EFESO
MANAGEMENT CONSULTANTS

SUPPLY CHAIN RESILIENCE IN THE FOOD & BEVERAGE INDUSTRY

FROM THEORY TO PRACTICE

WHITEPAPER

ABSTRACT

Supply chain professionals in the Food and Beverage sector are trying to make their supply chains more resilient, given the unprecedented number of challenges that companies are facing. There are several solutions and best practices for the improvement of supply chain resilience but these are only implemented in a limited number of cases. The concept of supply chain resilience is also often misunderstood. This paper aims to raise the awareness of professionals of the concept of supply chain resilience, considering its comprehensive importance for the flows of materials, information, and cash. For the three flows, the paper summarizes the main threats to resilience and provide an overview of the available solutions.

Food and Beverage (F&B) supply chains are highly complex systems, bringing together primary producers, food manufacturers, and logistics service providers, as well as wholesalers, retailers and food service providers (United Kingdom Food Security Report 2021). The interaction between these players relies on physical, digital, economic, and human infrastructures. Disruptions arising in any of these interconnected infrastructures can have consequences for the whole system and compromise the supply of food.

F&B supply chains are facing unprecedented global challenges. The Russia-Ukraine war is having significant consequences for the global economy; F&B supply chains have been heavily disrupted, with a marked increase of the price of food. Before the war, the COVID-19 pandemic created a high level of stress for supply chains in all industries. In parallel with these pressures, consumer demand, inflation, regulation, cyber-attacks, and climate are factors that continuously test the resilience of F&B Supply Chains.

Consumers, on the other hand, are continuing to ask for lower prices, and competition creates a demand for continuous productivity improvements. Therefore, the challenge for companies is to make their supply chains more resilient while improving their productivity.

A resilient supply chain remains capable of reacting effectively to the impact of an unexpected disruptive event by keeping its operations at the desired level of performance. Meanwhile, the economies of scale and the learning opportunities unlocked by the investments in resilience lead to innovation, faster product development, higher output capacity, and overall system productivity gains.

In the light of the challenges that F&B supply chains continuously face, as well as of the potential of resilience, this paper aims at characterizing the main vulnerabilities that affect F&B supply chains, together with the strategies that professionals can adopt to mitigate and overcome the implications of these vulnerabilities. The paper focuses on three different types of vulnerability, representative of the three main flows that characterize a supply chain: materials, information, and cash.

Vulnerability of the Material Flows

Resilience in F&B supply chains depends on being able to get materials from different sources and responding promptly to incoming demand. Weak links in supply chains occur at "choke points" in food production, manufacturing, and distribution. In some F&B supply chains a small number of suppliers represent a considerable part of the national production capacity for specific products and raw materials; even the temporary unavailability of these suppliers can lead to significant supply chain disruptions (USDA report, blog).

Currently, as mentioned in the introduction, the Russia-Ukraine war is disrupting the supply of a considerable number of F&B supply chains. Both Ukraine and Russia are critical suppliers to the global F&B industry: the two countries are among the largest world's suppliers of wheat, oil seed, barley, and corn.

The consequence of the disruption of these supply chains is a rise in the prices of the related foods – to record levels, as proven by the Food Price Index of the U.N. Food and Agriculture Organization (ABC News).

In addition to the disruptions in the flows of raw materials, the war has disrupted the supply of fertilizers, with a dramatic impact on their prices and availability. In response to the sanctions, Russia stopped the exports of fertilizers such as ammonia, urea, processed phosphate, and potash. These fertilizers are exported worldwide, to countries including Brazil, China, the US, and India (farmdocdaily).

Interventions for the Resilience of Material Flows

There are different interventions that supply chain managers can implement to increase the resilience of their supply chain. The interventions proposed for the improvement of the resilience of material flows cover all the areas that are typically considered within supply chain management models.

A first area of intervention regards the **management of suppliers**. In this area, the interventions suggested for the creation of a resilient supply chain often overlap with best practices for modern supply chain management. An often-suggested intervention regards the selection of suppliers according to criteria that can help to minimise both the disruptions and their impact. The supplier selection criteria that can maximize the resilience of a supply base include the political and social stability in the countries of the suppliers and the financial robustness, as well as the more general degree of managerial maturity of the suppliers, and their level of environmental and social sustainability.

