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Risk Management, Innovation and Sustainability: A Strategic Approach for Sustainable Competitive Advantage

Prof. Luca Giustiniano

SUPERVISOR

Ginevra Alessandra Lacalendola

CANDIDATE

SNR: 787041

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Chapter I

1. INTRODUCTION

A. Risk Management's Importance in Modern Context

The most obvious but true answer anyone would give if asked what is important for a business strategy to be successful would be: sharp vision and defined objectives, capable and determined top leadership, and solid corporate culture. This is true, but what is often undervalued is the importance of Risk Management, a systematic approach which recently gained a central spot in the business strategies of almost every organization, or at least the most advanced ones. In today's increasingly uncertain and volatile environment, one of companies' primary concerns is finding a way through which they can effectively ensure their stability, growth, and competitiveness without neglecting their business objectives. In this context, Risk Management acts as a facilitator, once reduced at a simple control function, but now regarded as a sustainability and innovation catalyst. Today's companies must face a variety of complex factors, like stringent environmental regulations, financial market instabilities, geopolitical changes, without losing sight of digital transformation and social sustainability.[1]

Modern risk management goes beyond the protection of companies' assets: it is intrinsically integrated into governance, management of resources and investments allocation. This transition is due to the growing interconnection between the global economic dynamics, production systems and consumers' expectation towards responsibility and transparency criteria.[2]

Financial markets instability and raw material price fluctuations impose firms to carefully manage economic risks, as well as rapidity of technological innovations necessitates them to keep constantly updated to avoid competitivity losses. Due to the increase in regulations on sustainability and safety, it is necessary to implement a continuous legislative compliance monitoring. Climate change obliges firms to adopt more sustainable resource management strategies. Risk Management should be at the same level of all organizational functions, rather than an isolated activity.

[1] Kaplan & Mikes, Managing Risks: A New Framework (Boston: Harvard Business Review, 2012), 49
[2] Hopkin, Fundamentals of Risk Management (London: Kogan Page, 2018), 37

Advanced firms adopt frameworks recognized at an international level, such as COSO ERM or ISO certifications, systematically and coherently structuring the risk identification, evaluation, and mitigation. The adoption of an integrated approach allows businesses to transform risks into growth factors, enhancing resilience, efficiency, and long-term competitive advantage.[3]

In the current uncertain context, Risk Management strategically guides business decisions and adaptability. The future of firms will depend on their capacity to manage risk not only as a threat which must be avoided, but as an opportunity to exploit for innovating and growing.

B. Relationship between Risk management, Innovation and Sustainability

It is important to understand that, in the contemporary context, it is essential to consider Risk Management, Technological Innovation and Sustainability as a set of three integrated components that influence companies' strategies and competitiveness. Recently increasing phenomena like regulatory pressures, technological advancement and economic uncertainty necessitate organizational adaptation to an approach which combines the three elements, aiming to ensure resilience, leverage opportunities and, finally, mitigate threats.

Examining threats, advanced digital tools improve risk identification and evaluation, but also lead to new criticalities, such as the dependence on digital infrastructure and internal resistances to change. A company which fails to integrate Risk Management into its innovation strategies is exposed to threats that could compromise the operating continuity and stakeholders' trust.[4]

Sustainability also became an essential element for Risk management. Environmental, social and governance factors significantly affect reputation and long-term operation capacity. By integrating sustainability into Risk Management strategies, companies can prevent negative impacts from climate change, resource scarcity and social tensions. Stringent environmental regulations and the consumer sensitivity necessitate firms to adopt sustainable business models to minimize risks of sanctions, boycotts, or market distrust.

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[3] Kaplan & Mikes, Managing Risks: A New Framework, 53

[4] Hopkin, Fundamentals of Risk Management (London: Kogan Page, 2018), 37

The adoption of innovative technologies support sustainability objectives through environmental monitoring, energy consumption optimization and low-impact materials usage. By integrating these initiatives into Risk Management strategies, companies can balance innovation and operational stability.

Firms efficiently integrating risk management, innovation and sustainability build resilient and competitive business models. Only through a strategic vision which valorizes these three dimensions, it will be possible to successfully address future challenges and assure a sustainable long-term growth.

C. Focus on the Sustainable Packaging Sector

The sustainable packaging industry represents a concrete example of how risk management could be integrated in business strategy to address regulatory, environmental and market challenges. Sustainability needs, innovation, and regulatory compliance are three factors that organizations operating in this sector need to strike a balance among, and they can do this through structured Risk Management.

Two of the most relevant regulations recently introduced by the European Union are the European Plastics Strategy and the Packaging and Packaging Waste Regulation. These institute tough compliance conditions regarding the reuse, recycling, and design of packaging. This leads to organizations using innovative and eco-friendly options. Companies not ready to adapt see this regulatory context as a threat, while those exploiting regulations as a competitive advantage see it as an opportunity.

Growing regulations in the packaging sector made Risk Management an essential element for guaranteeing sustainability and profitability. To avoid sanctions and restrictions on the market, companies must monitor regulatory risks, as well as manage operating risks associated to supply chain, sustainable raw materials availability and shifts in consumers' preferences. Transitioning from traditional materials to ecological solutions (e.g., bioplastics, recycled paper) makes companies face new costs and uncertainties related to scalability of production.

Sustainability represents a much-debated issue in recent years, and its management determines the success of the company's reputation. In this regard, Risk Managements once again acts as a facilitator for structuring certification, communication processes

and reporting, systematically verifying that sustainability strategies are adherent to recognized requirements like ISO standards, BRC packaging and ESG KPIs.
Risk Management demonstrates, in the packaging sector, its double function of control and strategies, leveraging challenges in growth opportunities, favoring competitiveness and resilience by complying with requirements, optimally using resources, and anticipating market tendencies.
In this scenario, sustainable packaging is not only an answer to environmental needs, but also a sector in which risk management directly translates in innovation, compliance, and strategic value. The capacity to navigate regulatory constraints, invest in research and development and build in a responsible supply chain represents the true success factor for firms operating in this sector.[5]

D. Research Objective and Questions

The objective is to analyze how risk management integrated in technological innovation strategies provides a sustainable competitive advantage. In an economic context characterized by uncertainty, rapid transformations and growing regulatory pressure, firms must adopt a strategic approach that allows them to innovate without compromise operating stability.
This research aims to examine how firms can adopt strategic practices that balance opportunities and threats, emphasizing sustainability. The Cartonpack S.p.A. case study delves into using Enterprise Risk Management systems not only to protect the firm from financial, operating, and regulatory risks, but also to stimulate technological progress and guarantee a sustainable growth.
The research revolves around a central question:
“How can risk management be integrated in technological innovation strategies to gain a sustainable competitive advantage?
This question aims at comprehending the strategic role of Risk Management for enabling and supporting innovation, without compromising corporate solidity. The objective is to identify the conditions, practices and factors that favor a risk

[5] Meherishi, Narayana & Ranjani, "Sustainable packaging for supply chain management," Journal of Cleaner Production, 237, 2019, 117582

management oriented at growth and competitiveness, also considering the sustainability and regulatory compliance aspects.

To delve deeper into this topic, the research is divided into a series of exploratory questions, which see the phenomena from different theoretical and practical perspectives.

- "Which are the main strategic theories that can support the integration between risk management and innovation?"
- "Which risk management best practices are most effective in supporting innovation?"
- "Which are the challenges that firms face during the implementation of an innovation-oriented strategic Risk Management?

E. Theoretical Relevance

Traditionally, Risk Management was a protection function, aimed at mitigating negative events and their impact on corporate stability.

Nevertheless, now economic actors are required to accept the fact that an effective Risk Management may be reached only completely absorbing it within the corporate governance, due to its strong ability to influence corporate decisions related to growth, development, and investment. Additionally, to the economic transition, it is evident how governance, transparency and sustainability regulations are becoming increasingly frequent and stringent, further enhancing the role of Risk Management as core part of business strategy. This implies that theoretical research must delve deep into how firm can develop risk management models able to align to these new requisites without compromising their own competitiveness.

F. Practical Relevance

Combining corporate strategies with Risk Management determines whether and how firms tackle difficulties and ensure sustainable growth paths. Risk Management enables companies to decide in a more informed way thanks to a careful and meticulous identification of opportunities and threats. Proactively risk managing facilitates reducing negative events impact, overseeing innovation and differentiation horizons,

and increasing efficiency, leading to a more favorable perception of the company by investors.

G. Thesis Structure

The thesis structure systematically analyses Risk Management and its integration into innovation and sustainability strategies. It starts from theoretical frameworks, crosses the adopted methodology, analyses the case study empirical results, and ends with a critical discussion and practical implications. The objective is to guarantee a clear and coherent treatment addressing the main explorative research questions, providing both theoretical relevance and practical recommendations for companies facing Risk Management related challenges.

1.1 RISK MANAGEMENT WITHIN MODERN COMPANIES

A. Definition and Objectives of Risk Management

Risk Management mainly consists in identifying, evaluating, and tackling possible occurrences which could unfavourably influence the accomplishment of a company's objectives, with the aim of keeping operations continuous without incurring in any sort of interruptions and consequently protecting business resources.

With the advent of market globalisation, technological transformations and ever-developing regulations, Risk Management increasingly plays a central role in modern firms' strategic planning.

What Risk Management aims to put in action for companies is the rapid identification of potential risks, which consequentially leads to the protection of both tangible and intangible assets (the first exemplifiable with financial resources, and the second with know-how), therefore avoiding major losses.

Another crucial objective is optimizing decision-making processes. By integrating risk management in planning and strategic development, organisation can more precisely evaluate potential threats and opportunities associated to different operational choices, balancing risks, and benefits in an effective way.

Regulatory compliance represents another fundamental aspect. Firms must comply to a variety of regulations and norms, and in this context, effective and structured risk

management verifies the adherence of organizations to these strict standards, therefore reducing, or eliminating, the chances of legal sanctions or reputation losses.
Risk Management also implies sustainability and social responsibility, being increasingly recurring themes, and this consequentially requires companies to consider the social and environmental effects of their own decisions and prepare negative effects mitigation plans whether the decision doesn't result in the expected outcome. In this way, investors will perceive the company as reliable and credible.
Even in the cases of natural disasters, global pandemics like Covid-19 or economic crises, companies must know how to act to avoid business interruptions and therefore guarantee operational continuity. They can do this by elaborating specific response strategies to these risks, reducing downtime and related deficits.
Similarly, financial risk management addresses market fluctuations and economic uncertainty, protecting financial stability through prudent resource management.
A further objective of risk management is the promotion of a risk-aware organisational culture. The organization must favour open risk communication and sharing between all members, leading to a quick identification and handling of threats.
Companies must be careful that their innovation initiatives also comply with current sustainability tendencies, to balance bold initiatives with sustainability. Accurate identification and control risks associated to innovative activities will lead to less chances of discrepancies between innovation and sustainability.
Business continuity is well-known to be an essential part for a company to survive, and this is assured by supply chain risks management, such as supplier diversification and contingency planning.
A well-structured and integrated risk management approach is required, that combines financial, operational, regulatory, and strategic factors to highlight and improve organizational resilience, decision-making processes, and stakeholder relationships. With such approach, companies would be able to gain and maintain a sustainable competitive advantage.[6]

[6] Kevin Buehler, Andrew Freeman, and Ron Hulme, "Owning the Right Risks," Harvard Business Review 86, no. 9 (2008): 102-113

B. Risk Management Evolution: from operating function to corporate strategy

Risk management was subject to a significant transformation over time, evolving from an operating function primarily focused on the production of assets to an essential strategic company for the success and sustainability of organisations. This evolution was influenced by various historical, economic, and regulatory factors which redefined ways by which companies perceive and manage risks.[7]

The first traces of a structured risk management belong to 1916, when the French engineer Henry Fayol included "prevention" among the six fundamental functions of business management, recognising the importance of anticipating and mitigating potential threats.[8] However, it is in the United States, between the 50s and 60s, that the concept of risk management became to take shape as an autonomous discipline. In that period, the focus was on a reactive, and not proactive approach, based on the protection of tangible losses, by using insurance instruments to transfer risks to third parties. Thus, companies simply reacted and tried to minimize the damage of adverse events after their happening.

In the 70s and 80s, companies started to recognize the competitive advantages offered by effective risk management, and in this period, there was a shift from simple assets protection to proactive identification and management of potential risks. The advent of more cutting-edge methodologies in this period helped understanding the importance of integrating risk analysis and evaluation into business decision-making processes. Companies started considering risk management as a key strategic planning element other than a support function.

The end of 80s and the beginning of 90s were signed by financial events which put a light on the importance of an integrated the risk management. Enron and WorldCom scandals are just two of the various events that put light on the importance of more stringent risk-oriented regulations and internal control systems, implying integrating risk management within their governance structures.

[7] Georges Dionne, "Risk Management: History, Definition, and Critique," Risk Management and Insurance Review 16, no. 2 (2013): 147-166

[8] Daniel A. Wren, Arthur G. Bedeian e John D. Breeze, The Foundations of Henri Fayol's Administrative Theory, Management Decision, Vol. 40 Iss: 9 (2002), 906-918

Additionally, the 2007-2008 financial crisis made Risk Management shift from simple operating function to integral part of corporate strategy, demonstrating the importance of risk management in decision-making and control processes.
There are many different categories of risk which an organisation is subject to.
To the category of strategic risks belong those type of risks related to the value and market competitive positioning of a company. Typical examples are the strategic positioning of the company, the evolutive context of the sector of belonging, the evolution of the client and supplier portfolio.
Financial risk is the possibility of losing money on an investment or a business venture and is linked to the liquidity risk (ability to access company resources in a short time), the credit risk (risk of losing from a third-party default), and market risk (arising from fluctuations in the cost of financing or other key elements of the business, such as commodities).
Operating risks are all those risks associated to internal operative processes, with particular focus on potential malfunctions of management systems and of processes, which could determine business interruptions.
Also defined as risks of non-compliance to regulations, legal and compliance risks consist in incurring in legal sanctions, amends, financial losses or image or reputational damages consequent to the non-compliance to current regulations or codes of conduct.

C. Main Frameworks of Reference (COSO ERM, ISO 9001, ISO 14001, BRC Standard)

In 1992, the Committee of Sponsoring Organizations of the Treadway Commission (COSO) introduced the Internal Control Integrated Framework, becoming a benchmark for companies' control and review of their own internal control systems. However, the evolvement of the economic context and the emerging of new risks, required an approach more focused on risk management.
In 2004, the COSO answered to this need by publishing the Enterprise Risk Management – Integrated Framework. This document extended the focus of the simple internal control to the integrated management of business risks, recognizing that an effective risk management is fundamental for the strategic and operational success of an organization.

The causes which led to the creation of this framework are various. In previous years, many financial scandals and business failures put light on the shortcomings in internal control and risk management systems, like the 2000s American energy company, Enron, which started to reveal its billion-dollar debts, until then hid by a Special Purpose Entity, facilitated by inadequate risk management and accounting practices. The lack of effective internal controls and the complicity of auditors led to the company's failure, with enormous losses for investors and a trust crisis in financial markets.

In addition to scandals related to financial markets, also different sectors saw collapses due to a scarce risk management. The Volkswagen case of 2015 is an example of failure of internal controls. The German firm was involved in the so called "Dieselgate", a scandal related to the manipulation of the diesel engine emissions to evade environmental controls. The absence of an effective risk management systems and the lack of internal supervision allows the fraud to continue for years, causing mammoth damage and billion-dollar fines.

At that point, both the need for more adequate internal control and risk management systems and the need for the latter to be integrated in companies' decision-making processes were evident, and the COSO answered to this need by publishing the 2004 COSO ERM framework, which introduced eight fundamental elements:

1. Internal environment: the organization's culture towards risk.
2. Definition of objectives: the alignment of business objectives with the mission and vision of the organization.
3. Identification of events: recognizing potential events which could influence the firm.
4. Risk evaluation: analysing the impact and probability of identified risks.
5. Risk response: determining how to face risks, for example through acceptance, reduction, sharing or elimination.
6. Control activity: policies and procedure for assuring the effective implementation of risk responses.
7. Information and communication: guaranteeing that relevant risk information is promptly communicated.
8. Monitoring: the ongoing risk management process' supervision, evaluation, and review

The 2017 review, named Enterprise Risk Management – Integrating with Strategy and Performance once again emphasized the previously mentioned integration needs. Moreover, the new framework emphasised the importance of considering risk in the strategy definition process and evaluating how risk could influence business performances.

Improved resilience and adaptation to changes are just two of the many benefits of the adoption of COSO ERM framework, which allow companies to have a clear vision of risks, favouring a tempestive identification, evaluation, and response strategy to risks, therefore reducing the potential negative impact of unexpected events.

Additionally, the balance between risk management and strategic planning is another key benefit of this adoption, providing firms with a clear framework to quantify the potential pros and cons (or benefits and related risks) of initiatives.

Another key advantage is the improvement of internal and external communication of risks. A common language and a shared risk comprehension facilitate collaboration between the various department and levels of the organisation, while the transparent communication with external stakeholders strengthens the trust and credibility of the firm.

The adoption of COSO ERM framework also contributes to the improvement of the corporate governance. An efficient risk management supports the board of directors and management in their supervision role, making sure that risks are managed in line with the organisation's risk appetite and that resource is are efficiently allocated to mitigate the most significant threats.

