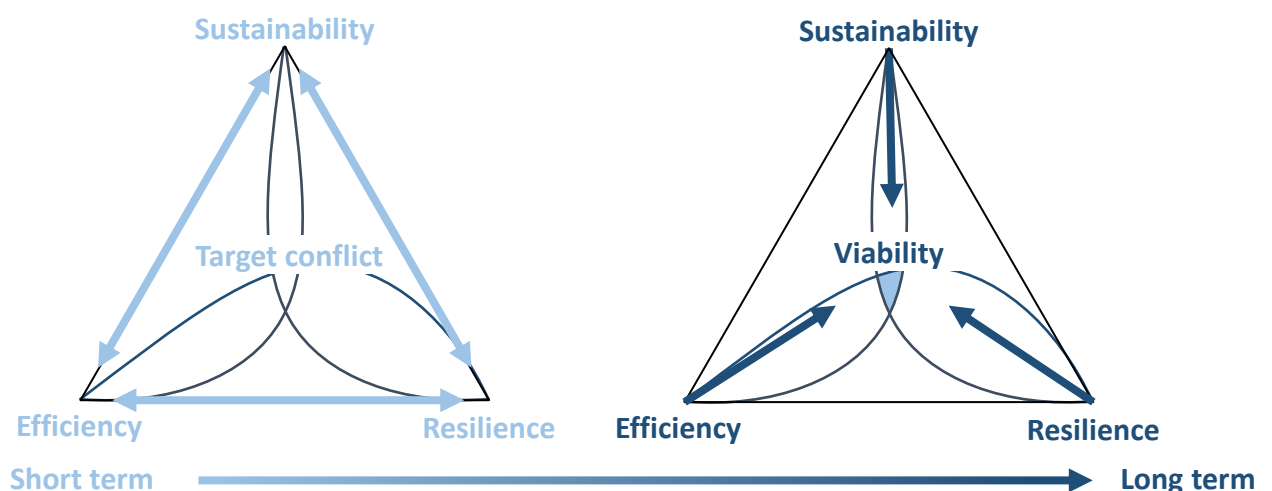
In today's interconnected and volatile global landscape, the traditional cost-driven approach to supply chain management is no longer sufficient. For decades, companies prioritized efficiency to remain competitive, optimizing for low costs and streamlined processes. However, recent disruptions have exposed the fragility of supply chains overly focused on efficiency alone. As a result, resilience and sustainability have emerged as equally critical dimensions in supply chain design and decision-making.

Yet, integrating these dimensions presents new and complex trade-offs. Enhancing resilience, for instance, often requires redundancy and flexibility, which can increase costs. Similarly, adopting more sustainable practices may raise expenses and affect short-term profitability. On the other hand, pursuing efficiency too aggressively may jeopardize both resilience and sustainability objectives. The interplay of these dimensions is no longer a matter of simple optimization but of deliberate balancing to achieve long-term viability.

This report introduces the “new supply chain equation” – a framework that acknowledges these tensions and emphasizes the need for conscious trade-off management. Drawing on extensive expert interviews and empirical insights, it maps the most common conflicts arising in planning, sourcing, manufacturing, and delivery. By understanding and navigating these trade-offs, companies can transform competing goals into complementary forces, turning supply chain viability from a theoretical ideal into a practical and strategic imperative.