After the selection process, best practices that promote both resilience and productivity can be applied to supplier development and supplier integration. A focal company willing to support the development of its suppliers can adopt incentives and knowledge transfer, as well as monitoring the working conditions of the supplier closely. In addition to developing its suppliers, an effective communication channel between suppliers and focal firm will enhance the visibility of the focal firm of its supply base, enabling the timely implementation of interventions in the case of unacceptable risks. A third and recurring intervention for the resilience of the upstream side of a supply chain is the creation of redundancy in the supply base, through the strategic and selective use of spare capacity and multiple suppliers to cope with disruptions.

The above-mentioned interventions look simple and immediate for the expert supply chain managers. Therefore, the question arising is why they are not implemented in current supply chains more often. The answer can be complex, but there are two factors worth mentioning for a quick characterisation of the phenomenon: the cost and the complexity of implementation of the intervention.

- **Regarding the cost**, it is easy to understand how the creation of redundancy in the supply base implies an important commitment of resources; determining the optimal trade-off between the resilience of the supply chain and other strategic performance indicators is a complex exercise.
- **Regarding the complexity of implementation of the interventions** mentioned previously, supplier integration is a good example of something that is simple to describe from a theoretical perspective but quite difficult to implement, given companies' inertia in the face of change and the human dynamics that change implies.

EFESO has a consolidated experience in supporting its clients in the creation and management of the supply base, with specific reference to the Food and Beverage sector. A meaningful example regards a Supplier Development project completed for a client operating in the F&B sector. The client was a central buying organization for a top 6 multiple retailer with a network of 16 regional distribution centres nationally across multiple retail stakeholders. It needed to leverage supplier terms to reflect efficiency in new ways of working, but it was facing some constraints in terms of lack of visibility of inbound supply chain. This included the need for a migration plan to shift volume and reduce supplier cost to serve, as well as need to improve collaboration between buying and supply chain teams. We covered different areas, operating in synergy with the client. For example, we identified suppliers suitable for the new distribution centre and modelled supplier efficiency savings, created joint buying / supply chain negotiation teams, developed a new negotiation strategy, and carried out detailed negotiations with about 150 suppliers. On top of these changes, we also identified and negotiated other opportunities related to direct store delivery, imports & backhaul. This project created tangible and intangible benefits for the client. Among the tangible benefits, the optimized trade terms re-negotiated created a benefit of circa £8m. The intangible benefits included fully trained teams to model and negotiate supplier benefits, a clear strategy for supplier allocation and review going forward, as well as good supplier relationships and service levels maintained throughout the program.

A second area of intervention regards **supply chain planning**. Best practices which are able to improve both the resilience and the productivity of a supply chain include portfolio diversification, contingency planning, assortment planning, dynamic pricing, and silent product rollovers.