The implementation of COSO ERM can lead to a competitive advantage. The organisations that proactively manage risks are better positioned for anticipating and responding to market challenges, exploiting opportunities more efficiently with respect to less prepared competitors. This framework represents a fundamental pillar for those organisations which desire to manage risk in a structured an integrated way with their corporate strategy. Its evolution over time reflects the need to face an increasingly complex risk panorama, which moves from financial, sustainability, governance, technological threats.[9]

[9] COSO & WBCSD, Enterprise Risk Management: Applying Enterprise Risk Management to Environmental, Social and Governance-related Risks (COSO-WBCSD joint publication, 2018), 12

The second framework to be analysed is the ISO 9001 international standard for quality management systems, which is aimed at ensuring organizations' products and services are continuously compliant with clients', current norms and standards' requirements, and its numerous revisions reflect its ability of improving and adapting to the ever-evolving market needs.

The International Standardization Organizations first introduced the ISO 9001 in 1987, strongly focused on production processes compliance and documentation, in response to companies' growing standardization needs due to globalization, requiring more structured approaches within trades between different countries which needed to comply to also different qualitative standards.

The main objective was assuring that firms followed well-defined processes to maintain quality, focusing on production control rather than continuous improvement.

In 1994, the rule was subject to the first significant review. The 1994 revision introduced the concept of preventive actions, shifting the focus from a simple final product inspection to the prevention of defects within the production process. Despite this progress, the norm was keeping a strong procedural orientation, requiring vast documentation that, in some case, could be costly for organizations.

A radical change happened with the 2000 revision, which unified the earlier versions in a single standard, adopting an approach based on processes. This conceptual shift encouraged organizations to comprehend and manage interactions between various business processes, promoting continuous improvement and client satisfaction as central elements of the quality management system. The explicit exclusion of the management responsibility underlined the importance of the commitment of top management in guaranteeing the system's efficiency.

A further 2008 revision followed, aiming to allow this standard to be coherent with other internationally recognized management standards.

It was with the 2015 revision that ISO was subject to significant improvements, introducing two main fundamental concepts that revolutionised its effectiveness. Firstly, the implementation of the High-Level Structure strengthened the standard's coherence and integration with other management, a need company had due to the earlier discussed advent of globalized markets. By complying to ISO 9001 standard, companies were able to use uniform standards and be aligned with those of many other countries.

Secondly, the debut of the "risk-based thinking" approach was aimed to make companies include risk in process planning, suggesting a proactive approach to risks, which translates in the management of risks before their happening, differently from the previously common reactive approach.[10]

Another determining cause was the evolution of clients' expectations. With the increase of competition, consumers became more demanding regarding products and services' quality, requiring firms to implement quality systems that consider both regulatory compliance and clients changing expectations' monitoring. A continuous feedback monitoring allows organizations to build loyal client relationships.

There are various benefits emerging from the implementation of this standard, such as the possibility for companies to rely to a structured business processes management approach, able to address challenges and improvement areas, as well as reduce waste and inefficiencies.

This systematic approach leads to more coherence to products' production in the supply of services, reducing the variability and increasing overall quality.

Another advantage is represented by the increase of market competitiveness with respect to non-adopting companies. In the eyes of the market, ISO certifications are perceived as a reliability factor contributing to the improvement of companies' reputation and trustworthiness, especially in highly regulated sectors.

Moreover, the norm predicts for the adoption of training and competencies development programs, contributing to employees' professional growth and creation of a more motivating and productive work environment.

Regulatory compliance is another key aspect of ISO 9001. Certified companies have a higher probability of being compliant with legal and regulatory requirements applicable in their sector. The norm provides a structured framework for monitoring and updating compliances, reducing the risk of sanctions, and guaranteeing a greater legal security. In many cases, firms operating in regulated sectors, such as the pharmaceutical, automobility or the packaging one, find in ISO 9001 a valid tool for demonstrating the compliance to current regulations and obtaining specific sectoral certifications.

[10] N. Astrini, "ISO 9001 and Performance: A Method Review," Total Quality Management & Business Excellence 32, no. 1–2 (2021): 5–32

A particularly relevant aspect of ISO 9001 is its applicability to any type of organizations, independently from the belonging sector or size. Differently from other certifications which pertain to certain industries, ISO 9001 can be implemented by manufacturing firms, service firms, public institutions, and non-profit organizations.
To obtain the certification, organizations must implement and document a quality management system compliant to the norm's requirement, later submitting to an audit conducted by an accredited certifying institution. Once obtained the certification, firms must maintain their compliance through periodical audits and a continuous update of the management system.
Subsequent revisions of the rule reflected the change in quality management paradigms, shifting the attention from mere compliance to processes, to value creation for the organization and its clients. The introduction of concepts such as the organization context, leadership involvement and risk-based thinking made ISO 9001 a yet more strategic tool for modern companies,
In an era in which quality is a distinctive element and a competitive advantage, ISO 9001 continues to represent a fundamental reference point for firm that want to improve their performances, strengthens market's trust and guarantee clients' satisfaction. Its application is not limited to quality management in a strict sense, but embraces the entire organization, contributing to the creation of an environment in which innovation, efficiency and sustainability become integral part of corporate strategy.
With the continuous evolution of the economic and regulatory panorama, it's likely that ISO 9001 will keep updating to respond to new challenges and opportunities. The growing attention toward digitalization, artificial intelligence and sustainability could lead to future norm reviews, with a further integration of innovative tools for quality management systems. Firms able to better adopt and exploit this standard will be best positioned for facing global market complexities and guaranteeing their own long-term success.
The 90's, was an era characterized by the advent of environmental awareness and increasingly strict environmental regulations and in this context, the International Organization for Standardization (ISO), unveiled in 1996 the foundational version of ISO 14001, which had as primary objective guiding organizations in the management of environmental requirements.

In 2015, with the third ISO 14001 version, some fundamental themes were emphasized, such as the role of leadership and of the organizational context.[11]

Organizations get many benefits from the implementation of this standard. Firstly, they lower the risk of sanctions by becoming capable of monitoring and being compliant to current environmental norms and regulations; a related consequence is the improvement of their reputation to the eyes of investors, due to their constant monitoring of environmental compliance factors, which ultimately leads to waste reduction and resource use optimization. Firms adopting this standard would distinguish themselves on the market also in financial terms, therefore gaining a sustainable competitive advantage.

At the base of this framework is the concept of prevention and the abandonment of the reactivity approach, but rather favouring proactivity, consisting of early identification and management of environmental risks, reducing the chances of incidents or legal repercussions.

To ensure organizational resilience, collaboration and involvement, the standard provides for the so-called Plan-Do-Check-Act cycle, envisioning the constant planning, monitoring, and revision of environmental operations.

An integrated management system allows organizations to efficiently face multidimensional challenges and respond in an agile manner to market and regulations changing needs. This is possible thanks to the high compatibility of ISO standards with other recognized standards. This versatility is also demonstrated by the fact that ISO standards allow firm of different kinds, sectors, or sizes to adapt the system according to their own necessities, in fact, entities like small, medium, or large-sized companies and public institutions are currently adopting them globally.

ISO certifications can be considered not mandatory but strategic for any organization, especially in sectors in which relationships with commercial partners, or public procurement contracts (e.g., tenders) are influenced by the possession of recognized standards.

However, the effectiveness of ISO 14001 depends on corporate leadership commitment and on the ability of actively involving employees are in the environmental

[11] M. Ikram et al., "Towards a Sustainable Environment: The Nexus between ISO 14001, Renewable Energy Consumption, Access to Electricity, Agriculture and CO2 Emissions in SAARC Countries," Sustainable Production and Consumption 22 (2020): 218–230

management process. One of the fundamental principles of the norm is the importance of the role of leadership, which should demonstrate a concrete commitment for the implementation of the system and guarantee that environmental policies are in the strategic objectives of the company; without its support, the environmental management system would become only on paper and not in practice.

Companies adopting an environmental culture through training programmes and internal communication systems, therefore enhancing employees' involvement, can obtain better results in terms of environmental impact reduction and compliance improvement.

In an increasingly globalised context, ISO 14001 also favours competitive advantages in commercial relationships. Many firms require their suppliers to be certified for guaranteeing that the whole supply chain operates in compliance with high environmental standards. Thus, certified companies can more easily access to international markets and improve their positioning with respect to competitors not adopting recognised environmental standards.

The British Retail Consortium represents a milestone in the global field of security and food quality, serving as a benchmark model for companies operating in many types of sectors, including food, packaging, logistic. Its fast global expansion denotes its key role in improving transparency and operational efficiency, ensuring regulatory compliance, and acting as a facilitator for reducing food security-related risks.

One of the advantages offered by this standard is its risk-based setting. BRC considers risk as a fundamental factor to constantly monitor within business activities, and constantly identifying, preventing, and mitigating risks, especially in sensitive sectors, reduces the chances of negative impacts on processes, products or even on companies' public image.

Since its first introduction in 1998, the BRC Standard was regularly updated to comply with new market needs and regulatory changes. Every new edition represented a step forward for the improvement of food security and quality management.

With the 2011 Issue 6, attention focused on the necessity of a greater responsibility of corporate management in food security management system. During this phase, a greater emphasis on the importance of a culture of food security within organizations was introduced, promoting training and involvement of employees.

Issue 7, published in 2015, represented a turning point for the product protection, with the introduction of new requirements for contrasting food frauds and guaranteeing a greater security in the supply chain.
Issue 8, released in 2018, brought significant improvements in environmental monitoring systems, protection against contaminations and digitalisation of food security systems. The growing attention to ESG themes (Environmental, Social, Governance) pushed companies to also consider the environmental and social impacts of their operations.
With the last edition, Issue 9, introduced in 2022, the focus furtherly shifted on supply chain transparency, traceability, and resilience, with new measures for guaranteeing a more efficient response to global emergencies and crises.[12]
The adoption of BRC Standard offers benefits that go beyond the simple certification. For many firms, obtaining the certification translates into demonstrating reliability to commercial partners, increasing the chance of expanding their own presence in global markets.
One of the main advantages is the reduction of the risk of product recalls, one of the most costly and harmful problems for the food industry companies. Following BRC protocols helps to prevent errors in the production and distribution, significantly reducing the chances of collecting products from the market for security of non-compliance reasons.
From the operating point of view, the application of the standard improves production efficiency, allowing to optimize processes, reducing waste, and increase the standardization level. This translates into an improvement of the overall quality of products, reinforcing firm reputation and consumer trust.
For producers, another fundamental advantage is the supply chain management improvement. The BRC certification imposes rigorous controls on suppliers, requiring them to respect high standards. This helps firms to build a more secure and resilient supply net, reducing the possibility of interruptions in supplies or problems related to raw materials quality.
From the regulatory compliance point of view, the BRC certifications simplifies the compliance to national and international regulations in food security themes.

[12] British Retail Consortium, *BRC Global Standard for Food Safety (Issue 8)* (London: British Retail Consortium, 2018), 6–25

Many governments recognize BRC standards as equivalent to local regulations, facilitating export procedures and reducing the need of additional audits from health authorities.

An organizational culture based on food security is a main tenet of this standard, which drives companies to fund personnel training programmes, enhancing competencies and employees' involvement, making them feel part of the whole process, creating a cohesive environment and therefore reducing the chances of human errors.

Although the BRC Standard was born for the food sector, during the years the British Retail Consortium has developed variants of the standard for other strategic sectors, including packaging, logistics and retail.

The BRC Packaging Standard, for example, was introduced for guaranteeing that packaging intended to contain food respect security and hygiene criteria. This has become particularly relevant with the growing attention to packaging sustainability, pushing firms to reduce the use of non-recyclable materials and develop innovative solutions for food preservation.

The BRC Storage and Distribution Standard was developed for guaranteeing that food products' security and quality are maintained also along the supply chain, preventing contaminations, deteriorations, and guaranteeing the maximum security for consumers.

The evolution of the BRC standard demonstrates how crucial food quality and security management is, in an increasingly globalised and complex world. From simple tool for regulatory compliance, the BRC has evolved into a strategic element for firms, allowing them to improve efficiency, reduce risks and build trust relationships with clients and stakeholders.

Continuous reviews and the expansion of the standard within new sectors testify its importance and ability to adapt to emerging challenges. Today, the BRC certification is not only a food security guarantee, but a real competitive advantage for firms seeking to position as market leaders, distinguishing themselves for quality, reliability, and innovation.

1.2 TECHNOLOGICAL INNOVATION AND COMPETITIVE ADVANTAGE

A. Definition of Technological Innovation

Technological innovation within a firm represents the introduction and application of new technologies, tools, systems, or processes with the objective of improving products, services, or operational methodologies. This process is not limited to the mere adoption of advanced instruments but implies a deep transformation that can influence every aspect of the organization, from production to human resource management, until market strategies.

The causes that lead companies to adopt new types of technologies could be various, including process optimization, operating costs reduction, efficiency improvement. The pace at which innovative technologies work allows to collect and analyse data, allowing companies to make more informed decisions and improve their general decision-making process more efficiently.[13]

Competitiveness is another key reason: in a continuously evolving market, firms which do not invest in innovation risk to be overcome by competitors offering products or services which are more advanced or in line with clients' expectations[14]. Technological innovation can also open new market opportunities, allowing firms to diversify their own offer and reach earlier unexplored client segments. Technological innovation has a rich and articulated history and hails from the First Industrial Revolution, when the manufacturing sector was profoundly reshaped by the advent of steam machinery, which allowed to reduce costs and increase production capacity. During the tenth century, computerization represented an epochal turning point. The introduction of computers within firms revolutionised information management, allowing for more rapid and precise operations. Between 80s and 90s, with the advent of internet, firms began exploring new communication and trade modalities, giving life to the e-commerce phenomenon, and expanding interaction possibilities with clients.

During last decades, digitalization has played a central role in corporate strategies. Digital technologies favour innovation and help firms to stay competitive in a continuously evolving market. Digital transformation is not only about the adoption of

[13] Hamdouna & Khmelyarchuk, 2025 – Technological Innovations Shaping Sustainable Competitiveness—A Systematic Review, Sustainability, 17(5): 1953

[14] Padilla-Lozano et al., Green innovation and competitiveness: empirical evidence from Ecuadorian manufacturing, Management Research 22, no. 3 (2024)

technological instruments but implies a review of business models and organizational processes. Firms adopting digital strategies are experimenting a 30% faster growth than those which do not[15].

The adoption of new technologies is often guided by the need of improving customer experience. Digital technologies offer clients and final users' new ways of interacting with firms, requiring them to invest in innovative strategies to satisfy market expectations. For example, the use of online platforms and mobile applications allows clients to accede services more rapidly and conveniently, increasing their satisfaction and loyalty.

Sustainability represents an additional push for the adoption of innovative technologies. Sustainability concerns started arising in 90s, requiring technologies to adapt to the global increasing sustainability awareness, and requiring firms to rethink their business models and environmental and social impact, leading to reputation improvements.

Digitalisation of corporate processes became a priority for many organizations. This process implies the adoption of strategies and instruments that allow to automize operations, improve internal and external communication an increase overall efficiency.

Geopolitical events like Covid-19 pandemics are other fundamental innovation drivers. In this regard, being isolated and having to find new ways of working required the implementation of remote working tools and platform, promoting the collaboration of employees along the whole adoption process. This practice is still in use nowadays and providing flexibility to workers, favouring an optimal work-life balance.

One of the challenges of innovative technologies is their continuous updating requirement to keep up with emerging technologies or changes in consumer trends and preferences, reflecting how important it is to constantly invest for companies so as not to be left behind and prosper in an increasingly dynamic context.

Technological innovation is not only a tool for increasing efficiency and competitivity of companies, but also a key element for promoting sustainability. In recent years, many firms started integrating in their development strategies innovative solutions which reduce an environmental impact and improve natural resource management. Sustainable innovation has become a priority not only for those firms which one to be compliant

[15] Redazione EconomyUp, (2024) "Digitalizzazione dei processi aziendali: strumenti, strategie, tecnologie per digitalizzare la propria impresa," EconomyUp

with environmental regulations, but also for those who want to differentiate in the market and respond to the growing expectations of consumers and investors.
One of the areas in which sustainable innovation is having the greater impact is that of circular economy. Traditionally, the dominant production model is the linear one, based on a life cycle based on extraction of resources, production, consume and finally disposal of products. This model led to an uncontrolled consumer of raw materials and an exponential increase of waste. To get back on the right path, companies now prefer approaches based on recycle or reuse, rather than waste, reducing natural resource dependence and contributing to a more sustainable economy.
A concrete example is represented by the packaging industry, in which technological innovation allowed to develop biodegradable and composable packaging, made with renewable and recyclable materials. Such solutions not only reduce environmental impact but also improve the perception of the firm that consumers have, increasingly aware of environmental themes. The adoption of advanced technologies for the recycling of materials allowed the recovery of precious raw materials from industrial waste, transforming what once were considered scraps in new productive resources.

B. Critical Success Factors in the Adoption of New Technologies

A company's ability to compete, prosper and innovate in a continuously evolving market is strongly influenced by new technologies, whose adoption success or failure is affected by a series or factors which must be comprehended to fluidly progress and exploit new technologies' advantages.
New technologies profoundly impact companies' capacity of innovating, prospering, and competing in an ever-evolving market. The success or failure of the adoption of innovation technologies is influenced by various factors, whose comprehension is crucial to fluidly evolve and entirely leverage the benefits fully provided by new adoptions.
Leadership is a critical factor for the success of a new technology, requiring leaders to act in a visionary manner, identifying with clarity the related prospects and obstacles, aiming to align technologies within organizational objectives by integrating it with business processes. A strong and informed leadership can guide the entire organisation

towards change, facing internal resistance is an promoting an innovation-oriented culture.