Figure 1

Target Conflicts and Viability



Research Methodology

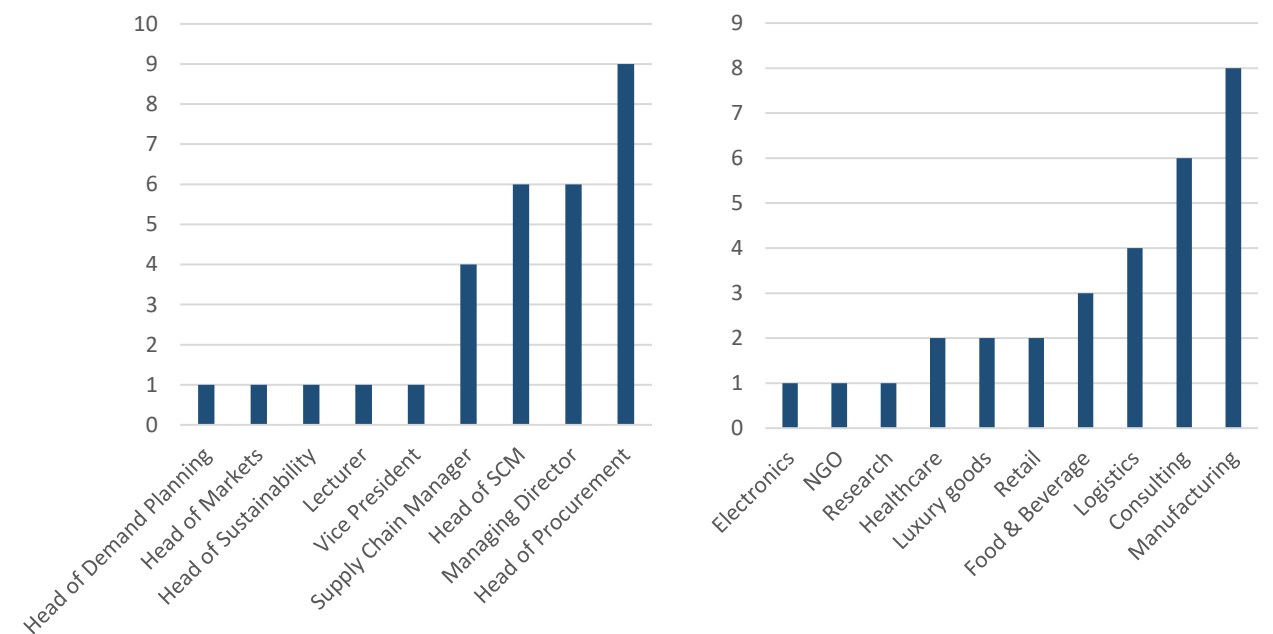
This study followed an exploratory, qualitative research approach conducted as part of our Innosuisse project. Between June 2024 and January 2025, we conducted 30 semi-structured interviews with industry experts across various sectors, with a primary focus on manufacturing, consulting, and the food and beverage industry. Each interview lasted between 30 minutes and one hour.

The collected data was analyzed using a systematic, category-based coding process. This analysis formed the foundation for the development of the **trade-off map**, which **categorizes 21 distinct trade-offs into nine groups**. These trade-offs are structured according to their conflicting dimensions:

- E vs. R (efficiency vs. resilience)
- E vs. S (efficiency vs. sustainability)
- R vs. S (resilience vs. sustainability)
- E vs. R vs. S (all three dimensions in conflict)

To validate the findings, the results were presented to a panel of experts from the Innosuisse project consortium. The group critically reviewed the map and refined the categorization with the research team.

Figure 2
Industry and Job Role Distribution of Interview Participants



n = 30

Mapping the Trade-offs

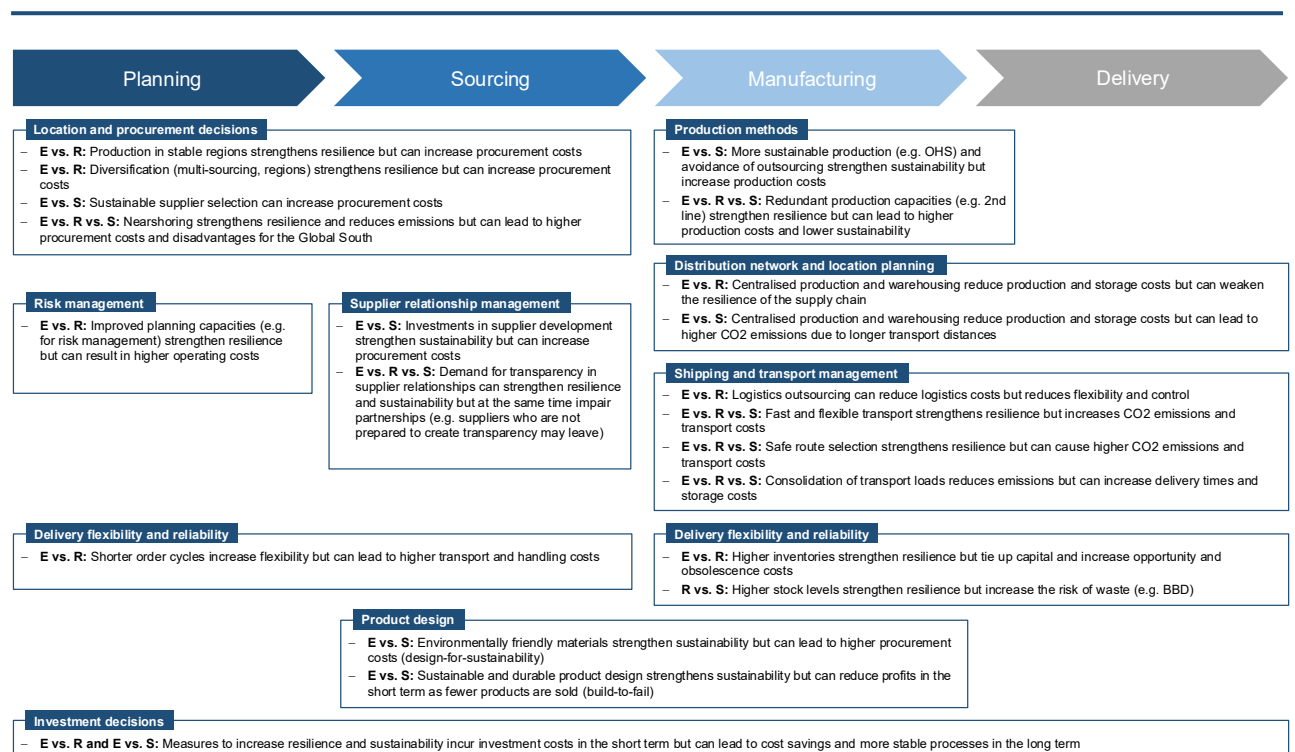
Based on the interviews, we developed a trade-off map. This map is based on the structure of SCOR and categorizes the trade-offs along the four process sections: Planning, Sourcing, Manufacturing, and Delivery. A total of 21 trade-offs were identified and grouped into nine categories.