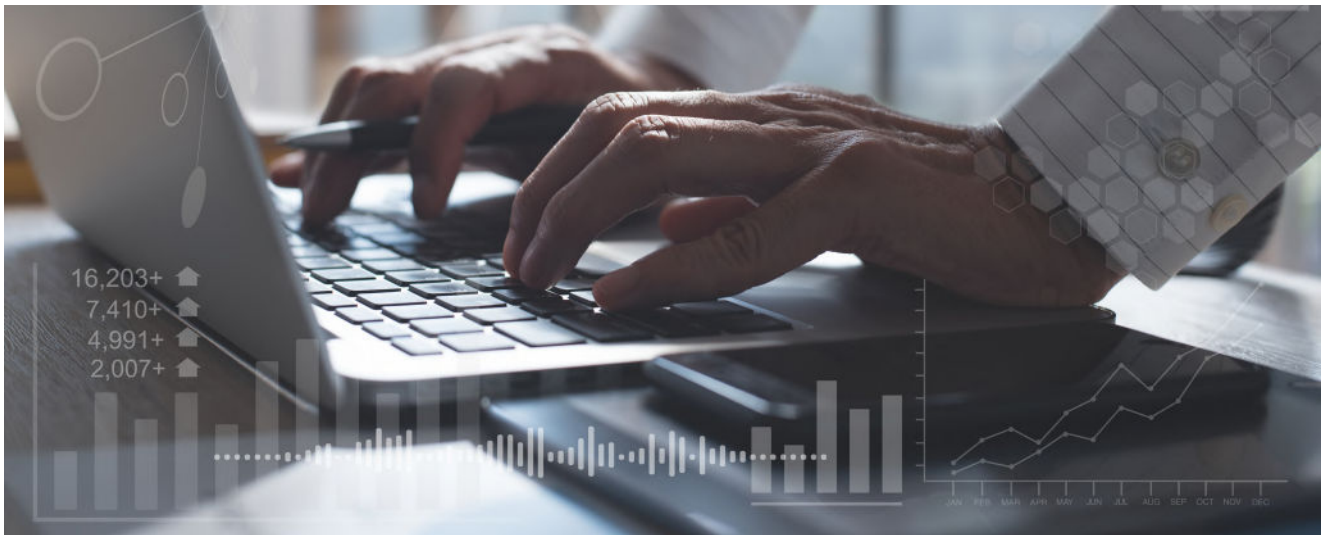
Do supply chain managers effectively implement these practices? The answer seems to be negative. The design of these interventions requires a set of organizational prerequisites that are often absent in many F&B companies and supply chains. For instance, an effective portfolio diversification requires a strong integration between the product development and the supply chain functions, as well as strategic alignment between the competitive and the functional strategies of the company. EFESO successfully implemented the principles of strategic alignment while supporting several leading clients in the F&B sector. A meaningful example is the project completed for one of the largest global producers of bakery ingredients, which had to align its product portfolio for three acquired production facilities in the UK. The implementation of the principles of strategic alignment implied, among other benefits, a reduction of direct labor costs of 15-20% as well as the introduction of a platform for further growth and efficiency improvement.

Most organizations in F&B cannot fully master these prerequisites yet. Therefore, the implementation of portfolio diversification requires a maturity journey that goes beyond the reaction to a specific crisis.

A third area of intervention relates to the **capabilities and the culture** within the supply chain. Firstly, logistics capabilities are needed for the effective coordination of the flows of materials and information of a resilient supply chain. Operational capabilities include a constant awareness of the risk levels, while tactical and strategic capabilities include a risk management culture enabling all the actors of an organization to contribute to the supply chain risk management processes. The involvement of management and a good functional integration are key ingredients for the implementation of such a culture. Coopetition can create and maintain collaboration with competitors to create synergies and share resources for building resilience. Meaningful examples of coopetition are the initiatives of data sharing for safety purposes that are bringing together competitors across many industries. Similarly, contractual agreements between the public and the private sector can enable the sharing of skills and assets to deliver better customer services.

When facing the challenge of a cultural change, EFESO is chosen for its 'Boost' approach of improving focused areas, combined with the development of an improvement culture. This was the case with a recent project focused on the introduction of a continuous improvement culture in a frozen food company. Thanks to specific interventions such as a 'push' to 'pull' mindset to create flow in the system and a Performance Control System, the project achieved a 55% waste reduction and expected savings of € 2,6m pa. Increasing visibility is another must, since the real time visibility of the nodes and links of the supply chain enables the identification and mitigation of threats. Visibility also implies understanding the mechanisms that enable the exchanges of materials, information, and cash; an understanding of these mechanisms is essential for the identification of the root causes of risks and disruptions.

Finally, the use of **information technology** is a pivotal capability, but also an enabler of all the other previously mentioned capabilities. Information technology can indeed enable visibility, collaboration, and the implementation of any desired change in the direction of higher levels of resilience.



Financial **Vulnerability**

Supply chains in the F&B industry face a unique set of challenges related to the **management of cash flows**. These challenges are a direct consequence of two factors: the imbalance of power between larger and smaller firms, and the seasonality that characterises harvesting.

The imbalance of power between larger and smaller firms is particularly significant in food and beverage industry compared to other industries, since several F&B suppliers are small farmers who supply their products to larger distributors and retailers.