The work environment should favour flexibility, change openness and continuous knowledge acquisition to favour the success of the technological adoption, and companies should therefore have an accepting attitude towards failure, to constantly learn from mistakes. Conversely, a risk-adverse organizational culture could prevent the innovation to be efficient and the company to grow. Organizations should favour open communication and dialogue, involving every member to understand the potentials of the new technology, therefore increasing engagement. Moreover, creating open feedback channels allows to rapidly face concerns and challenges, favouring a collaborative environment.

A growth-oriented culture is crucial and can be achieved through training programmes investments by the company would favour a more effective employees' mindset towards new technologies, therefore eliminating the stress and frustration related to their inability to use them.[16]

Adjustments to business processes or responsibilities might be needed after the adoption of innovations, and a well-planned change management strategy should be implemented to mitigate potential resistances to change, containing involvement of stakeholders and transparent communication.

Every technology must suit a company's needs, resources and strategy. Thus, is fundamental to understand the importance of accurately selecting the technology, avoiding useless investments. Similarly, to reduce uncertainty and easily identify areas for improvement, companies must identify and define the new technology's details, including its timing, success potential and necessary resources,

Inter functional collaboration is often necessary when new technologies are adopted that influence various departments, to make the technology comprehensible and easier to implement for each department, according to the needs of every organizational function.

Speed is a key word of last decades, due to information circulating continuously and rapidly and companies having to integrate this information within their strategy,

[16] Hamdouna & Khmelyarchuk, Technological Innovations Shaping Sustainable Competitiveness—A Systematic Review, Sustainability 17, no. 5 (2025): 1953

processes, and technological advancements, to keep up with market changes and updates.

Human and financial resources is another fundamental core part of the adoption of new technologies, being these often very costly and therefore requiring companies to check their overall budget related to necessary activities, from implementation, to training, until technical support. New technologies do not only imply implementation costs, especially if it is substantially different from existing technologies.

As previously mentioned, it is relevant for firms to detail plans on the potential objectives and challenges of the technology, and it is equally important to keep controlling and monitoring these factors to understand if the technology provides expected advantages. Companies can do this by collecting feedback from employees who use the technology, gathering information about usability or concrete benefits, and using them to adjust, allowing the organization to express its needs and adapt the technology to them.

The consideration of ethical and social impacts of the technological adoption is becoming more and more relevant for companies' reputations. Organisations must evaluate how new technologies will influence not only the company, but more generally, also society. For example, if a company decides to adopt a technology which will allow it to completely automate a department's processes, it will have to consider the occupational impact this news will have both on the same workers and on markets' perception of this choice.[17]

An in-depth analysis of the regulatory context also through the collaboration with compliance experts must be conducted to ensure new technologies' alignment with current regulatory compliance standards, to avoid potential legal repercussions and damage on reputation.

Stakeholders' involvement in the technological adoption process is essential for guaranteeing an effective and frictionless transition. Organizations must involve all key actors, including employees, suppliers, clients, and partners, for better comprehending their needs, expectations, and concerns. The early involvement of stakeholders helps identifying potential problems before they become significant obstacles and favours a

[17] European Commission (Joint Research Centre), Industrial Innovation for Competitive Sustainability: Science-for-Policy Insights (Brussels: European Commission, 2022), 12

greater acceptability of the new technology. Creating an open dialogue with all interested parties allows to collect precious suggestions for optimizing the implementation and maximize benefits.

The user experience and usability of new technologies are often undervalued but fundamental for the success of their adoption. If a technology is hard to use or requires a too complex in-depth analysis, the chance of resistances from users notably increases. For this reason, companies must select technological innovations that are intuitive and accessible, investing in the interface design and use experience. Usability testing and iterations based on users' feedback can improve the adoption and guarantee that the technology is effectively used as intended.

Technology's scalability is another critical element. Companies must ensure that the adopted technologies can grow with the organization and adapt to future needs without requiring a complete substitution or costly updates. A technological solution that works well on a small scale may not be as effective when the firm grows and expands in new markets. Concerning this, pre-implementation scalability evaluation allows to reduce useless investments.

Compatibility with current systems is one of the biggest obstacles to new technologies' adoption.

Many organizations use complex IT infrastructure, composed of a variety of software and platforms which must function harmoniously. A new technology which does not well integrate with existing systems can generate inefficiencies, delays, and additional costs. For this reason, before adopting a new solution, it is fundamental to verify the compatibility with already in-use instruments and, if necessary, develop gradual migration strategies for minimizing operating interruptions.

Another key factor is the informatic security and data protection. With the increase of informatic threats and privacy regulations, firms must ensure that adopted technologies respect high security standards. This includes the protection against hacker attacks, accesses management and compliance with regulations such as GDPR in Europe. Security must not be a secondary element in the technological adoption but a priority since the first selection and implementation phases of the technology.

Another element which must be considered is the long-term support and maintenance. The adoption of a new technology does not conclude with the initial implementation; to

the contrary, it is a continuous process that requires updates, technical assistance and improvements based on the evolution of corporate needs. Choosing reliable suppliers with a solid reputation in the post-implementation support guarantees that potential problems can be solved rapidly, reducing the risk of inefficiencies and downtimes.
In addition to the already mentioned factors, the financial factor remains the most determinant in evaluating the success of a new technology. Regardless of how innovative, efficient, or promising a technological solution can seem, the true indicator of its effectiveness lies in financial results and its capacity to generate tangible economic value for the firm. Strategic decisions of adoption must be supported by a rigorous analysis of the return on investment (ROI), which represents the key parameter for measuring the relationship between initial costs, obtained benefits and investment recovery time.
Although business leadership can have opinions and intuitions about potential opportunities offered by a new technology, in the end numbers are the sole factors determining the feasibility of the investment. The enthusiasms for an innovative solution must be balanced by a detailed financial evaluation which analyses not only the direct costs of the implementation, but also the potential hidden costs, such as employees training, integration with existing systems, maintenance, and future updates. A technology which on paper appears revolutionary could reveal inefficient or too costly then the concrete benefits it offers, reason why every adoption decision must be supported by a well-structured costs-benefits analysis.
Another crucial aspect is the continuous measurement of economic performance of the technology over time. The initial ROI can provide an estimate of the expected value, but only a constant monitoring of key performance indicators (KPI) allows to verify if the promised benefits are being achieved. Companies must therefore define clear financial metrics for evaluating the improvement of productivity, the reduction of operating costs, the increase of profitability and the potential of growth emerging from the technological adoption. If, after a certain period, the expected yield is not achieved, it is necessary to intervene with strategic corrections, optimizations or, in some extreme cases, the abandonment of the technology to avoid further financial losses.
The financial factor plays an increasingly central role if we consider the impact of the new technology on corporate cash flows. Companies must cautiously evaluate the

financial sustainability of the investment, because the technology could require a massive initial investment. Corporate leaders could have to make hard decisions regarding the allocation of resource if a technology is expected to provide lasting advantages but damages short-term cash flows. Sometimes, a step-by-step adoption of the technology to distribute costs over time and reduce financial destabilization could result in the wisest option.

Ultimately, the success of the adoption of new technologies cannot be evaluated only according to their innovative potential, their usability, or their ability to improve business processes. Without a tangible economic return, any investment in technology risks to become an unsustainable cost for the company. For this reason, final decisions on the adoption of a technology must always be guided by numbers, because, in the end, a financial criterion remains the only true effectiveness indicator of an innovation.

C. Relationship between Innovation, Competitiveness and Sustainability

The interconnection between innovation, competitiveness and sustainability has become a central theme in the current economic and industrial debate and the corporate strategy of the most advanced companies. These three elements, once considered distinct or even overlapping, are now seen as synergic components of an integrated and resilient development models. Innovation was always considered a means to leverage market opportunity and build competitive advantages, increasing their efficiency and providing a variety of products on the market. With the growing recurrence of sustainability concerns and awareness, companies are now required to integrate sustainable practices both within their strategies and innovations, and transforming initial related challenges in growth opportunities, therefore furtherly consolidating their competitive advantage, would be the optimal way to do so. Innovation offers various competitive advantage, including productivity improvement and production cost reductions, essential components for entering in new markets and distinguishing among competitors. Companies are now called to consider both strategically relevant factors, and environmentally related concerns of their moves. This translates in the growingly

popular concept of sustainable innovation, which translates into the integration of sustainability criteria within technological and organizational development processes. [18] A determining factor in this evolution was the evolvement of consumers' preferences. New generations of clients are more careful to the social and environmental impact of the products they buy and consume. Market studies demonstrate that consumers are willing to pay more for goods and services that respect sustainability criteria, favouring firms that adopt responsible practices along the whole value chain. Consequently, innovation can no longer be pursuit exclusively according to productive efficiency or technological performance but must be compensated by a strong attention to ESG aspects.

This phenomenon had a direct impact on corporate competitiveness. The firms which invested in sustainable innovation were able to differentiate, acceding to new market segments and strengthening their reputation. Moreover, they obtained an advantage in terms of regulatory compliance, anticipating environmental regulatory requirements and reducing the risk of commercial sanctions or restrictions. [19]The European Union, for example, introduced the Green Deal, a plan aimed at transforming European economy in a sustainable system, imposing firms increasingly stringent environmental standards. The firms which adopt sustainable innovation strategies are therefore better positioned to face these challenges and catch the opportunities offered by new circular economy models.

One of the fields in which this relationship between innovation, competitiveness and sustainability is more evident is the energy sector. The firms that early invested in renewable energies obtained a significant competitive advantage than those which continued to spend in fossil fuels. The adoption of solar, wind and hydrogen technologies allowed to reduce operating costs, improve energetic efficiency, and get access to government incentives. Moreover, the regulatory push through carbonization

[18] Padilla-Lozano et al., *Green innovation and competitiveness: empirical evidence from Ecuadorian manufacturing,* Management Research 22, no. 3 (2024)

[19] Padilla-Lozano et al., Green innovation and competitiveness: empirical evidence from Ecuadorian manufacturing, Management Research 22, no. 3 (2024): 305; European Commission (Joint Research Centre), Industrial Innovation for Competitive Sustainability: Science-for-Policy Insights (Brussels: European Commission, 2022), 12.

created a favourable environment for those who were able to innovate, penalizing companies which did not adapt their production models to new environmental needs. Companies in the automobile sector were also subject to this transition, and they were called to revolutionise their business models, primarily shifting towards CO2 emissions reduction, to keep up with sustainability innovation concerns. Tesla is an emblematic example of this shift, as well as many other companies that had two possibilities: following this transition smoothly or losing their market positioning.

The same concept applies to many other sectors, including the packaging one. This sector has been highly impacted by the global transition towards sustainability, both from the reputational point of view and from the regulatory compliance point of view, and the firms which were able to innovate through the implementation of production models based on biodegradable, recyclable plastic or even paper packaging solutions, were those facing the least adaptation effort. Innovation in this sector was about both the development of new materials, such as bioplastics, and the improvement of production processes for reducing waste and optimizing the use of resources.

From the strategic point of view, the firms that are able combine innovation and sustainability not only improve their competitiveness but also increase their ability to attract investments. Companies adopting sustainable business and production models are also awarded by investment funds and financial institutions which, due to the importance of the theme, aim to provide the most engaged companies with ESG funds, demonstrating the reputational relevance of integrating innovation with sustainability. Companies, institutions, and stakeholders must work together to catch up with environmental and social complexities and develop efficient solutions. Companies could find it useful to participate to consortia, joint initiatives, or innovation conferences to share best practices and promote common sustainability standards. The role of institutions in this context is fundamental to promote an environment that favours sustainable innovation. The adoption of innovative solutions by firms can be facilitate by fiscal incentives, research and development financings and clearer regulations.

The relationship between innovation, competitiveness and sustainability represents one of the most important challenges for modern firms, but also one of the greater opportunities to guarantee a solid and responsible growth. The adoption of innovative strategies, the integration of sustainability in business models and the ability of

anticipating market tendencies will be determining factors for the success of firms in the following decades. Only the firms capable to balance these three elements in a synergic way will be able to prosper in an increasingly complex and interconnected economy.

1.3 THEORETICAL FRAME

A. Resource-Based View: Risk Management as a Strategic Resource

Resource-Based view is an economic and management theory which became well-known in the end of 20th century and is based on the concept that companies' internal resources are fundamental factors for their competitive advantage within the market. The most successful resources for a company to own are those which present unique characteristics and hard imitability and offer the chance to gain a strategic and distinguishable spot within the market with respect to competitors. This theory completely changed the ways companies envision their key differentiating factors, primarily identifiable in mere external market logics, but then focused on internal strengths, like know-how or unique resources. Jay Barney is the scholar who formalized this theory and according to his visions, firms most able to identify and take advantage of their unique and hard-to-imitate internal resources, will be those able to build and maintain a durable and sustainable competitive advantage. At the base of RBV there is the idea that corporate success does not exclusively depend on external environment, but on internal resources and capacities of companies[20]. In this sense, the RBV is opposed to traditional corporate strategy models, such as the five forces analysis by Porter, which emphasizes the importance of external competition. Resource-Based view identifies various types of resources, including physical resources (e.g., infrastructure, technologies, plants, machinery), human resource (e.g., know-how, experience, competencies), financial resources (e.g., investments, capital), organizational resources (e.g., processes, management systems, corporate culture) and finally intangible resources (e.g., patents, client relationships, trademarks, corporate image and reputation). What is important to understand about resources is that each of them can

[20] Barney, J. (1991). "*Firm Resources and Sustained Competitive Advantage." Journal of Management*, 99-120

have a different influence on competitive advantage, therefore requiring to understand the five fundamental VRIN Resource-Based view criteria:

- Valuable: the resource must provide additional value to the company, improving efficiency or operating effectiveness.
- Rare: the resource must be scarce or not easily available between competitors.
- Imperfectly Imitable: it should not be easily replicable or copyable by other firms.
- Non-substitutable: there should not exist and alternative resource that could effectively substitute.

A practical example could be Google's research algorithm. This algorithm is a precious resource (it improves the effectiveness of online research), rare (it is developed internally and not available for competitors), difficult to imitate (it is protected by industrial secrets and technical complexity), and non-substitutable (there is not alternative that offers the same level of performance).

Applying the RBV to the Risk Management context, we can consider the latter not just as an operating function, but also like a strategic resource able to contribute to the firm's competitive advantage. An effective risk management system can satisfy VRIN criteria in many ways:

- Value: it protects the company from potential financial, legal, or reputational losses, improving operating efficiency and long-term stability.
- Rarity: non all firms possess a developed risk culture or advanced risk management systems. A firm that invests in these areas can distinguish itself among other competitors.
- Imitability: effective risk management often derives from a unique combination of processes, competencies, and corporate culture, making it difficult for competitors to exactly replicate the same approach.
- Non-substitutability: there are no valid alternatives to risk management that can guarantee the same level of business protection and resilience.

To transform risk management in a strategic resource according to RBV, firms should adopt a proactive and integrated approach, making risk management a key element of their competitiveness. This process starts with internal competencies, through training and specialization of personnel in risk management. Creating resolute teams with a deep

knowledge of the sector and business specificities allows to face threats with a greater effectiveness and turn them into opportunities.
Additionally, companies' decision-making processes must be well compensated by an accurate risk analysis related to the potential opportunities and threats brough by specific decisions. In this way, companies would be more able to rapidly react and mitigate unexpected events. On this matter, an effective risk-based corporate culture is once again vital for the success of this integration, allowing every member of the organization to communicate inefficiencies openly and promptly, for the improvement of the human and corporate well-being of the company. Constant intra-departmental risk update is essential to obtain up-to-date views of current risks. By effectively tailoring this process to its own needs, a company would create a hardly imitable approach, therefore distinguishing itself from competitors on the market and building not only a sustainable competitive advantage, but also greater innovating abilities, resilience, and agility.

B. Knowledge-Based View: Risk Management's role in Knowledge Management

Knowledge based view (KBV) represents an important theoretical perspective in the strategic management field, focused on the leading role of knowledge as fundamental resource for companies. This vision develops as an extension of resource-based view, which considers internal resources of companies as determinant for competitive advantage. However, KBV puts a particular emphasis on knowledge, described as the strategic resource par excellence, difficult to imitate and transfer, therefore capable of guaranteeing a sustainable competitive advantage.
According to KBV, knowledge is incorporated and transmitted through various elements within the organization, including corporate culture, policies, operational routines, documents, information systems and, above all, employees. This perspective suggests that the ability of a company to effectively generate, share and apply knowledge is fundamental for its success and competitivity in the market.
Knowledge Management (KM), thus, becomes crucial in the KBV field. KM is made-up of the mix of strategies and processes adopted by an organization for identifying, capturing, developing, sharing, and using knowledge in an efficient way. The objective

is to improve business performances, promote innovation and maintain a competitive advantage.

KBV distinguishes several types of knowledge, including explicit knowledge and tacit knowledge. Explicit knowledge is the one that can be easily codified, documented, and transferred, like manuals, procedures, and data. Tacit knowledge, On the contrary, is personal, contextual, and often difficult to formalize, like competencies and individual experiences. The effective treatment of both forms of knowledge is essential for organizational success.