Location and Procurement Decisions

E vs. R: Production in stable regions strengthens resilience but can increase procurement costs

Relocating production to politically stable regions enhances resilience but often comes with reduced cost efficiency. In contrast, sourcing from low-cost but high-risk regions improves cost efficiency but increases vulnerability to geopolitical disruptions and longer lead times. A statement from an interviewee from the food and beverage industry: “When outsourcing production to Malaysia, we only paid attention to costs and underestimated the impact on resilience. Problems with longer delivery times and power fluctuations significantly impacted production.”

Figure 3
Trade-off Map for SCV



E vs. R: Diversification (multi-sourcing, regions) strengthens resilience but can increase procurement costs

Diversifying suppliers improves resilience by reducing dependency on a single source and mitigating risks from geopolitical events and supply chain disruptions, but it raises procurement costs and reduces efficiency. Additionally, working with multiple suppliers limits the ability to negotiate better prices through economies of scale and complicates logistics and collaboration due to reduced standardization. Furthermore, a multi-supplier strategy could hinder building long-term partnerships with single suppliers. A statement from an interviewee from the food and beverage industry: “Although the long-term commitment to our cocoa producers improves the sustainability of our supply chains, it has made us heavily dependent on these few suppliers. We are now diversifying more.”

E vs. S: Sustainable supplier selection can increase procurement costs

Choosing cost-efficient suppliers over sustainable options, e.g., suppliers who care about nature and people, compromises sustainability goals to achieve lower procurement costs (e.g., sourcing organic products). A statement from an interviewee from the healthcare sector stated: “There is a government mandate to integrate sustainability into public procurement, but this is often ignored. Instead, costs are prioritized, and sustainability criteria are seen as an alibi.”

E vs. R vs. S: Nearshoring strengthens resilience and reduces emissions but can lead to higher procurement costs and disadvantages for developing countries

Nearshoring improves sustainability by reducing transport distances and lowering environmental impact, but it comes with higher procurement costs due to the premium prices in local markets. While nearshoring to regions like Europe offers advantages (e.g., faster transportation and lower supply chain risk), it is significantly more expensive than global sourcing from low-cost areas (e.g., Asia). An interviewee from commodity trading mentioned that sourcing steel from Europe reduced environmental impact but was 30-45% more expensive than sourcing from China.

Risk Management

E vs. R: Improved planning capacities (e.g., for risk management) strengthen resilience but can result in higher operating costs

Investing in more precise planning and risk management systems improves the ability to identify and respond to disruptions early, increasing the supply chain's resilience. These measures can result in costs, e.g., for technology, training, and implementation.

Supplier Relationship Management

E vs. S: Investments in supplier development strengthen sustainability but can increase procurement costs

Supporting suppliers in adopting sustainable practices improves environmental and social outcomes but often requires significant upfront investments in training, technology, machinery, or certifications. These costs are typically increasing short-term procurement expenses. A purchasing manager from the textile industry stated that they planned to fund water-saving technologies for their textile suppliers in South Asia and wanted to eliminate harmful chemicals. An interviewee gave another example of an attempt to package goods, such as hibiscus flowers, directly in the country of origin (in their case, Burkina Faso). Still, it failed due to high import tariffs on packaging materials.