Farmers must also manage long production times, with seasonal harvesting and working capital cycles driven by biological processes, while the demand for finished goods is relatively inelastic and flat.

The combination of these two factors creates large inventory build-ups for farmers and processing plants, bringing significant inventory holding costs. This situation can be exacerbated by high interest rates, a situation that many farmers are currently facing. In the UK, for instance, the annual rate of inflation reached 9.9% in August 2022, close to a 30 year high (Rising cost of living in the UK, House of Commons Library).

Interest for farm loans depends on factors that are beyond the control of the F&B industry. However, the financial conditions of the borrower as well as borrower and lender maturity can heavily affect lending rates.

Financial conditions often present a barrier to credit access for many farmers, considering the high levels of debt. In the UK, for instance, the average level of debt of farms in 2020/21 was around £246,100 (Gov.uk), while in the EU it was around €61 000 in 2018 (European Commission, Agriculture and rural development).

The challenges generated by the management of working capital can jeopardise the performance of the farms, with an impact on the quality and reliability of supplies.

Solutions for Financial Resilience

What can a supply chain manager do to mitigate the risks related to financing problems in global supply chains?

Supply Chain Finance (SCF) represents an effective solution for the improvement of the financial health of global supply chains. SCF can be briefly defined as a group of "financial arrangements adopted by two or more supply chain partners and generally mediated by a digital platform with the aim of improving the financial performance of the supply chain" (de Boer et al., 2015).

Supply chain finance offers different instruments that cover the strategic, tactical, and operational decisions related to the management of the financial flows. The instruments covering the operational decisions are all the arrangements that are used to finance net working capital and they are the most frequently implemented in current supply chains.

The most common SCF instruments include reverse factoring, dynamic discounting, inventory financing, purchase order finance, and, for the specific F&B sector, tolling agreements and contract farming.

Reverse factoring assumes that large buyers can obtain lower interest rates compared to their smaller suppliers. When adopting reverse factoring, suppliers can cash their invoices before the original terms in return for a small discount. The interest rate applied by the capital provider is mediated by the large buyer and therefore lower of the one that the supplier would get with an autonomous negotiation. The suppliers can thus get a loan at a lower cost and with a manageable timescale. Suppliers can thus plan with more confidence in the uncertainty of market threats and the supply chain is protected from cash flow related disruptions.

With a tolling agreement, a large buyer will own raw materials, while another company will process those materials, according to the specifications of the buyer. This is typically applied when farmers need access to specialized equipment, expertise, or processes of limited availability.

In contract farming, one company can provide land, buildings, and other equipment, while a second company will provide labour and machinery. This is typically applied when manufacturers need to assist farmers financially or exercise control over the supply chain.

In addition to these two instruments, some innovative solutions are being proposed and successfully implemented in the F&B sector. One of these solutions is Inventory Financing, where the lender provides a loan using the inventory itself serves as collateral for the loan.

At EFESO we have a consolidated approach for contextualizing financial flows within the end-to-end supply chain flows, simultaneously taking into account sales, production, purchasing, quality, finance and logistics. In a recent project for a chocolate company, we supported the implementation of a progression growth strategy with a "quick win" implementation achieving +5% EBIT. One successful intervention involved restoring the accounting system, starting from COGS, BOM, commercial and amortization policies. We proactively developed a BI system to analyse and deploy the company P&L with all possible analysis dimensions.

Cyber **Vulnerability**

The information exchanges of a modern supply chain are normally mediated by internet, telecommunications networks, and computer systems. A cyber-attack is any deliberate disturbance to this interdependent network that leads to a loss of functionality, performance, or capacity. A cyber-attack can directly target the food supply chain, but it can also disrupt other essential related sectors, such as energy or water.

The threat of cyber-attacks to global supply chains, including those in the food and beverage sector, is significant and growing. Some figures can easily highlight the magnitude of the phenomenon. Forbes notes that since global security breaches are "impacting over 200,000 computers in 150 countries and costing millions", cybersecurity impacts businesses as a whole and is no longer a concern for IT departments alone. Global cybercrime damages exceeded the predicted US $6 trillion in 2021 . The average cost of a cyber-attack for a company can be of $1.07 M3. Recent high profile data breaches include Marriott (5.2 million customer records fraudulently accessed) and MGM (10.6 million customer records shared by hackers).