Risk management in knowledge management implies the identification of the risks associated to loss, improper use, or non-authorized access to the critical knowledge of the organization and the implementation of strategies to mitigate such risks.

One of the fundamental aspects of risk management in knowledge management is the protection of critical knowledge. Knowledge is a human resource and a loss of employees with such know-how and competencies would represent a significant risk for any organization, therefore requiring identifying which mastery factors are the most critical for the organizations and constantly protecting them from key employees' losses or technological obsolescence. To mitigate this risk, companies can implement mentorship programs, document key processes, and promote and knowledge sharing culture.

Another critical aspect is the integrity and accuracy of knowledge. The diffusion of wrongful or obsolete information can lead to wrong decisions and compromise the corporate operations. Risk management is based on the implementation of processes for guaranteeing that knowledge is updated, accurate and verifiable. This could include periodical reviews of content, validation of sources and continues personnel training.

Knowledge availability is another key element. Knowledge must be accessible to those that need it, whenever they need it. Risk management is concerned with verifying and guaranteeing that there are systems and processes for the efficient storage, retrieval, and distribution of knowledge. The implementation of knowledge management systems, such as corporate intranet, shared database, and collaborative platforms, can facilitate the access and the sharing of information.

C. Dynamic Capabilities Theory: Risk Management as a Dynamic Capability to Face Uncertainties

Dynamic capabilities theory, formalized by Teece, Pisano and Shuen in 1997, revolutionized the concept of competitive advantage development and maintenance, especially in changing and uncertain environments. This theory sees internal and external competencies as central, and requires companies to integrate, reconfigure and build them to cope with variable contexts. Firms must therefore adopt a transforming and adapting strategy to effectively respond to outside mutations.

Essentially, dynamic capabilities are those competencies that allow the firm to modify its resource as operational routines to effectively respond to environmental challenges. As suggested by this theory, three main activities define dynamic capabilities: firstly, sensing consists in the capacity of recognizing potential threats and opportunities by promptly catching outside market and environment's signal; secondly, seizing is about taking advantage of identified potentials by transferring resources and competencies, having more chances of diversifying products and services and serve a larger market portion; thirdly, reconfiguring involves being able to modify and adapt a company's competencies and resources to keep up with new market circumstances. By proactively operating according to these activities, companies would be able to anticipate changes and prepare, allowing to keep up with latest trends and maintain their competitive positioning in uncertain and changing environments.

A company that values dynamic capabilities is able to continuously reconfigure corporate practices and respond to new external information. An emblematic example is the Covid-10 pandemics, an unexpected event that gave companies two chances: rely on their traditional business models or reinvent themselves, whereas the second option surely guaranteed a smoother transition, survival, and success. This does not mean that failures do not represent growth opportunities for organizations; instead, this theory enhances a continuous learning approach, which sees failure as one of the key teachings from which to draw lessons. This continuous feedback loop feeds innovation, allowing the firm to develop creative solutions for facing uncertainties and exploiting new opportunities.

For risk management to function as a dynamic capability, it has to be integrated in the organizational culture. This means that all the members of the organizations,

independently from their role, should be aware of the risks and participate actively to their management. This shared culture facilitates a response which is fast and coordinated to uncertainties.

In the global environment, uncertainties often transcend organizational borders. Firms with dynamic capabilities establish collaboration Nets with other organizations, institutions, and stakeholders, sharing information and resources to face together usual challenges.

The dynamic capabilities theory offers a lens through which organizations can comprehend and develop the necessary competencies to navigate in a world characterized by uncertainties and fast changes. Considering risk management not only as an operating function, but also as an integrated dynamic capability, allows organizations to anticipate, adapt and innovate while facing challenges, guaranteeing a sustainable competitive position over time.

D. Contingency Theory: Risk Management' s Effectiveness according to the Business Context

Contingency theory represents a fundamental approach in the study of organizations and corporate management, arguing that there does not exist and only optimal way for managing an organization; to the contrary, the effectiveness of managerial practices strictly depends on the specific context in which the organization operates. This approach is opposed to traditional regulatory theories which propose universal management principles applicable to all organizations, independently from circumstances.

Contingency theory emerged in the 60s as a response to the limitations of earlier organizational theories, which often proposed rigid and universal models. Scholars like Joan Woodward, Paul Laurence, and Jay Lorsch, highlighted how contingent variables, like used technologies, external environment, organizational dimension and adopted strategy, influence in a significant way the structure and the most appropriate management practices for an organization.

One of the cardinal principles of contingency theory is that organization must adapt their structures and processes to specific conditions of their environment in order to reach effectiveness. For example, in environments characterized by high uncertainty and

fast change, flexible and decentralized organizational structures can result in more effectiveness then rigid and centralized structures.

The effectiveness of the risk management practices strongly depends on the organization's specific context. The characteristics of the sector in which the organization operates influence the type and the entity of the faced risks. For example, a manufacturing firm could focus more on work safety and supply chain management, while a technological firm could focus on information security and protection of intellectual property.

Large organizations often own wider resources to implement complex risk management systems, while small or medium sized firms could adopt more informal approaches, or more focused on specific risks.

In organizations with decentralized structures, risk management could be delegated at operating unities levels, requiring a greater coordination for guaranteeing coherence in risk management practices.

Norms and regulations are another contingent factor that influences the way an organization manages risk. Sectors like the financial, pharmaceutical or communication ones, are highly regulated and require more structured and formalized risk management strategies. A banking institution, for example, has to respect strict regulations in the subject of capital adequacy or credit risk, while a company in the tourism sector could have less stringent compliance requirements.

The contingent approach to Risk Management also implies that risk management cannot be considered as an activity separate from corporate strategy. On the contrary, risk management must be integrated in decision-making processes and strategic planning.

Contingency theory offers a lens through which we could comprehend that there does not exist a universal approach to Risk Management applicable to all organizations. To the contrary, the effectiveness of Risk Management depends on the alignment of management practices with the specificities of the context in which the organization operates. This implies a careful evaluation of all contingent variables and a flexible adaptation of the risk management strategies for effectively facing the unique challenges of every organization.

E. Activity-Based View: Risk Management as a value-generating Activity

Activity-Based View is a corporate strategy approach that sees organizational activities as central for value creation, competitiveness, and profitability. In contrast with other resources competencies-focused perspectives, this method relies on in-depth analyses of business operations, to identify elements that provide companies' products or services with additional value, allowing them to eliminate inefficiencies and useless costs and aiming for business processes optimization, favouring essential activities over low-value ones. At the base of this theory is the Activity-Based Costing accounting method, which assign costs to identified activities, detailing more accurately where a company's costs are allocated, and spotting improvement areas and inefficiencies. In this regard, Risk Management would act as an essential facilitator for value creation for any organization, by pointing the main risk factors or improvement opportunities related to activities and suggesting optimal and efficient resource allocation logics. An important value-adding practice within the organization is employee's involvement and communication regarding potential risks, increasing their engagements in the process and promoting innovative solutions to existing problems or efficiencies.
By integrating Activity-Based View with Risk Management practices, business processes could be improved and, consequentially, companies' competitiveness, sustainable long-term success and profitability would be enhanced.

F. Stakeholder Theory: the role of Risk Management in Corporate Sustainability

Stakeholder theory is a business management theory that sees the sustainability and success of firms as strongly influenced by various subjects. Conventional perspectives consider shareholders as key parties of an organizations, while stakeholder theory includes many others sets of participants as impacting or impacted parties of organizational activities' success. The first traces of the term "stakeholder" date back to 1963 when, in Stanford Research Institute briefing, stakeholders were defined as "groups without whose support the organization would cease to exist". Despite this, "Strategic Management: A Stakeholder Approach" by R. Edward Freeman was the first work that introduced the actual well-known stakeholder theory. This concept argues that interest groups are not solely composed of shareholders, but also of actors like

governments, clients, employees, suppliers. This theory defines the firm as a set of interactions between these fundamental actors and the firm itself, and these connections are at the base of the value creation and achievement of business objectives.
These objectives must be pursued by effectively balancing the interests of the various parties, trying to not neglect portions of them to prevent firms' images, sustainability, and financial performance.
This model is based on three separate but linked approaches. The descriptive approach, examining behaviours, organizational structures, and decision-making processes, analyses how organizations proficiently manage stakeholder relationships. The instrumental approach studies how stakeholders and the attainment of business goals, like sustainable growth and profitability, are interrelated. The third approach, named regulatory approach, provides companies with ethical and moral standards useful for managing stakeholder relationships according to equity and justice principles.
Stakeholder relationships also influence companies' commitment towards corporate social responsibility, corporate sustainability, and corporate governance concerns.
Organizations, also by relying on Risk Management practices, must operate ethically and responsibly toward the society, the environment, and stakeholder's interests considering the impact of their actions. Risks could be of legal, reputational, operating, financial or environmental typology. A neglect of even one of these risks could challenge the firm's long-term sustainability and lead to legal sanctions and decrease of consumer trust. It is evident how valuable is the strategic approach offered by Risk Management in this context, allowing companies to assign and value the various expectations of the many interest parties, avoiding neglecting their expectations and consequentially promoting a trust and open communication environment among the organization, therefore reducing the probability of misunderstandings. For a company to become advanced and innovative it is essential to involve stakeholders in daily decisions, improving transparency and reliability of the organization.

1.5 STATE OF THE ART AND LIMITATIONS OF PREVIOUS STUDIES

Current risk management, innovation and sustainability theories present both developments and gaps. The recent growing interest for these topics reflects the evolution of the concept of risk management: a no longer mere mitigation instrument, but a strategic value creation facilitator. Nevertheless, recent studies usually separately treat these themes, rather than integrating them, requiring deeper analyses regarding the potentialities and challenges related to their combination.

The role of risk as catalyst of innovation, earlier considered as a sole identification, evaluation, and mitigation tool, has only emerged more recently in the academic literature. Some studies and effective risk management allow companies to make more informed decisions, increasing their capacity of exploring new market strategies and technologies without incurring in excessive exposure. Approaches like the risk-based decision making were proposed for integrating risk management in strategic decision-making processes, suggesting that the adoption of advanced enterprise key risk management practises can favour the development of more resilient and sustainable innovations.

From the innovation point of view, the dynamic capabilities theory highlighted how important it is for firms to develop flexible competencies that allow them to adapt to the changes of the competitive context. However, the relationship between dynamic capabilities and risk management is still not very thorough, and there is a lack of analytical models able to quantify the value of risk management for the innovative capacity of firms.

Some authors, like Chesbrough (2003) and O'Connor and Rice (2013), suggested that risk, if strategically managed, can act as incentive for the adoption of emergent technologies and the rethinking of business models, especially in contexts characterized by high regulatory and technological uncertainty. However, there is still a lack of longitudinal studies that can empirically demonstrate how risk management strategies influence innovation paths on the long-term.

In parallel, the growing interest for sustainability led to an expansion of environmental, social and governance (ESG) risk management literature. Companies are increasingly asked to integrate ESG criteria in decision-making processes, and some studies (Eccles et al., 2014; Freeman & Reed, 1983) suggested that the adoption of a structured

approach to risk could facilitate this transition. Particularly, the adoption of ESG risk management practises is often associated to a greater corporate resilience and a reduction of the exposure to reputational and regulatory risks. However, the literature still presents significant methodological gaps: despite the availability of various risk management framework for sustainability, there is a lack of currents in their application between different sectors and economic contexts. Moreover, most of the studies focuses on the short-term impact of ESG strategies, neglecting the long-term implications of sustainable risk management.

Another significant limitation of current literature is about the fragmentation of theoretical perspectives. Many studies analyse the risk management, innovation, and sustainability as distinct fields, without considering in an integrated way the interconnections between these elements. This leads to a compartmentalised approach which reduces the possibility to identify synergies and trade-offs between risk management, technological development, and sustainability strategies. Also, in the cases in which literature faces the integration of these fields, the proposed models tend to have a stronger regulatory tendency, providing general guidelines without delving into the operating mechanisms that regulate such interactions.

Another criticality is about the scarcity of robust empirical evidence that confirm the relationship between risk management and sustainable innovation. Although some case studies documented examples of companies that use the risk management as leverage for innovation and sustainability, there is a lack of wide scale systematic analysis that can validate these results. The difficulty in collecting reliable quantitative data on how risk management influences the adoption of gnu technologies and sustainable practises represents one of the main barriers to the building of and more solid and generable theory.

In light of these considerations, some future research directions emerge that could contribute to field the gaps of current literature. Firstly, it would be useful to develop more integrated theoretical models that consider simultaneously the role of risk management in innovation and sustainability, avoiding too treated these elements as a separate field. Secondly, there is the necessity to conduce longer term empirical studies that can provide more concrete evidence on the effects of risk management on innovation capacity and sustainability of firms. Their research should also delve into the

organisational and cultural barriers of the integration of risk management with the innovation and sustainability, identifying effective strategies for overcoming internal resistances and promoting a structural change in corporate practices.

Although current literature may the significant progress is in the exploration of the role of risk management, many open points remain that necessitate further study. The main challenge is to overcome the conceptual and methodological fragmentation, developing more integrated approaches based on solid empirical evidence. Only through a greater cohesion between the different theoretical perspectives and a wider base of empirical data it will be possible to build a completer and more operative framework on risk management as a strategic factor for innovation and corporate sustainability.

Chapter II

2. RESEARCH DESIGN

A. Research Strategy

The adopted research strategy aims to understand how the chosen Case Study operates along their various business units, how these are coordinated and how the top leadership, with its visionary approach, is able to guide subordinated functions towards success. The benefits and challenges of risk management and its integration with sustainability and innovation principles are also discussed, by analysing these principles under numerous point of views of employees from various levels of the organizations, used as primary methodological tools. Interviewing employees and top leadership served not only as an information tool, but also as a means to effectively catch participants' view of the firm and of its progress over time, therefore establishing direct, and in-person, contacts with them. Interviews crossed many business functions, specifically 9, from CEO to CFO, from Quality Manager to Legal and Compliance Manager, and many others. The aim was to understand the impact of modern technologies, in terms of risks and opportunities, and how they balance these aspects through aimed approached and standards. Interviewing many figures allowed to get a deeper knowledge of the business object of the study, therefore reinforcing the validity of the study. Cartonpack S.p.A. was the chosen case study, a company belonging to the packaging sector, which allowed the author to both know more about this context and how participants keep up with changing regulations and market trends.
This decision was taken to enhance the role of the packaging industry and their understanding about the main aspects of the research, including the importance of risk management, their view on ever-recurring sustainability topics, and the importance of continuously innovating.

B. Sampling

My research is based on the challenges and opportunities brought by the adoption of risk management frameworks for innovation and sustainability reasons. The selected sector is the packaging sector, and the reasons for this choice are various. Firstly, the packaging sector is one of the most looked at nowadays, due to sustainability concerns, and this led these companies to take these issues more seriously and become risk-

averse, therefore adopting Risk Management facilitators such as ISO certifications, COSO ERM framework or BRC standards. These regulations, although not mandatory, allow companies to neglect no relevant aspect, avoiding legal repercussions. Secondly, in recent years regulations for this sector became increasingly more stringent, as well-as companies' cohesion through consortia, committees, to face these challenges together. I had the chance to learn more about regulations and rules of this industry within the development of the research, and about how crucial it is to become innovative in this context, especially in the eyes of the outside environment. The methodology used for this research implies in-depth interviews with employees from the organization, performing different role and responsibilities. This aims as ensuring reliable and effective results. Choosing to interview people with different roles allowed to understand the impact of the used risk management, innovation and sustainability methods along the different levels of the organization. Also, interviews are structured following similar but interconnected questions shaped for having different point off views, allowing to cross the paths of the many interviewed people. Furthermore, one company was purposely chosen, whose detailed description will be provided in the following pages.

C. Recruitment

The early selection of personnel to be interviewed was conducted according to relevance criteria, after identifying the main areas of research. The effective selection criteria were essential for the research, and consisted in the communication with the company CEO, who was open and available for the planning and interviews. His contribution was truly meaningful and valuable, helping me to coordinate all the interviews and allowing me to conduct them in presence, reserving a special room for me in which to conduct them. His help was crucial for the proper identification of the key people to include. As a result, he provided me with the names and surnames corresponding to the main roles I identified and communicated him. He then forwarded each of them the research design I had previously sent him in order for them to have a general overview and understanding of my project and its objectives. I managed to get nine interviews with the following nine different company figures: CEO, CFO, Operational Director, Production Manager, Quality Manager, Sustainability Manager,

Legal and Compliance Manager, Logistics & Supply Chain Manager, R&D Manager. The selection criterion used was basically selecting company figures with a relatively long work duration, for having a deeper understanding of the evolution of the main research topics within the selected company, and the employees' related points of view. This technique aimed at guaranteeing that all interviewees were well-aware of the company's structure and developments. The choice to interview figures belonging to totally different departments was aimed at investigating how unexpected events affect the various job responsibilities and how these interact with each other. In this way, I managed to interview not only the top leadership or financial direction, which is somehow the function that puts correction measures into practice, but also subordinated functions, designated at the constant monitoring and identification of potential risks which could negatively impact business routines or potential opportunities to catch. In the end, I reached a heterogeneous and targeted sample of 9 participants from the chosen company, both women and men, who voluntarily answered to my questions with a more than satisfactory degree of commitment. *(See Table 1 for details)*

Table 1

Interviewees	Gender	Years of Experience	Job Role
A1	M	25	Chief Executive Officer
A2	M	8	Chief Financial Officer
A3	M	10	Chief Operating Officer
A4	M	20	Quality Manager
A5	F	15	Sustainability Manager
A6	F	18	Logistics & Supply Chain Manager
A7	M	10	Production Manager
A8	M	10	Legal and Compliance Manager
A9	M	11	R&D Manager

2.1 CASE STUDY: SELECTION AND CONTEXT

A. Company Description and Key Differentiatiors: Cartonpack S.p.A.

Cartonpack S.p.A. was founded in 1970 by the Leone family in Rutigliano, in the Bari province, and started its business as a small company primarily concentrated on packaging solutions for fruit and vegetables market. Over the years, evolution had been the main objective of the company, becoming leader in multi-material applications and advanced production processes like flexible packaging and paper transforming. This constant push towards innovation and progress made Cartonpack become a completely integrated Group, today recognized as the main European leader in the food packaging industry.