E vs. R vs. S: Demand for transparency in supplier relationships can strengthen resilience and sustainability but at the same time impair partnerships (e.g., suppliers who are not prepared to create transparency may leave)

Requiring transparency in supply chains, such as detailed reporting on labor conditions, environmental impact, or sourcing origins, supports resilience and sustainability while improving visibility. However, this can strain relationships with suppliers unwilling or unable to comply, potentially leading to their withdrawal and higher costs to replace them, impacting cost efficiency. An interviewee from the wholesale sector stated: “We have a sustainability strategy, but some suppliers refuse to disclose certain information. We must decide whether to enforce the requirements or risk the supplier relationship.”

Delivery Flexibility and Reliability

E vs. R: Higher inventories strengthen resilience but tie up capital and increase opportunity and obsolescence costs

Maintaining higher inventory levels reduces the risk of stockouts and ensures continuity during disruptions. However, this approach requires capital investment, limits liquidity, and increases the risk of losses from expired, obsolete, or unsold goods. Example from the interview: An electronics manufacturer stocks extra components, but this inventory risks becoming outdated due to rapid technological advancements.

E vs. R: Shorter order cycles increase flexibility but can lead to higher transport and handling costs

Frequent and shorter order cycles enhance responsiveness to demand fluctuations and improve supply chain agility. However, this often increases transport costs due to smaller shipment sizes and higher handling expenses from more frequent processing. An interviewee from a retailer stated: “Changing the order cycle from 24 to 48 hours allowed us to reduce production costs and improve vehicle utilization. But it also reduced flexibility for customers who could no longer make last-minute changes to their orders.”

R vs. S: Higher stock levels strengthen resilience but increase the risk of waste (e.g. BBD)

Holding higher inventory levels enhances resilience by buffering against supply disruptions, especially for perishable goods. However, this increases the risk of waste due to limited shelf life, particularly for fresh products, creating a conflict with sustainability goals. Example from the interview: A convenience store chain reduced order cycles to minimize waste from unsold fresh products like sandwiches. However, stock levels had to be slightly increased in noise-restricted urban areas where frequent deliveries were not feasible, balancing those conflicting targets.

Product Design

E vs. S: Environmentally friendly materials strengthen sustainability but can lead to higher procurement costs (design-for-sustainability)

Switching to sustainable materials, such as biodegradable materials, reduces environmental impact and aligns with sustainability goals, but often comes at a higher price due to higher material, production, or certification costs. Example from the interviews: Wooden pallets are more cost-effective but have a negative environmental impact, while plastic pallets are more sustainable but more expensive to replace.

E vs. S: Sustainable and durable product design strengthens sustainability but can reduce profits in the short term as fewer products are sold

Designing products to last longer reduces environmental impact and aligns with sustainability goals, but limits repeat sales, potentially affecting revenue and short-term profitability. Example from practice: A home appliance company decides to manufacture a washing machine with a 15-year lifespan and modular, repairable parts. While this satisfies environmentally conscious consumers and complies with regulations, it cannibalizes their market for new sales. Over time, the company shifts its revenue model by offering extended warranties, subscription services, and repair kits to offset the decline in product turnover.

Investment Decisions

E vs. R and E vs. S: Measures to increase resilience and sustainability incur investment costs in the short term but can lead to cost savings and more stable processes in the long term

Spending on resilience (e.g., redundant systems, risk management) and sustainability (e.g., eco-friendly processes, compliance) increase upfront costs and pressure short-term profitability. However, these investments reduce risks, lower operating costs, and create more stable and efficient processes. An interviewee from manufacturing stated: “Our investment decisions focused on internal resilience, such as machinery upgrades and maintenance. We made the experience that misallocating funds or delaying necessary investments increases the risk of unplanned disruptions.”

Production Methods

E vs. S: More sustainable production (e.g., OHS) and avoidance of outsourcing strengthen sustainability but increase production costs

Sustainable production methods, such as implementing Occupational Health and Safety (OHS) measures, using renewable energy, or reducing waste through circular manufacturing, significantly improve environmental and social outcomes. Additionally, limiting outsourcing (or controlling it) ensures higher labor standards and reduces transport emissions. However, these approaches often have higher operational and labor costs, increasing production expenses. An interviewee from the mining industry stated: “The extraction of calcium carbonate has a significant environmental impact (e.g., large-scale mining operations), but costs a lot. Due to environmental restrictions, we had to use mechanical extraction instead of blasting, significantly increasing costs and reducing efficiency.”