There are different types of cyber-attack, continuously enhanced by hackers and cyber criminals. Examples of cyber-attacks are espionage, ransomware, and phishing.

Espionage happens when cyber criminals try to infiltrate the IT infrastructure of a supply chain with the intention of gaining information for future attacks. Ransomware happens when data is made inaccessible to the victim until a ransom is paid. Phishing consists of the theft of personal or corporate data and financial transactions.

With the advent of Industry 4.0, attacks can also directly target the manufacturing plants and industrial control systems (Gov.uk).

The probability and the impact of cyber-attacks depend on several factors. The vulnerability of a company can be increased by factors such as the lack of a cyber-security strategy, a low level of awareness and expertise among people at different levels, and dated or inadequate technologies.

A case study that demonstrates the impact of cyber threats is the attack experienced in June 2021 by José Batista Sobrinho (JBS).

JBS is the world's largest meat supplier, processing nearly one quarter of the beef used in the USA. It employs over 150,000 people across the world and its top customers include very well-known fast-food outlets, among them McDonald's. In 2021 a ransomware attack disrupted the operations of the company, with servers compromised in North America and Australia.

In response to the attack, JBS released a statement: "JBS USA determined that it was the target of an organized cybersecurity attack. The company took immediate action, suspending all affected systems, notifying authorities and activating the company's global network of IT professionals and third-party experts to resolve the situation. Resolution of the incident will take time, which may delay certain transactions with customers and suppliers." (https://fooddigital.com/food/cyber-attack-hits-jbs-worlds-largest-meat-supplier).

The attack compromised the operations of all the company's production plants in the US and some of the plants in Australia. The operations were restored after 10 days and after the payment of a ransom of £7.8m via Bitcoin to the attackers (Source: United Kingdom Food Security Report 2021: Theme 3: Food Supply Chain Resilience).

1. Cybersecurity in 2022 – A Fresh Look at Some Very Alarming Stats (forbes.com)
2. By 2021 The Cost Of Cybercrime Will Be $6 Trillion (cybersecurityintelligence.com)

Solutions for Cyber Resilience

The World Economic Forum (WEF, 2012) defined cyber-resilience as “the ability of systems and organizations to withstand cyber events, measured by the combination of mean time to failure and mean time to recovery”.

Cyber-resilience is not only a technological challenge to be solved by the IT department, but it requires the synergic action of processes, technologies, and human dynamics. Failing to address one of these three aspects weakens the entire system and exposes the supply chain to attacks. People are often the target of hackers trying to identify the weakest link of the chain: nearly 90% of all successful cyber-attacks are a result of information unknowingly provided by employees. Similarly, hackers could identify a poorly designed cyber-security process and use this process to infiltrate a network. Within a supply chain, hackers will probably try to penetrate the system by targeting the weakest element of the network. Having penetrated the system, the information gained will be used to target the other more resilient elements.

The interventions for the mitigation of cyber risks within a company and within a supply chain begin with an assessment of the risk, followed by the implementation of mitigation interventions that cover technologies, processes, and human dynamics.

Examples of cyber-resilience interventions targeting people include the provision of training on the identification and response to cyber threats. Examples of interventions targeting processes include the creation of a cyber security policy which incorporates the strategic, tactical, and operational decisions of the organization. Interventions targeting technologies include Network Security Monitoring tools, Encryption Tools, Antivirus Software, Firewall, PKI Services, and Managed Detection Services.

A company can rarely have all the capabilities to manage these internally so these types of intervention are often outsourced to a Security Operations Centre. This will be run by a dedicated team of cyber-security experts responsible for risk assessment, risk monitoring, and implementation of the interventions responding to the attacks and mitigating the risks.

EFESO has developed solid experience in the field, having supported the setting of an Initial Operational Capability for Computer Emergency Response Team (CERT) of a high electronic solutions company. We also supported the IT Security department of the main Italian Postal Service Operator in exploring cyber-security market opportunities in order to adopt a robust business model.

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ADDITIONAL REFERENCES

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