Its productive and logistic infrastructure crosses 120.000 square meters, and the company serves more than three thousand clients across fifty countries, operating at an international level, with a particularly relevant presence in strategic markets like Germany, France and United Kingdom. Its structure was subject to a first acquisition in 2018, and a second one in 2022, allowing the company to enhance its transition from local company to cohesive group, integrating various technical competencies and productive capacities, therefore offering complete and tailored solutions for the evolving food industry needs.

Cartonpack's key differentiatior lies in its client-centered approach, high operative flexibility and sustainability commitment. The usage of advanced technologies and recycled and recyclable materials allows the company to balance innovation and ecologic responsibility, qualifying as trust partners for European and foreign clients seeking efficient and sustainable packaging solutions.

Cartonpack relently focuses on innovation and investments in research and development of new technologies, aiming to constantly improve the quality and sustainability of its products.

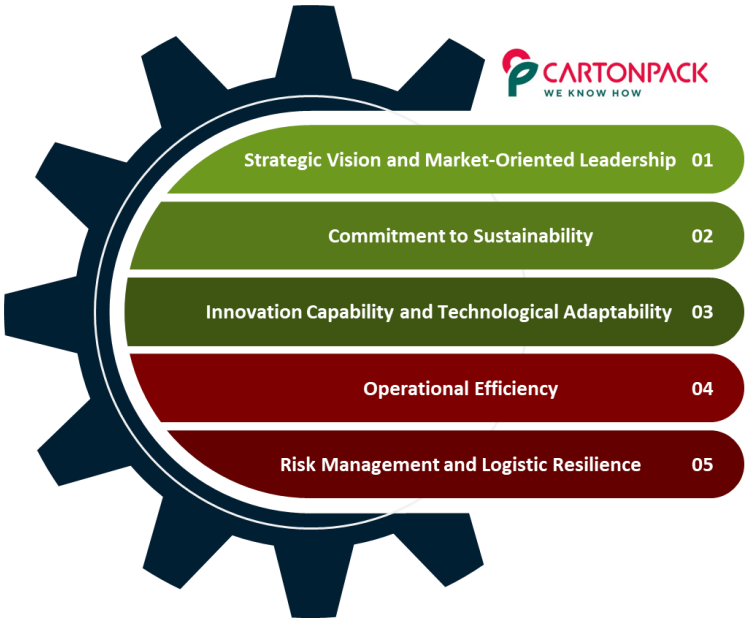
The company is directly connected to its own clients and ready to develop packaging solutions that respond to specific conservation and presentation food products needs. Cartonpack leadership guides the organizations to strongly believe that rapidly adapting to market needs leads to solid and durable relationships with important companies belonging to the food sector. The implementation of sustainable production processes

and quality certifications are essential components of corporate strategy: each step of the production process is constantly tested and verified, ensuring packaging's compliance to highest hygiene and security standards. This allows to improve clients' and final consumers' perception of Cartonpack's reliability.
Environmental sustainability commitment is not limited to quality certifications or tests, but also extends to intensive R&D investments aimed at finding new biodegradable and compostable materials for the reduction of environmental impact along the whole production cycle, therefore highlighting the role of circular economy within the organization. Cartonpack's evolution was marked by a strong visionary leadership, able to predict market trends, and therefore anticipating market requests regarding environmental issues. This has and continues distinguishing Cartonpack among competitors on the market.

B. Cartonpack's Key Success and Growth Factors

Cartonpack was subject to an exponential growth in recent decades, transitioning from local producer to international leader in the packaging sector, due to a well-structured strategy put in action by many corporate departments.
Its strategic vision was certainly one of most valuable constituents. Cartonpack's CEO, Gianni Leone emphasizes the importance of a market-centered decision-making process, aimed at foreseeing clients' expectations and standing out from competitors. The company's well-defined differentiation strategy, composed of investments in many packaging solutions, allowed to be perceived as a key player within the market. Cartonpack provides the market with plenty of multi-material solutions, composed of compostable materials, paper, plastic and cardboard; this facilitated a rapid adaptation to sustainability regulations and market transitions.
This growth was fundamentally coordinated by corporate leadership. Gianni Leone believes that one of companies' core principles, or maybe the most important one, is the ability to interpret the market and anticipate its changes. This principle was determinant for Cartonpack's successful growth, which happened thanks to an in-depth strategic analysis, a careful evaluation of risks and constant commitment towards innovation. Marco Gabriele, Cartonpack's Chief Operating Officer, considers digitalization and automation two fundamental contributors to the company's success. This can be

translated in the adoption of ISO 9001 and ISO 14001, establishing order in corporate management, and avoiding major risks, such as excessive waste or errors within the production process. New standards and technologies allowed processes and quality's continuous monitoring, and systems like the MES (Manufacturing Execution System) for a greater control on materials and production operations' traceability and efficiency.
As underlined by Alessandra Curci, Cartonpack's Sustainability Manager, sustainability is one of the core foundations of the company's growth, translated in continuous investments in eco-friendly materials aiming for environmental impact reduction. Curci exemplified the company's environmental commitment through the collaboration with Plastic Bank, a for-profit social enterprise that builds recycling ecosystems in under-developed communities. Cartonpack' s role in this collaboration lies in the usage of plastic coming from social collections in its own packaging solutions, therefore demonstrating its pledge to environmental sustainability and social initiatives.
Unexpected Global events like geopolitical crises and Covid-19 pandemics generally put companies' logistic and supply management systems to the test, and to avoid any undesired surprises, Cartonpack diversified its supply sources and adopted advanced technologies both for transport monitoring and materials traceability improvement. In this way, potential business interruption would have a minimal impact on the firm, therefore ensuring greater operational resilience.
Some key points summarize the main success drivers of Cartonpack:



2.2 DATA COLLECTION

A. Data Collection Techniques and Interview Protocol

I conducted nine interviews with employees belonging to different organizational tiers. Every interview was performed in presence at the headquarters of the company, in Italian, due to all employees being Italian, and subsequently translated into English. The interviews lasted between 20 to 35 minutes, with an average of 30 minutes, for a total interview time of about 2.70 hours. The data collection for this academic study was ceased when data saturation was attained. The respondents were questioned about the ways by which the company identifies innovation opportunities basing on efficiency, security and sustainability, Cartonpack's environmental commitment and usage of sustainable materials, environmental and quality standards and certifications, strategies for facing compliance and technological uncertainties to remain compliant with regulations, their supply chain management, how they balance investments with the minimization of risks and optimizations of production and supply costs, the importance of a visionary and proactive leadership that aims at internationalization, continuous improvement and market trends' anticipation, the importance of risk management in daily and long-term routines.

Prior to conducting the actual interviews on the scheduled dates, all interviewees were mailed the questions they would have been asked, to familiarize them with the research team and main subjects to be discussed.

There were used two main topic guides, one regarding the management of innovation and sustainability in the packaging sector, and one about risk, supply chain and business performance management, for every interviewee. Furthermore, I asked participants whether they thought it was useful to provide me with samples or papers to enrich their answers. Secondly, I explained to every participant both that they had the right to revoke their participation in any moment and that they had the right to decline to respond. Moreover, participants had the possibility to know about the study's objective and request information. I also asked participant if recording their interviews would have represented a problem for them. Interviewees were also aware of the fact that their responses would have been analyzed based on the research objectives. These clear statements, along with secrecy of responses, guaranteed an ethical methodology.

Anonymity, pledges and confidentiality were key principles adopted in the management of these interviews.

B. Data Analysis and Theoretical Saturation

Interviews were analyzed according to the Gioia Methodology[21], a widely used qualitative methodology that allows to develop theories according to collected data, in this case interviews, therefore enhancing interviewees' opinions. This methodology is rigorously composed of three main steps: first order concepts identification, categorization in second order topics and, finally, final summary in aggregate dimensions. This technique allows to coherently analyze data and clearly interpret collected information.

As primary action, I collected and codified interviews' information, firstly by completely transcribing the answers of each participant. Each interview is carefully analyzed with the aim of identifying key elements emerging from the various interviews, avoiding out of scope information, therefore maintaining integrity of contributions, and allowing for a transparent representation of interviewees' different perceptions and experiences. Information is extracted in a structured way due to transcripts' segmentation based on meaning units, allowing for an easier following categorization.

Subsequently, first-order concepts are extracted from transcribed and codified interviews, allowing for the identification of the main key concepts emerging from interviews. These concepts are not interpreted or modified, to facilitate the most objective and coherent analysis: these are empirical notions that directly derive from each participant's answer, and they are reported in transcripts in the form of a citation. For example, Sustainability Manager's statement "we largely invested in compostable materials" was codified as "investments in sustainable materials" followingly aggregated under the theme of "sustainability within production processes".

This second phase aims to assess which are the most recurring topics and concepts explicated by interviewees.

The third phase, differently from the second one, requires an interpretative process for grouping first-order concepts in second-order themes. Here, by identifying similar

[21] Gioia et al.'s methodology (Gioia, Corley & Hamilton, 2012)

concepts and aggregating them in wider categories, it is possible to synthetize the main points emerging from interviews. By shifting from specific ideas to more general themes, it is possible to emphasize recurrent patterns and draw connections between interviewees' various and different point of views and experiences.

The final step of this technology is about offering a wider perspective of discussed themes. This is reached by synthetizing second-order topics in aggregate dimensions, therefore determining the main thematic domains arising from interviews. These aggregate dimensions allow to comprehend the general frame of the research, and transform individual contributions of interviewees into more general theory, allowing for an easier and smoother data interpretation and application into practical contexts.

Gioia Methodology[22] finalizes the representation of data through a table, in which every first-order concept is related to a second-order theme, finally associated an aggregate dimension, therefore visualizing the complete logical progression of the analysis. (*See Table 2 for detail*)

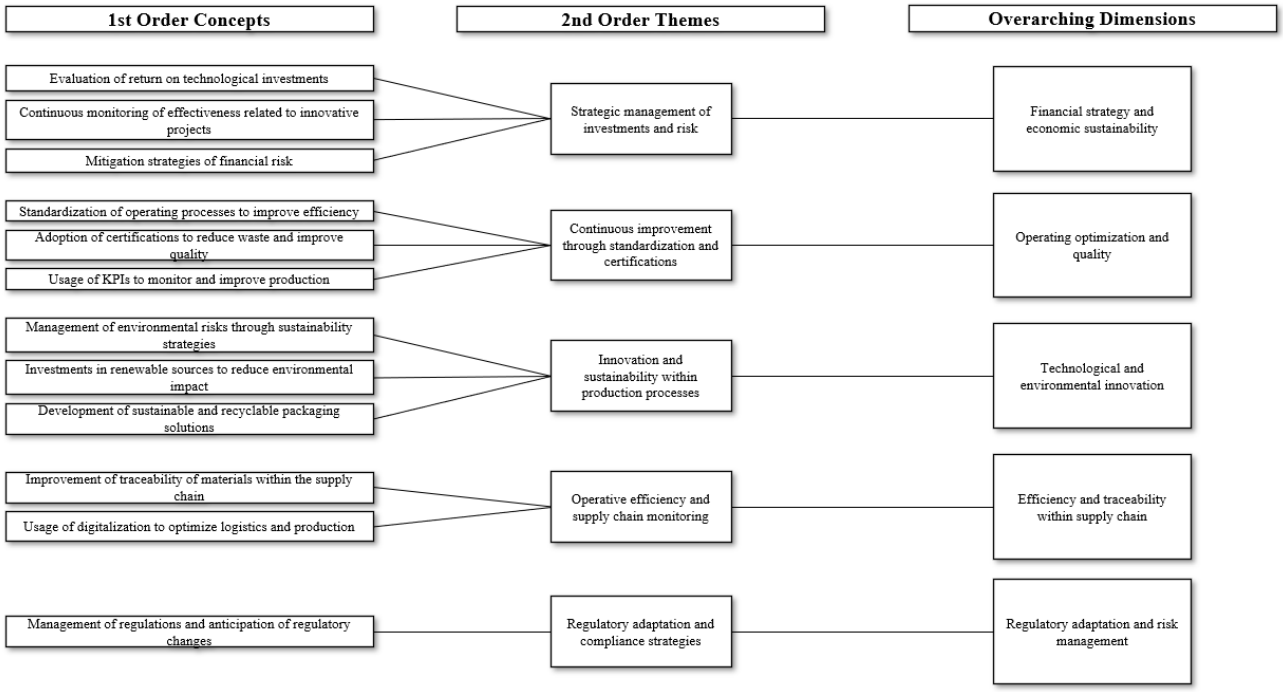
Gioia Methodology[23] is a key tool useful for rigorously and systematically structuring interviews analysis, identifying emerging data patterns. The structured and schematical representation of data allowed to clarify traceability of the analytical process as well as the interpretation and accessibility of concepts. The company's organizational dynamics appear to be more comprehensible, due to results' solidity, coherence, and transparency.

A theoretical saturation criterion was adopted within the qualitative analysis to assess when further interviews would not have represented an added value and benefit for the research. Recurrence and coherence of emerging concepts were fundamental principles for the evaluation of saturation, analyzing interviews and checking if there were new firs-order concepts or second-order themes to be included. Once interviews began generating already met themes and no new insights resulted from interviews, the theoretical saturation point was achieved. Every interview initially allowed the conceptual structure to be expanded, but at a certain point the emerged categories were considered valid and sufficient. Specifically, theoretical saturation was considered reached after the ninth interview, when emerged topics were recurring, and no new

[22] Gioia et al.'s methodology (Gioia, Corley & Hamilton, 2012)
[23] Gioia et al.'s methodology (Gioia, Corley & Hamilton, 2012)

concept emerged in the following two interviews. This emphasized the validity of the emerged model and justified the halt in the inclusion of further interviews.
The strategic management of investments and risks is strictly connected to Resource-Based View (Barney, 1991), because it allows to understand the importance of evaluation and risk management capacity as key internal resource, which is difficult to imitate, therefore enabling the company to maintain a sustainable competitive advantage. This approach also reflects the concepts expressed by the Dynamic Capabilities Theory (Teece et al., 1997) according to which, companies' survival in changing and uncertain contexts depends on their capacity to reconfigure their resources. Continuous improvement through standardization and certifications second order theme recalls the growingly recognized international standards and certifications (e.g., ISO, BRC) and COSO ERM framework, crucial for understanding the importance of risk management withing conducting daily or long-term business activities. The sustainable innovation theme within production processes can be red according to various theories, including Dynamic Capabilities Theory (Teece et al., 1997) which in this case would imply that a constant attention to environmental impacts and recyclable materials adoption would translate in resources and competencies from a sustainable point of view (seizing and reconfiguring). This concept also recalls Stakeholder Theory (Freeman & Reed, 1983), requiring companies to integrate environmental issues within their decision-making processes. The attention to operating efficiency and supply chain control and monitoring recalls Contingency Theory (Donaldson, 2001) which sees adaptation of the company to the specific context of reference as central for the effectiveness of managerial practices. Specifically, as previously noted, the packaging sector is highly regulated, and these regulations constantly change and traceability systems which allow materials to be tracked from production to final arrival allow to affectively respond to market contingencies. Activity-Based View, in which case Risk Management represents a way by which companies can create value, identifying critical activities and optimizing resource allocation. Regulatory adaptation and compliance strategy insert themselves in the Contingency Theory (Donaldson, 2001), due to it expressing the importance of adapting organizational practices to specific regulatory requirements.

Table 2 *Data Analysis*



C. Methodological Approach: Case Study and Theoretical-Sectorial Comparison

The adopted methodology consists in a single case study, focused on a deep analysis of Cartonpack S.p.A., an Apulian company which produces packaging solutions and is specialized in innovative sustainable packaging. Through an in-depth analysis, the company's managerial practices are investigated, especially those related to Risk Management, Sustainability, and Innovation.

The research objective is to explore the strategic integration between risk management in the complex packaging industry, and a single case study analysis allows to do so in a real and defined context, useful for offering recommendations and provide significant points of reference. The choice of Cartonpack as object of the study is justified by this company being an emblematic testimony of the power of risk management, translating in a strongly rooted anticipatory leadership vision which expands at every level of the organization, as well as a continuous improvement-oriented corporate culture and a workforce made up of experts of many fields which better enables the company to face challenges of various kinds in a proactive and aware way.