E vs. R vs. S: Redundant production capacities (e.g., 2nd line) strengthen resilience but can lead to higher production costs and lower sustainability

Building redundant production capacities, such as maintaining a secondary production line or backup facilities, enhances resilience by ensuring continuity during disruptions or demand spikes. However, this increases fixed equipment, maintenance, and staffing costs and may lead to underutilization, reducing efficiency. Additionally, redundant capacities often require higher energy and material use, conflicting with sustainability goals.

Distribution Network and Location Planning

E vs. R: Centralised production and warehousing reduce production and storage costs but can weaken the resilience of the supply chain

Consolidating production and storage facilities lowers operational costs by optimizing economies of scale and reducing redundancies. However, it increases vulnerability to disruptions, such as natural disasters, political instability, or infrastructure failures, as the supply chain relies on a single location. Therefore, choosing safe locations for production and warehousing or using a hybrid approach, such as adding small regional hubs to support the central site, is important.

E vs. S: Centralised production and warehousing reduce production and storage costs but can lead to higher CO2 emissions due to longer transport distances

Centralizing facilities minimizes operational expenses by leveraging scale efficiencies and reducing overhead. However, it often increases the distance between production sites and end markets, resulting in higher transport emissions and a negative environmental impact. Support through other compensation strategies, e.g., electrification of the fleet or optimized routes and transport consolidation, can reduce emissions in the long term.

Shipping and Transport Management

E vs. R: Logistics outsourcing can reduce logistics costs but reduces flexibility and control

Outsourcing logistics operations to third-party providers helps reduce costs through economies of scale and specialized expertise. However, it limits the company's ability to respond quickly to changes or disruptions and reduces direct control over logistics processes. An interviewee from the manufacturing sector stated that logistics outsourcing was cheaper. Still, it is harder to make last-minute changes and keep direct contact with end customers since delivery can be, sometimes, the only opportunity for the company to interact with them.

E vs. R vs. S: Fast and flexible transport strengthens resilience but increases CO2 emissions and transport costs

Choosing between air, rail, and road transport modes involves a trade-off between efficiency, resilience, and sustainability. Air transport improves efficiency by speeding up deliveries, but it comes with significant environmental costs due to high CO2 emissions. Similarly, sustainable options like rail or electric trucks reduce emissions but are less flexible and sometimes more expensive. Furthermore, intermodal transport reduces CO2 emissions but compromises efficiency due to increased lead times and complexities at multiple handling points. An interviewee from the healthcare sector stated that their hospital used air freight primarily for high-value or critical pharmaceutical goods because managing shipments from China can be complex, where delays of up to 60 days can disrupt production schedules.

E vs. R vs. S: Safe route selection strengthens resilience but can cause higher CO₂ emissions and transport costs

Choosing safer transport routes minimizes hazards like poor infrastructure, political instability, or adverse weather conditions. However, these routes are often longer, leading to increased fuel consumption, higher CO₂ emissions, and elevated transport costs. An example is that more and more shipping companies often go for longer routes around Africa than the Suez Canal.

E vs. R vs. S: Consolidation of transport loads reduces emissions but can increase delivery times and storage costs

Combining shipments into fewer, fuller loads lowers fuel consumption and reduces CO₂ emissions, supporting sustainability. While this approach may minimize flexibility and responsiveness to sudden demand changes, technologies like AI-driven planning tools and collaborative transport models can help balance sustainability goals with operational efficiency. An interviewee from the food and beverage sector stated that closing production sites to centralize production resulted in longer transportation distances and increased the CO₂ footprint. However, the new facilities were more energy-efficient overall.

Lessons Learned

Most trade-offs seem to happen **between efficiency and resilience** or **efficiency and sustainability**. By contrast, trade-offs between resilience and sustainability are less common, likely because these two objectives often support each other.

Short-Term vs. Long-Term Goals

Short-Term Wins, Long-Term Risks

Most trade-offs are about balancing short-term cost efficiency with long-term goals. This tension mostly appears in highly competitive industries, where companies often prioritize immediate profit over long-term investment. Sustainability is often associated with too high upfront costs.

Cost Efficiency Still Comes First

Even though resilience and sustainability are becoming more important, cost efficiency is still the number one priority. While digital technologies can improve the quality of decisions, they cannot eliminate trade-offs at all.