Although the analyzed company is single, its practices' description anyways implies implicit comparisons which allow to further enrich the treatment.
Firstly, mainly in the third chapter, Cartonpack's key differentiating factors are analyzed and compared with examples of different and less efficient practices, which often lead to difficulties in facing the high costs and challenges which sustainable transition is characterized by. Moreover, European regulations and norms and discussed, often used by the company object of the study as benchmark for being and remaining compliant. One recurring concept is Cartonpack being compliant to regulations even way before their formal introduction, due to its well-defined internal audit, monitoring, and risk management system. Thirdly, literature and best practices are discussed within the work, and their analysis enables to find the best solutions for companies in the same sector. This methodology allows to give the company a dual valence: it becomes both an empirical case study to draw insights from, and a reference model to emulate to achieve success and learn from who performed well. This research approach allows to combine the typical case study analysis' deepness with interpretative richness coming from sectorial and theoretical comparison.

Chapter III

3. CARTONPACK'S RISK MANAGEMENT SYSTEM AND CONSEQUENTIAL BENEFITS

Cartonpack adopts a Risk Management system based on its integration and coherence with internationally recognized standards like environmental ISO 1400, BRC/IOP about packaging health and hygiene safety, and ISO 9001 about quality.[24] The peculiarity of this firm is that its commitment to efficient Risk Management systems is not limited to the adherence to standards, but dates to the visionary leadership which always believed in the power for firms of such structure. Risk Management is evident at every level of the organization, from top leadership to daily operations, therefore impacting in many ways organizational culture, at which base is the acknowledgement that continuous improvement, corporate sustainability, and competitiveness are just three of the many benefits Risk Management can bring to a corporate reality.

Starting from the quality context, ISO 9001 allowed the company to improve and implement new ways of standardizing and establishing order, but without upsetting current practices. On the contrary, this standard enriched current ways of doing things, as well as giving every member of the organization a greater possibility to optimize resource use, improve productivity and capture hidden inefficiencies, translated into reducing incompliances. By adopting this approach, the company can measure each activity in an aimed way by using fundamental indicators like noncompliance rate regarding quality, OEE (Overall Equipment Effectiveness) to measure productivity, delivery punctuality level for logistics and supply chain and energetic efficiency for sustainability.

Environmentally speaking, Cartonpack's interviewees reported that the adoption of ISO 14001 standard allowed to introduce circular economy principles within the company's processes by providing with a clear regulatory and management framework. This standard allowed led to many benefits in term of environmental impact reduction, like renewable energy sources usage or waste recovery. Cartonpack's not only regulatory, but also ethical commitment towards sustainability is exemplified by its usage of photovoltaic panels and thermal oxidizers aimed at depurating emissions. Another

[24] Cartonpack. (n.d.). "Quality and certifications". Retrieved from https://cartonpack.com/quality-and-certifications/

added value for various departments was the avoidance of information flows superfluities, therefore streamlining the decision-making process.
Traceability is one of the main crucial principles to be carefully considered by a company operating in the packaging sector. In this regard, BRC/IOP standard served as a tool for improving hygienic-sanitary risk management with rigor and detail.
The company, from the adoption of this standard, ensures a prompt noncompliance chances management and complete traceability by tracking down each product batch along the whole production cycle. Cartonpack's demonstrated its awareness and dedication towards hygienic practices long before the existence of standards and certification, such as the BRC/IOP's HACCP approach, which became an automatic and systematic operation. Cartonpack's efforts towards the implementation of such approach include the elimination of sectional blades in the cutters of the flexible printing departments, which they substituted with fixed blenders to avoid any sort of contamination. This is only one example, among many, testifying the pragmatic company's commitment towards prevention.
Additional and more technical Risk Management strategies adopted by the company, especially within the R&D department, are tools like SWOT or FMEA, allowing each innovation to be compliant with regulatory or market barriers. This implies conducting real simulations on each new innovative material or technology, which should satisfy standards like environmental conditions resistance, degradability, or food compatibility. Once again, it is necessary to explain that Cartonpack was a real pioneer in the field of anticipative Risk Management, being compliant with the 1616/2222 European Regulation, long before its introduction, thanks to the company already putting into practice the coextrusion mechanism.
Digitalization is another key pillar of the company's operations. Machines, and therefore processes, see a real time communication with information systems, allowing to promptly catch deviations or inefficiencies and to respond immediately with pre-established mechanisms and protocols implying three main phases: risk analysis, supply planning, reallocation of loads and review of production plans. Corporate leadership is the driver of this proactive approach that extends at every level of the organization. ISO/BRC standards and certifications therefore becomes an integrated system which allows to keep the governance as unitary. This is not just about rules and standards to be

compliant with but set of tools and an instrument that prevents fragmentation among the organization, developing into a strategic infrastructure the organization benefits from. Risk Management is also performed, within the organization, by constant and cross communication among departments, sharing objectives, data, and risks.

Cartonpack is a reality in constant movement, and its Risk Management system is as well: they believe in a proactive and dynamic approach to risk, not relegated to strict protocols to be followed, rather, they favor continuous improvement and up-to-date information. Experiences are seen as ways of learning and improving, therefore avoiding already-encountered mistakes.

Risk is regarded as a lever for continuously changing and innovating, and not as an element to be contained or be afraid of.

This vision is well-acquainted by each member of personnel, who is aware that being an active participant of both the conceptual and operative fields of the risk management process, allows to exploit all the benefits the latter can offer.

Sustainability is a core principle of this process: every choice, within any department, is intended to have the smaller environmental, regulatory, and economic impact possible.

A far-sighted vision is applied to innovation's financial risks, through a careful and precise analysis of costs, return on investment and impacts of these investments and innovations both on people and processes. In this regard, the process is once again both standardized, and suited to each project's needs and expected benefits and implies meticulous initial analyses, assessments, and handbooks to avoid, and eventually manage at best, unexpected events.

An element that furtherly strengthens Cartonpack's approach is the constant coordination and synergy existing between the many departments, whose peculiarity is their shared language in terms of sustainability, regulatory compliance, quality and production at every level of the organization. In this regard, an effective Risk Management system is exemplified by the key and active roles played by the legal and financial functions, essential for a continuous monitoring and anticipatory analysis.

From this analysis, it can be deduced that at the base of Cartonpack's integrated risk management system is an organizational intelligence that wants it to be harmonious and interconnected and that uses standards and certifications as value-creation tools and not

mandatory duties, therefore guaranteeing a prudent, visionary, resilient and sustainable growth in line with market expectations.
Benefits will be furtherly discussed through the analysis of real Risk Management and innovation examples which clearly demonstrate how a well-defined Risk Management system can contribute to achieving successful projects and initiatives.

3.1 INNOVATION AND SUSTAINABILITY: OPPORTUNITIES AND CONTRADICTIONS

A. Circular Economy: Adopted Strategies

Circular economy is now a need within the modern industry context. Cartonpack's distinguishing factor lies in its circularity-oriented production model that mixes technological innovation, environmental sustainability, and production efficiency. The whole supply chain, from phases like selection of raw materials to product design, until waste management and energy optimization, is covered by circular economy strategies, with the core objective of continuing to strengthen the company's competitiveness while reducing environmental impact.
Eco-design is a fundamental part of this strategy; beginning from the raw material selection, every product development phase is investigated closely. The preferred materials are recycled, recyclable ones, and materials coming from renewable sources like FSC paper or PET post-consuming recycled are largely considered. These practices help to ensure and improve product recyclability and reduce the usage of raw material, resulting in a well-designed packaging that can both protect what is inside of it and facilitate its disposal.
A strong focus on reducing the weight of packaging walks alongside the concept of "design for recycling". This idea leads to two crucial consequences: reducing the materials placed on the market and the second consequential one which is the optimization of transportation methods and resultant CO2 emission reduction.
Circular economy is also exemplified by the usage of production waste. More particularly, scraps in the hard compartment are entered in the production cycle through their recovery and flake transformation, therefore preventing material to disperse and limiting new resources usage. The absence of water within technologies operating in the

production cycle largely strengthens efficiency, therefore furtherly reducing the company's environmental impact.
Photovoltaic systems represent significant efforts by Cartonpack in terms of investments, having the possibility to cover almost the overall production energy needs through them, and monitoring their efficiency through a careful analysis of energy used correlated to realized product indicators, therefore allowing for constant optimization.
As previously mentioned, certifications and standards like ISO 14001 or ISO 9001 played a crucial part in providing efficiency, product quality and reducing waste. To these, a useful element is added, which is the simple but effective One Point Lessons tool, which improved control on daily activities and ensured employees' continuous training.
Selection of suppliers is also critical, and Cartonpack manages it at its best: its commitment towards sustainability goes is demonstrated by the selection of suppliers according to ethical and sustainability standards, as well as certifications, once again demonstrating the power of these in providing reliability in the eyes of the outside world.
A participative leadership is crucial in shaping a circular economy-oriented corporate culture, and Cartonpack is the real-world proof of this concept. In this company, each employee understands the power of his/her own choices and knows pushing towards continuous improvements can be nothing but beneficial. This shared behavior is performed behavior within the company, where adaptation is key, even from a compliance point of view. Regulations are constantly monitored to continue being in line with them and to avoid surprises, therefore adopting a proactive approach to risk, and favoring a well-set environment. Decisions are well-calibrated both from an economic and technical point of view, as well as from a social and environmental one. To do so, the company's strategy goes beyond a fundamental well-rooted corporate culture, but extends to the adoption of specific analysis such as FMEA and SWOT which are crucial for capturing the existence of potential threats, difficulties or obstacles and find prompt and well-defined solutions to them.
The company, moreover, does not have a direct dialogue and connection with final consumers, such as the individual going to the supermarket and buying a fruit package: that individual won't even know that that packaging item was produced by Cartonpack.

Here the question becomes: how can Cartonpack evaluate the effectiveness of its own products? The company does so B2B sales representative, who is the employee selling the product to client firms. In this way, the sales representative establishes direct connections with its clients, therefore collecting feedback and understanding the evolution of market trends.
Cartonpack's efforts towards circular economy are numerous and commendable, resulting in a mix of sustainability, competitiveness, and innovation. Each decision is based on an ensemble of various factors and neglecting one would result in an insufficiently effective decision for the company.

B. The Cost Problem: Sustainability Between Competitive Advantage and Financial Charges

Issues regarding sustainability costs are primary for firms operating in a way that tries to strike a balance between keeping their competitiveness and adopting responsible practices, translating in the equal weight to be given to financial charges and competitive advantage. Within Cartonpack, this concept is faced through various and slightly different approaches based on the department, but what unites these approaches is their shared goal: to perceive sustainability as a value-creation leverage and not as a weight.
One of the most relevant contributions emerging from interviews is Gianni Leone's one who, as CEO of the company, expresses a way of perceiving sustainability that calls to rethink it not as just a trend, but as a choice based on knowledge, precise data, and awareness. Sustainability is a topic strongly relevant in these days, but to pursue sustainability goals, a company must know exactly what the challenges, opportunities and current as-is situation are, through an in-depth knowledge of the market, analyses, and precise information. Sustainability has a cost: and this is the primary concrete difficulty for companies. Analyzing the case of Catonpack, it is clear that becoming versatile, diversifying technologies and materials, and proposing innovative solutions to effectively and promptly responding to market needs, leads to a considerable increase of management, updating and training costs. This company was able to combine these efforts to diversify its proposals on the market, resulting in key differentiation factors that nowadays allow Cartonpack to distinguish itself from those competitors that did not

capture the value, and above all the impact that the sustainability transition could have on their operations. Facing costs is inevitable, but not facing them and staying in their operational comfort zone is much more of a risk.
This idea was also reported by Cartonpack's R&D manager, Toni Azzella, who argues that the diversification of materials, favoring sustainable ones, in most cases results in higher costs. This problem can be contained by operating according to two fundamental concepts: process innovation and economies of scale. Similarly, the Chief Financial Officer Federico Saraconi agrees with Azzella's view of sustainable materials' substantial higher costs, and he exemplifies this with the substantially, and more precisely triple cost of paper over plastic, and cellulose pulp's being five times more costly. These are not the only costs which the firm has to face, On the contrary additional ones are represented by logistics do you to more sustainable materials necessitating of more space and higher weight.
He explains how Cartonpack manages the issue: through pragmatic approach which sees the distribution of these costs on the value chain, from the production of the product until its final destination which is the final consumer. The company tries to listen to the markets economic needs but also must think about the financial aspects which governate its survival. This cost the distribution does not represent the fact that the firm sees these costs as unavoidable, on the contrary, the company has a strategy which consists in a careful evaluation on the expected return on investment and the time which will be required to recover the investment in order to optimize every investment choice they make. In this way Cartonpack can meticulously manage the initial assessment phase to avoid having unexpected costs surprises which go against the financial sustainability of the investment. As previously mentioned logistics is an important factor of the cost theme. Car jump park initiated new partnerships with, for example, reality is like plastic bank Allowing to operator using ecologically certified materials. As we said these materials are costly and following these reasoning a furtherly careful financial planning is needed in these cases. From this it is possible to understand that investing in more ecologically friendly materials is not a short term investments, rather in the short term it won't probably show any financial advantage but, on the long term and by finding a balance between the high costs and benefits, the firm

will experience enhanced reputation and, in case of anticipatory practices, early compliance adaptation, such as in the case of Cartonpack.

Although sustainability aimed at changes lead and have led the company to face substantial investments what drives the company to reconsider them again and again is not just the production efficiency objective related to them, but also the aim of reducing environmental impact. Once again sustainability is a cost but is also and internal efficiency improver. As Alessandra Curci states within the interview, “every sustainability driven investment must be equally financially justified”. Expanding the discussion we can say that standard packaging must be competitive on the market, so there is no doubt that ecological packaging must be competitive as well. Cartonpack, as well as many other competitors in the same sector is a profit organization and every initiative it pursues must bring in some sort of return, otherwise sustainable practices, initiatives, and products risk to remain a market-less good intention.

Compliance is another fundamental pillar which must be carefully considered and analyzed within the undertaking of sustainable initiatives. Compliance, especially in highly regulated sectors like the packaging one or the hard industry one is an element that can compromise, if not well managed, accompanies future. Cartoon park faces the challenges posed by stringent regulations and directives by the introduction within the firm of specialized skilled employees with a deep knowledge of the sectors the regulations. This is another type of sustainability investment that does not present considerable short-term advantages, but it certainly will do in the future.

The cost problem is faced realistically by the company, by recognizing its inevitability, but overcoming the fact that it is a problem, and realizing there are transferability, innovation and optimization strategies is what distinguishes Cartonpack, because these strategies become well-rooted within the business model, demonstrating once again the company’s proactive approach to risk: they transform the cost problem in a leverage to succeed, rather than an obstacle.

C. Regulations and Controls: The Gap between Norms and Practical Application

Within the various interviews conducted, one of the most recurring theme was the issue regarding the stringent norms and regulations applied to the packaging sector and, the lack of their effective application and control. Many participants expressed a complex situation due to the extremely difficult interpretation of regulations, incoherencies between them, no external control that ensures companies comply with these regulations and general uncertain and difficult implementation of practices. As previously mentioned, the packaging sector was subject to a growing number of stringent regulation in a short time, especially in recent years, due to sustainability concerns and environmental impact reduction topics becoming more popular both for institutions and governments and the general market and consumers. According to interviewees, this acceleration was not well managed and this is evident if we look at the discrepancies between the various norms and regulations that make it difficult for companies, especially in the packaging sector like Cartonpack, to be compliant with them in an harmonious way. Cartonpack and its visionary leadership have always preferred an anticipatory approach and in this regard, we can name the coextrusion mechanism, a technology introduced by regulation 1616/2022, that Cartonpack adopted way before, specifically 20 years before the introduction of this regulation, according to food security and traceability measures internal to the own firm.

What participants to interviews complain about is the excess of bureaucracy regarding regulations. The legal and compliance manager believes that this overabundance of abstract rules without a practical application methodology is an obstacle for innovation common problem the company is trying to overcome bye a close participation to European consortiums to make companies' needs be heard and understood for contributing to a more effective regulatory framework and strike a balance between sustainability concerns and companies' operating sustainability needs. In a field where innovation and development of new products it is often difficult to be constantly on track with the regulatory changes and, as expressed by Catonpack's R&D manager, these difficulties are worsened by these incoherencies and constant complexities. As discussed previously, SWOT and FMEA analyses are powerful tools for facing these kinds of complexities, but regulations should be by the side of companies, at least in

terms of comprehension, rather than an obstacle to their progress and innovation, which incur the risk of significantly slowing down. Similarly, ISO and BRC standards and certifications represent crucial tools in terms of quality control and monitoring, but without an effective external regulatory support, this risk not to be sufficient for pursuing their objectives. Once again it is evident how Cartonpack's commitment towards quality, security, sustainability, and compliance issues is real and touchable, but a result of an autonomous initiative, possible thanks to cooperation and cohesion between departments, rather than a regulatory imposition.

Rigid external controls would be a facilitator for companies for effectively understanding how to apply regulation in their daily practices, but their lack implies that application of regulations should be the result of companies' efforts in terms of interpretation, organizational readaptation, and further complexities to be faced. Cartonpack's demonstrates itself to be a winner in this practice: the implementation of a proactive approach to risk, translating in the anticipation rather than reaction to regulations, with the support of legal experts, allows to have the necessary time to adapt and avoid inconvenient regulatory surprises. This testifies the voluntary commitment of Cartonpack's towards adaptation, often not facilitated by clear guides by regulatory institutions towards compliance to new regulations.

Logistics and Supply Chain Manager underlined the importance for the company of materials traceability. Concerning this, when asked whether the company considers specific supplier selection criteria, the participant answered that they do, but that they are not formalized regulations. The company considers ethical internal criteria for this selection, such as the adoption of internationally recognized standards and certifications, confirming once again the complex gap between popular sustainability principles and its practical application.

Current regulations in the packaging sector are the result of abstract theories enacted with good intentions but not well projected to be effectively implemented within companies' daily operational practices. Among all interviewees, every one of them demonstrated a strong belief in the power regulations and their potential of efficiently introducing concepts like sustainability or quality within the scope of every company, and this is true if we think about Cartonpack's anticipatory commitment. The issue is that if a regulation is not effectively applicable, it results in being inefficient and not

sustainable for companies' well-being. This inefficiency becomes a weight for companies, which find themselves to manage in an excessive way the compliance, mediation, interpretation and, in the case of Cartonpack, also anticipation phases.

3.2 PRACTICAL CASES OF RISK MANAGEMENT AND INNOVATION: BENEFITS OF A WELL-DEFINED RISK MANAGEMENT SYSTEM

A. Case One: Elimination Of Sectional Blades Within Production To Avoid Risks Of Contamination

Risk analysis and management can lead companies to strengthen processes' security, and one of the most impactful risks for Cartonpack was the contamination one, emerging from sectional blades in cutting processes. Cartonpack was able to overcome this risk and avoid it to affect its reputation, business operations and daily activities. Sectional blades were the standard instrument used within the process of flexible production cutting, specifically in cutting plastic films which would have become food packaging. Being these blades sectional, the risk was for them to break, especially after long production hours, and in that case, the final packaging product incurred the risk of being contaminated due to the fragment ending inside the packaging. The company realized this was a issue to be solved, and although no contamination case was ever reported, they preferred to change their process strategy before instead of risking heavy and very serious accidents which would have destroyed its reputation both from a market point of view, both from a sanitary one: they acted proactively. The process through which they operated was well-defined and implied a careful evaluation of risk through KPIs regarding the accident's probability of occurrence and potential impact, which were both considered aspects which the company could have not neglected, resulting in a high and serious risk to take care of. The incident, other than substantial reputational damages, would have led to serious sanctions and product recalls.
These were potential events Cartonpack had to avoid, and to do so, the company opted for a prompt elimination of sectional blades from all department, an expensive but necessary choice to prevent accidents from happening. Fixed blades cutters were introduced within processes, to avoid blades' breaking and consequent contamination. This action is an emblematic example of a practice that Cartonpack adopts from a long

time: prevention. Prevention, and not reaction, was crucial in this case for analyzing criticalities and anticipate possible quality and security challenges.
Moreover, followingly to this event, process controls were moved from the sole final phases to initial phases to ensure prevention at every step of the path.
Reiteratively, this intervention confirms the potential of risk as an innovation instrument, due to the consequences it led to: a review process was initiated both on every instrument and technologies in use within production department and on people working with these technologies, with the aim of analyzing further potential lacks, inefficiencies or near-misses.
Cohesion in key in Cartonpack, and this is confirmed by the fact that after this intervention, both standard operating procedures (SOP) and corporate culture were reviewed as well, enhancing employees' awareness, allowing them to understand, also through in-depth training programs, that every detail of their decisions can impact their objectives, and therefore prevention was furtherly included in the main shared core values.
ISO and BRC standards, already well-known by Cartonpack, were perfectly aligned with the ways this intervention was conducted and they allowed for its clear documentation, evaluation, and improvement.
Result coming from this initiative were measurable thanks to Cartonpack's already existing KPIs systems, such as the food security one, and the compliance one, which were both subject to a substantial decrease. This improvement is beneficial for the company both for its own operations and both for clients' perception of Cartonpack's commitment towards its packaging security goals, therefore reinforcing commercial partnership relations.
This event is a quintessential example of how a single process change can consequentially influence the whole company, from its daily operations to its organizational and corporate culture.
These improvements are evident from the external world too, and in a sector where at the base of all partnership relations is trust, and reputation is key to succeed, putting consumer health and product security before meaningless savings, compared to serious consequences emerging from potential incidents, will lead to a sustainable and durable competitive advantage. In this case, risk was seen as a leverage for innovation, and the

integration between the two concepts led to meaningful improvements in terms of products, corporate culture, people, and processes.

B. Case Two: Pricing Strategy and Transfer of Sustainability Costs

Companies in the current era, dominated by sustainability becoming a necessity, must face financial risks and must thrive to strike a balance between environmental sustainability of the products produced, and financial sustainability of the same company producing them. Cartonpack is a B2B packaging company, and although not having a direct link with final consumers, the strategy they adopt to face this challenge involves these subjects.

As previously mentioned, the shift towards sustainable materials and the consequent production of more sustainable and innovative products requires massive investments, both due to the high costs of these materials, and for new machinery and infrastructure needed to implement within each production department.

These investments become duties for companies, like Cartonpack, seeking to innovate and keep up with market trends.

To manage these costs and continuing to make profits, the company adopts an approach based on the transfer of costs on the final client, translating in the shift of costs across the supply chain with a following overturn on the final client, therefore not altering its own operating margin. In this way, the company is both able to defend itself from higher prices and find a reasonable balance between sustainable objectives and its competitiveness attainment and protection.

This strategy was conceived according to a precise and meticulous cost analysis with the aim of setting prices sustainable both for the company itself and for the final consumer. Risk is therefore managed with a structured approach, awareness, and proactivity in order to avoid loss of competitiveness within the market or profit reduction.

As Tony Azzella, R&D Manager explained during the interview, sustainable products' challenge is not only cooping with their high prices, but also exploiting their efficiency that, being them new and not well-discovered yet, often lacks. In this regard, investments in eco-design serve as a powerful tool for maximizing the effectiveness of

these materials while minimizing the quantity of material used with the aim of reaching a full recycle of the product.

Sustainability manager Alessandra Curci expressed a similar opinion: sustainability must be achievable both for the environment and for the company, and sustainability investments must bring a return for the company, being it a profit entity. Cartonpack sees economies of scale as useful for reducing the costs of sustainable materials, to preserve the company's competitiveness.

Maintaining a constant dialogue with competitors and similar organizations, for example through participation to consortia, or technical meetings with the European Commission helps the company to keep up with the market and adapt its offer, while maintaining a unique strategy tailored to its own needs.

In the end, Cartonpack's pricing strategy represents a way by which companies can cope with one of the challenges posed by sustainable innovations, and here every decision is aimed at balancing the perceived value, which upholds its quality standards, and cost and therefore between financial sustainability and environmental sustainability commitment. This system results being flexible yet solid, adaptable yet reliable, in a growingly sustainability-aware market.

C. Case Three: Digitalization and Traceability within the Supply Chain

Cartonpack case is an emblematic example of the importance of a well-managed supply chain risk structure. New compliance, efficiency and sustainability needs constantly arise and companies should be able to transform their managerial and operating model according to these. Business resilience is key for this concept, and a way of pursuing and continuously improving it is by the implementation of digital tools within supply chain management, therefore improving the capacity of the firm of responding to the unexpected and guarantee a greater control of products sent and received. This was deeply explained by Cartonpack's supply chain manager, Daniela D'Ambrosio, who addresses the importance of advanced digital systems in the total control of products sent within the whole process, from its departure to its final arrival. Contrarily than earlier years, in which products data and updates were lacking and approximate, in recent years the company became able to track materials and products in real time, avoiding inconvenient events and above all conducting a meticulous monitoring of

goods from their prior usage within production processes to their departure, until their final arrival. In this way, the company was again able to turn a complexity into an opportunity to grow and improve, without remaining anchored to old ways of doing things and having a complete and total view of the products produced.

As the interviewee expressed, global unexpected events or geopolitical tensions (e.g., 2021 Suez Canal obstruction, Red Sea geopolitical tensions) are not frequent but crucial events for companies subject to export operations like Cartonpack. In this regard, well-structured risk management systems play a crucial role in keeping the supply chain alive, by providing companies with strategies. During these impactful events, Cartonpack adopted a strategy aimed at the improvement of operating flexibility and digital organization, which translates into a greater attention paid to timing and redistribution of supplier orders. This approach allowed the company to continue its daily exports and imports and not be excessively impacted by what was happening outside the organization.

Digitalization positively impacted various areas, including the supplier collaboration. The company introduced a labelling system, a meaningful tool for materials traceability, which allows to draw direct connections between received raw materials and finished products, therefore ensuring qualitative and regulatory compliance. Thus, the company s now able to enhance transparency and reliability by systematically verifying materials' provenience.

An added perspective was provided by Marco Gabriele, Chief Operating Officer in Cartonpack, who explained the closeness of the company with Industry 4.0 principles. This implies an adjacent interaction between digitalization and production processes, due to the 2017 adoption of the bidirectional dialogue between machinery's PLC and management software, allowing processes to "communicate with each other". This real-time monitoring is key for capturing discrepancies or criticalities within the production process and intervene promptly in case of events which would cause damages along the supply chain.

Digitalization is also very present within the quality department, where almost every control is being automized and will probably also be supported by artificial intelligence, ensuring a complete control within the three crucial phases: beginning, during and end of production. New technologies will enhance data precision and reliability, and

consequently the capacity of the firm to predict and anticipate incompliance or unexpected risks to managed.
These concepts reconfirm once again the proactive risk approach Cartonpack adopts and, as expressed by its CEO, this is pursued by a data analysis-oriented decision-making model, and communication between the diverse functions. Integration of advanced digital technologies within the company allows to enhance service quality, resilience, and compliance. In the current global landscape, increasingly competitive and uncertain, for companies desiring to reach and maintain their competitive advantage, ensuring total material and product traceability is key. Cartonpack, leader in the global packaging sector, is a suitable example with its strategic vision, openness to digital and technological innovation and operating rigor.

D. Case Three: the Transition to "Autorizzazione Integrata Ambientale" (AIA) – a Challenge Turned into Opportunity

Cartonpack's ability to transform challenges into opportunities is largely exemplified by its transition to AIA[25], the Integrated Environmental Authorization (in Italian, Autorizzazione Integrata Ambientale). Before stepping into the explanation of this authorization, it is convenient to step back and express the causes that led to its implementation, and how things worked before.
First, the introduction of AIA within Cartonpack was one of the most robust and hard challenges to be faced by the company, especially within the regulatory and environmental risk management field, which had many impactful consequences in terms of technologies, culture, organization, but also a chance for the company to redefine its business processes in a more sustainable and innovative optic.
As previously mentioned, it is required here to understand the previously adopted regime: AUA. AUA stands for "Autorizzazione Unica Ambeintale" and, differently from AIA, is a combination of many and various environmental authorizations, like those for rainwater management, hydric discharges, and emissions into the atmosphere,

[25] Redazione. (2022). *Cosa sono e che differenze ci sono tra AIA, AUA e VIA*. Rigeneriamo il Territorio

and it’s useful for small or medium-sized companies whose operations have not a great impact on the environment.
This authorization requires careful reports regarding, for example, solvent balance for solvent-based flexographic printing, translating in the annual communication to relevant institutions of the used quantity of solvents, of active abatement systems (such as the thermal oxidizer), of the recovery of the solvents themselves in the production cycle and of emissions into the atmosphere. These tasks were crucial for monitoring the company’s production and its environmental impact from a legal perspective, and in fact, Cartonpack always carefully carried them out during the adoption period.
As time went by, however, Cartonpack started distinguishing itself on the market due to its product heterogeneity and diversification in print, flexible and hard materials converting which of course require different processes for their conduction.
One of AUA requirements was to not overcome the limit of 200 tons of solvent used during the solar year. Overcoming this threshold translates in the passage from AUA to AIA, and due to Cartonpack’s production capacity’s exponential growth over time, this limit was not difficult to be overcome.
Without a crystal-clear plan about what to do if that limit was exceeded, the company would have found itself operating illegally, and without any authorization justifying having crossed that line. The implications would have been serious for Cartonpack, for example requiring activities to stop, and making the company subject to three options of decisions: firstly, the company could have chosen to reduce production; secondly, converting the process to water-based print; thirdly, shifting to AIA and facing the whole costly and long process required to do so.
It's important to analyze the potential implication of each of the three decisions:

1. Production reduction is the most obvious choice for a company which is happy with what it has achieved and does not desire to grow any further. By this, it is clear that this was not the right choice to make for Cartonpack, due to its constant desire for improvement and growth.
2. Converting production water-based print was risky, due to its low expected performance compared to current processes: packaging would have incurred the risk of not being durable, long-lasting, and well-defined. Other than technical

challenges, this choice would have implied reputational damage for the company due to the notable decline in quality products would have been subject to.

3. The most viable solution over time seemed to be the third one: the transition to AIA, although this decision implied significant effort both in financial terms and both in terms of re-adaptation.

Cartonpack chose to adopt AIA, a European regulation that provides companies a unique and integrated solution for the various environmental issues previously mentioned. The different matrices are managed through the Best Available Techniques (BAT). Here the activities are not managed singularly but cohesively and constantly, by a coordinated devaluation of areas such as energetic consumption, waste management, water and soil impact and emissions. Here, differently from AUA whose solvent maximum threshold was 200 tons, is of 400 tons.

The peculiarity of Cartonpack's adoption was the exploitation of this challenge as an opportunity to modernize and innovate its sustainable footprint once again. This adoption was long and required technical, financial, and human investments to efficiently carry out this transformation.

The drafting of a Control and Monitoring Plan (CMP) was one of AIA's required tasks that Cartonpack introduced, and this plan aims to precisely defined the ways emissions into the atmosphere, rainwaters quality and waste management are controlled and evaluated by the company. New AIA requirements also necessitated the company to modernize its production machinery and implants, translating in a strengthening of environmental protection, solvents recovery systems and machinery be more energetically efficient.

The human factor was as well very crucial: new personnel training was conducted to ensure a continuous improvement culture. Each member of the organization had the chance to learn numerous lessons due to this experience, such as the importance of an anticipatory planning of events based on data, such as the monitoring of the quantity of solvent used and the alternative ways the excess of this limit could be managed by. This concept allowed the company to take time to think and decide the best option while maintaining a strategic and visionary leadership in carefully evaluating options.

The adoption of AIA also had as a consequence an actual and tangible benefit, such as the elimination of AUA- required production thresholds, enhanced the company's environmental reputation, and gave chances for further growth.
Organizational culture experienced a greater cohesion during this adoption, since each member of the organization, from more operating functions to managers and CEO had to be united and involved in the change, therefore allowing everyone to understand, train and act to explore further the concept that sustainability can also be a chance to strengthen a durable competitive advantage.
AIA favored a leaner bureaucracy; process flows optimization and the overall operating efficiency. Moreover, new markets were explored thanks to this authorization, enhancing Cartonpack's role as leader in the global packaging market, in a growingly sustainability-aware international context.
Cartonpack's proactive risk management approach was significantly boosted due to the AIA adoption, due to its tendency to not be subject to a transformation, and in this case consider it as a set of rules to be subject to, but rather exploit it as a development leverage. AIA was a chance for Cartonpack to rethink its models and culture in a more aware, sustainable, and efficient manner.

E. Case Five: Daily, Weekly and Monthly Meetings

Constant communication and cohesion[26] are at the base of Cartonpack's risk management and innovation system, and powerful tools for pursuing collaboration between departments are represented by periodical meeting. These are divided in daily, weekly, and monthly meetings and each of them with a specific aim.
Firstly, daily meetings allow to preliminarily control operations and see teams such as production planning, maintenance personnel and shift leaders communicate and discuss production trends and allow for a real-time facing of current issues or concerns. These last 15 minutes, and they are critical for employees' daily updates regarding daily most relevant and immediate issues, necessitating prompt interventions. In this way, no relevant theme is left behind and every problem is

[26] Sandeep Kashyap. (2024). *15 benefits of cross-functional team collaboration.* ProofHub

managed proactively, therefore ensuring a constantly monitored production quality and machinery efficiency.

It is possible that daily meetings are not enough to face issues that need to be resolved in the longer-term, and in this case, weekly meetings step in to fill the gap. During these one hour meetings, which present a more structured and long conduction and imply the participation of the Chief Operating Officer, problems previously discussed within daily meetings are analyzed more deeply and carefully with the aim of analyzing data and finding appropriate and more elaborate responses. The difference between the two discussed meetings lies in the fact that the first, daily meetings, have the aim of limiting the effects of the problems to be faced and finding fast solutions, while the second, weekly meetings, imply the analysis of the causes which generate problems and finding appropriate medium-term solutions for solving them.

Thirdly, monthly meetings are conducted with the participation both financial team and the Chief Executive Officer and aim to discuss operating results and conjugate them with financial and commercial objectives. To do so, KPIs are analyzed, such as the earlier cited non-compliance rare or energetic efficiency. Data here are carefully analyzed, and then used to take investment decisions which will impact the company on the long-term.

These tools are powerful to establish and maintain a continuous improvement culture within every department of the company, and making every employee take part, with their observation, to a greater process of exchange of points of view, therefore eliminating the typical functional isolation and favoring cross-cutting competencies. These meetings allow to evaluate decisions on the base of what happens daily within the various departments, and each member of the organization, from a worker to a manager, can actively contribute to this.