The Growth vs. Sustainability Dilemma

The pursuit of growth and sustainability is an inherent conflict. While companies need to operate more sustainably, the traditional economic system is based on constant growth. A conflict that seems almost unresolvable.

Industry-Specific Priorities

Different Industries, Different Trade-offs

Each industry has its own priorities. Some examples: Food and beverage companies focus more on sustainability because of strict regulations and waste concerns (e.g., food expiration dates). Pharmaceutical and medical industries prioritize resilience because supply disruptions can cause health risks. Automotive and cost-sensitive industries tend to put sustainability second since they rely on global supply chains and high-price competition.

Nearshoring is Increasing

More and more companies are moving production closer to home and using regional supply chains to reduce risks. However, slightly higher costs in local markets still make this a difficult decision. Many companies still rely on low-cost production in distant regions, especially when competition is high.

External vs. Internal Factors

Trade-off Drivers

External factors such as geopolitical risks and regulatory requirements are more prominent in procurement-related trade-offs. Internal factors such as corporate strategy and technology adoption play a more important role in production and delivery.

Company Size Affects Trade-offs

The maturity and size of an organization also affect the nature and frequency of trade-offs. Smaller companies with simpler structures often face fewer trade-offs, while larger organizations must make more complex decisions due to greater legal obligations and operational reach.

Strategic Challenges

Flexibility Has Hidden Costs

Flexibility can be helpful in one part of the supply chain but cause problems elsewhere. For example, a flexible sourcing strategy can make a company more resilient, but it also raises procurement costs and complicates logistics.

Resilience is Hard to Sell

Unlike sustainability, which can be used for branding and marketing, resilience is mostly a hidden advantage. This makes it harder to convince decision-makers to invest in long-term risk reduction.

Managerial Implications

Trade-offs are a Strategic Priority

(1) Trade-off Management as a New Core Competence

The balance between efficiency, resilience, and sustainability is no longer optional. Reorganize those conflicting goals as a strategic issue and actively integrate them into strategy discussions, also at the “CEO level.”

(2) Turn Trade-offs into Synergies

Even though resilience and sustainability are becoming more important, cost efficiency is still the number one priority. While digital technologies can improve the quality of decisions, they cannot eliminate trade-offs at all.

(3) Use Efficiency Gains to Fund Resilience and Sustainability

Resilience and sustainability make economic sense in the long term but require investment in the short term. Let’s change the perspective: Increased efficiency is essential because it frees up resources, which can then be invested into resilience and sustainability initiatives.

(4) Consider Nearshoring

Rising transportation costs and geopolitical uncertainties are making nearshoring more attractive. To minimize risks and promote sustainable production models, consider making your supply chains more decentralized and flexible.

Better Decisions

(5) Prioritize Trade-offs Based on Stakeholder Requirements

Trade-offs often arise from conflicting stakeholder requirements. Instead of trying to balance everything equally, you could prioritize trade-offs based on your stakeholder requirements (check our Report 1).

(6) Don't Forget the Ripple Effect

Decisions about trade-offs in one part of the supply chain, such as planning, can impact other areas like production and delivery. Consider these cascading effects, whether positive or negative.

(7) Use Transparency as a Communication Tool

Supply chain transparency helps manage risks and arguments with stakeholders. Invest in monitoring tools such as EcoVadis to improve the overall decision-making for your purchasing strategy.

Leadership and Communication

(8) Build Cross-Functional Collaboration

Decisions about trade-offs benefit from input across departments. Create multi-functional and multi-aged teams that combine operational, financial, and sustainability perspectives.

(9) Communicate Simple with Top Management

A major obstacle to implementing viability strategies is the lack of support from top management. “Sell” resilience and sustainability as a business case. This includes clear figures, simple communication (top management often does not come from a supply chain or sustainability background), and proof that improvements will contribute to competitiveness.

(10) Support Soft Skills within your Teams

Many initiatives fail due to poor communication, weak leadership, and lack of collaboration. Invest in the development of soft skills at all levels within your team. These could include effective communication, problem-solving, teamwork, and workshop design. Use workshops to familiarize teams with trade-offs.

(11) Motivate Employees through Incentive Systems

Actively encourage your employees to work towards resilience and sustainability. This can be done through clear targets, bonus programs, or more inspiring workshop formats. SMEs, in particular, have a greater chance of developing an entrepreneurial conscience and driving change from within.

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