Risk management is largely put into practice through these appointments, and an anticipatory leadership is transmitted at every level of the organizations, implying that problems can be faced both through reaction, but above all through anticipation, pursued through daily, weekly, and monthly communications of relevant improvement areas which would generate serious consequences if not properly managed.

F. Social Plastic: Cartonpack's Innovative Initiative Towards a Growingly Sustainable Approach

Cartonpack's sustainability commitment[27] is clearly demonstrated by the "Social Plastic" initiative[28]. This project is a relevant example of reputational risk management and innovation tendency of the company, and is a combination of social responsibility, environmental sustainability, and supply chain resilience strategy principles. This initiative stems from a collaboration with Plastic Bank, "a social fintech with a global bottle deposit program that helps end poverty and stops plastic pollution"[29], and as expressed by Cartonpack' Logistics & Supply Chain Manager, this partnership allows the company to re-use material which would otherwise become waste. This project implies the usage of material, specifically plastic, collected by poor, vulnerable, and disadvantaged Indonesian communities, within Cartonpack's production processes, thus contributing to a project characterized by a valuable social meaning. Cartonpack acts as a recycler, but also responds to market sustainability needs and local socioeconomic vulnerabilities. Another advantage deriving from this project is the avoidance of reputational risks: by actively participating to these kinds of initiatives, a company like Cartonpack gains a spot in the market both as a commercial leader but also as a powerful sustainable actor through the production of specific "Social Plastic"[30] products, obtained through the supply of resource coming from a controlled and certified source.

This initiative implies specific ways of conduct, translating into a mass balance logic which sees the entry in the company of a specific quantity of collected plastic, which will then be used to produce final products. Through this approach, the company can ensure a reliable traceability of materials along the whole process as well as compliance to regulatory and logistic standards.

Plastic Bank ensures the supply of certified and traceable materials, and this is convenient for the company also from a Risk Management point of view, since

[27] Cartonpack Group. (2023). Sustainability report 2023. Cartonpack S.p.A.
[28] FreshPlaza. (2020, October 16). *CartonShell® et Social Plastic®: la double face de la durabilité*
[29] Plastic Bank Website. Retrieved from: Plastic Bank | The global bottle deposit program
[30] Cartonpack Group. (2023). *Social Plastic® initiative*. Cartonpack S.p.A

reconfirms the preventive strategy principles Cartonpack upholds, and differentiating its products between different technologies and materials, including plastic collected in socially responsible ways is a striking example of such foresight. This anticipatory vision is reflected in many of the decisions that led Cartonpack transformation from local family business to international leader in its sector.

G. CartonShell® 2.0: An Innovative Packaging Product Developed by Cartonpack

Sustainability and innovation cannot be considered as simple trends anymore, rather, they should be exploited as leverages to improve companies' strategy. Cartonpack is a pioneer in this field, and R&D experts guide within the company the development of advanced products like CartonShell® 2.0[31]. This product, as expressed by Toni Azzella, Cartonpack's R&D Manager, is an ideal blend of environmental sustainability commitment, versatility, functionality and, not less importantly, aesthetics (*See Pictures 1, 2, 3, 4, 5 for detail*).

The development of this product necessitated a close cooperation and dialogue between different company departments, with the aim of creating a product effectively able to satisfy the needs of the agri-food sector, increasingly requiring improved resistance, ease of usage, modularity, and environmental sustainability, of course preserving a well-defined a satisfactory design in line with dominant market trends.

The peculiarity of this product is its composition, characterized by a fully recyclable cellophane transparent window, and paper, which allows this item to be compliant to the 20205 PPWR (Packaging and Packaging Waste Regulation)[32] which predicts a strict packaging waste reduction by 2040.

CartonShell® 2.0's key distinguishing factor lies in its previously mentioned modularity: its structures can be modified according to different lengths and heights, but its shape remains the same, allowing this product to be suitable for many types of fruit and vegetable products, therefore reducing waste. Another peculiarity of this item is its closure: it is made up of a circular tab which acts as a spreader and a lid

[31] FreshPlaza. (2020, October 16). *CartonShell® et Social Plastic®: la double face de la durabilité*
[32] Official EU Website. Retrieved from: Packaging waste - European Commission

characterized by stabilizing features of linear form, which ensure the product's resistance even in crushing situations, for example during transport. Moreover, this product was developed both for automatic filling and manual one, allowing for a diversified supply distribution.

The environmental impact of this item is minimum, rather, it fully follows circular economy principles due both to its materials being completely recyclable and to the recycling facilitation thanks to the avoidance in the use of mixed component which would be hard to separate within industrial processes. This approach is innovative but not new for Cartonpack, being one of the first companies to adopt recycled plastic within its production, and production processes which favor an increasingly lightness of material to reduce both environmental impact and its production costs.

The development of this product was of course complemented by a careful analysis, and SWOT and FMEA (Failure Mode and Effects Analyses) were crucial to identify potential risks associated with this innovative item, which could be of financial, technological, or regulatory nature. Along with theoretical but based on data analyses, the introduction of this offering was preceded by a pilot testing period which tested the actual food compatibility, environmental degradability, and resistance in real-world conditions.

The regulatory aspect must not be neglected, since continuous regulatory changes necessitate meticulous anteriority research to ensure the item is suitable for the various clients' countries of belonging, as well as protection of the innovation from potential counterfeits.

CartonShell® 2.0's results were real and touchable, and it registered a significant increase of orders from clients, as well as positive feedback regarding its structure and ease of use.

A great contribution in this development was given by the constant cross-functional collaboration between the R&D, production, quality, and logistics within the same firm, which allowed to not incur the risk of neglecting often under faced factors such as the logistic management of necks, or compatibility with labeling systems.

Focus groups, polls and market analyses were also crucial for understanding market expectations in terms of aesthetics, materials preferences, and disposal, once again reconfirming the market-oriented approach guiding Cartonpack strategy.

CartonShell® 2.0 demonstrates the packaging sector' evolvement possibilities towards a more competitive, intelligent but responsible approach, and that innovation and sustainability must be looked at not only as abstract concepts but as real objectives to be pursued with active market interest, careful design and technology and meticulous regulatory attention. Cartonpack's R&D department, directed by Toni Azzella, is one of the company's precious gems which with its foresight and innovative solutions, plays a key role in ensuring the company maintains its position at the forefront of this complex and competitive sector at an international level.

Picture 1

Picture 2

Picture 3

Picture 4

Picture 5

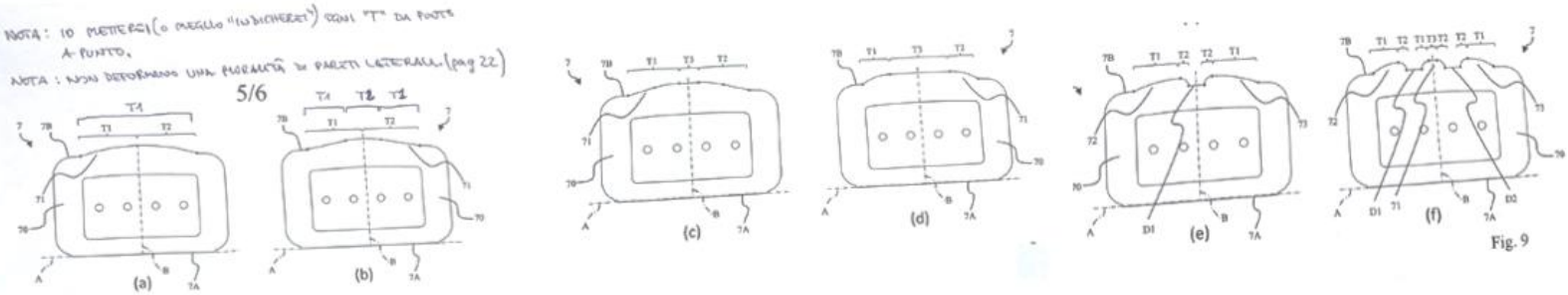


Fig. 9

Chapter IV

4. COMPARING THEORY WITH PRACTICE

A. Success Factors and Obstacles in the Integration between Risk Management and Innovation

Cartonpack is a virtuous example of the integration between Risk Management and Innovation, and the success of this harmonization does not necessarily imply absence of significant obstacles. On the contrary, significant obstacles, if not adequately faced, can determine the failure of such integration, and analyzing them under managerial theories perspective enables to better understand the actual comparison existing between theory and practice. Cartonpack concretely exemplifies the possibility to turn challenges into opportunities in a growingly complex context. Within the Resource-based View, Risk Management is considered a strategic resource that can allow a company to enrich its own internal capabilities. This was possible, also in Cartopack, due to the development of a structured risk management approach able to incorporate and making progress in the technological innovation field. Although there are many successful examples of this integration, it is necessary to underline the various obstacles at the base of this process. As previously discussed, the packaging sector is a highly regulated sector and one of the most impactful and powerful obstacles is the incapacity to anticipate regulatory changes and demonstrate an adaptive attitude towards change and regulations. In this regard companies must go beyond the simple compliance to regulations and develop actual internal compliance mechanisms that allow not to lose track of current regulatory trends and tendencies. Risks in this context vary according to various factors such as hygiene, contaminations and quality, and for these reasons Cartonpack, as well as many other companies in this field, decided to adopt some powerful risk management tools like ISO 9001, ISO 14001 and BRC/IOP, as well as AUA/AIA authorizations. These certifications and authorizations are not simple to achieve, and the only fact that a company like Cartonpack thrives to reach its best shape in order to comply with these standards demonstrates its commitment towards reaching a culture based on continuous improvement which starts from inside, rather than merely outside. This concept can be framed within the Dynamic Capabilities Theory, in which this integrated and systemic

approach allows organizations to develop a strategic flexibility and operating resilience able to effectively respond and not be too impacted by external pressures.
The Stakeholder Theory was also highly exemplified during the treatment of the discussed topics. Cartonpack's collaboration with Plastic Bank and its commitment towards the development of innovatively recycled or biodegradable materials demonstrate the will of the company to not stop at what they are already good at, but constantly trying to see what the gap in the market is and trying to fill it in. This is what makes Cartonpack a leader in this sector and risk management acts as an essential support tool but also as an instrument to strike a balance between innovation, financial impact and environmental impact.
Although the positivity of these aspects, some difficulties persist; as expressed by the Contingency Theory, the sector to which the company belongs is crucial for the effectiveness of Risk Management. The packaging sectors presents many complexities, from the high regulation to the continuous food and environmental regulations evolutions and these complexities must be well treated in order to efficiently plan innovative activities.
The interviewees often expressed a similar concept: each member of the organization must possess a deep knowledge of the sector and of the operations conducted by the company, otherwise it would not be possible to calibrate flexible and adaptive strategies suited for the company' specific needs. Some examples of complexities were expressed by Toni Azzella, Catonpack's R&D Manager, such as long validation times of new materials and the recurring difficulty in ensuring compliance to continuously evolving national and international requirements, which could therefore determine project slowdowns and consequently increase costs. These aspects must be carefully faced in order to ensure compliance but also preserve the company's competitiveness and strong reputation on the market.
Another winning point a company like Cartonpack should detain is a diffused and shared intellectual capital which translates into the ability of the whole team within various departments to learn from operations and processes and share opinions and ideas in order to be able to promptly react and manage any type of situation. This knowledge net, however, has a clear and powerful risk in it: fragmentation has a high probability of happening if the corporate culture and the leadership guiding the

company do not support and promote risk awareness. An important and clear contribution to this concept was given by the company CEO, Gianni Leone, who expressed its awareness about the fact that if risk management perception is not unified and shared across the various departments, then the risk is to face resistance to change especially in the most operating and most traditional departments, such as in the production department. These ideas can be found in the activity-based view theory, which sees risk management as a powerful and value generating activity only if it is integrated in daily operating activities.

The risk-return trade-off logic is a largely applied concept within Cartonpack's financial operations, as explained by the company's Chief Financial Officer. More particularly, in the field of innovative investments, a crucial passage is to carefully find a balance between high initial costs and future benefits. This becomes even more difficult due to the highly competitive pressure which requires fast responses within the market, as well as complex and increasingly rapid regulations' changes which require companies to quickly readapt to standards and requirements. In this regard, the Dynamic Capabilities Theory offers a lens by which it is simple to understand the importance for companies to continuously innovate and therefore adapt its own competencies to keep and strengthen its competitive advantage.

Obstacles are significant within the integration between risk management and innovation, but they should not hinder the possibility for companies to build a strong and effective integration model, and Cartonpack is an emblematic example of this. The ability of the company to invest in sustainable technologies, develop a shared risk culture, involve stakeholders and adapt to the regulatory context translates in a practical application of theoretical models in real-life actions. It is just in the tension between theory and practice that an organization's strategic maturity can be measured. Cartonpack, in this comparison, is able to demonstrate not only its bases, but also a successful vision for adequately facing future challenges.

B. The Role of Corporate Culture and Leadership: The Human Factor as Source of Competitive Advantage

Cartonpack's experience has as core pillars corporate culture and leadership, and these central elements contribute to the well-functioning of any decision-making, strategic or operational process being active within the company. Leadership, as expressed by majority of people interviewed, is not considered just as a kind of direction guiding decisions, but also a sort of tool for interpreting the operating context, ability to combine vision and objectives, and coherence in how to make decisions.

An extremely interesting contribution was provided by Gianni Leone, Cartonpack's CEO, who explained the role of leadership using a metaphor according to which leadership actors have to behave similarly to orchestra conductors and should detain qualities such as being able to coordinate different instruments, each with a different timing and functioning method, in order to reach a unified and coherent outcome.

This fascinating if we think about one of Cartonpack's main peculiarities: its leadership is based on a deep and active listening to the market which allows to concretely answer market needs, translating in the adoption of a technical and pragmatic application of sustainability in daily operations, based on data, while strongly refusing logics that view sustainability as an ideological imposition to be applied to matter what.

This philosophy is strongly reflected in the corporate culture of the company: Cartonpack's culture lies on a deep knowledge of the belonging sector, it is at a balance between rigor and flexibility, and combines both sustainability and innovation.

A central tenet within Cartonpack's organizational culture is the systemic integration of processes, whereas standards and certifications like ISOs and BRC act as facilitators to ensure continuous improvement and standardization, rather than mere bureaucracy.

In this regard, a second metaphor was provided by Cartonpack's Chief Operating Officer, Marco Gabriele, according to whom, the adoption of such certification, was similar to "putting the house in order", translating in the discovery of earlier neglected resources or even efficiencies, therefore enhancing the value assigned to each resource present in the company. In this context, traceability, quality, and transparency are cornerstones in the company's corporate culture, and this is possible thanks to the foresight which Cartonpack's leadership is characterized by, translating in a well-though and harmonious decision-making process.

This leadership style highly values knowledge based on technical data and embraces and encourages shared empowerment among each member of the organization. Michele Picci, Cartonpack's Quality Manager, underlines how crucial it is for different teams to collaborate with each other to ensure every incompliance is adequately faced, translating in an approach based on prevention and avoidance of mistake reiteration. Here mistakes are not met with blame but, rather, they are approached with a constructive mindset, seeing them as a chance to collectively improve and share mistakes and lessons learnt, therefore actively involving people.

This leadership integrated approach closely embraces the concept provided by Giustiniano et. al[33], which recalls the utility of the combination of control methods like KPIs, and OKR (i.e. Objectives and Key Results), a system able to adequately face discrepancies between stability and need for change principles., allowing for a company to demonstrate a greater adapting attitude.

As Cartonpack's R&D Manager, Toni Azzella explained during the interview, leadership does not limit to providing personnel with guidance, but also becomes risk management and long-term corporate vision: innovation always goes side by side with a careful technological and regulatory risk analysis. In this way, leadership makes the whole firm able to plan by using a defined method which would also allow to predict potential outcomes.

This type of shared culture promotes controlled audacity, in which every made decision or step forward is the result of a combination of discipline and creativity, always guided by a clear and well market-rooted strategic direction.

Sustainability application can be a challenge, and also in this case, the role of leadership shapes the management of this challenge by treating it as a multidimensional matter. Cartonpack's Sustainability Manager, Alessandra Curci, sees as central for the company's strategic approach an integration between environmental, quality and security, possible mainly due to a foresight and cohesive leadership, which considers the whole product life cycle and avoids informational fragmentation. This attention to detail and commitment can be realized only if the cause is shared across the organization and at every level of it: from the leadership to the most operative functions.

[33] Giustiniano, L., Pina e Cunha, M., Parreira, R., & Rego, A. (2024). *The KPI–OKR System: Articulating the paradoxical tensions of strategy and execution*. Manuscript.

Financially speaking, as Federico Saraconi, Cartonpack's Chief Financial Officer explains, leadership lies in a careful and precise evaluation of investment projects, therefore being able to make innovation sustainable and reduce at their minimum the innovative investments' risks.

Here leadership embraces corporate culture in a way that sees immediate profitability as just one component and not the primary concern for the company: the company seeks and strives to apply sustainability even though such economic decisions undermine profitability in the short term. The company innovates, to reach and maintain a competitive advantage in the short term, rather than continuing doing what it is already good at and staying at the same point over time. This is the risk: innovating, learning new ways of doing things, and being subject to the risk of sacrificing shot term profits but benefitting of long-term ones, or preferring to focus on short-term gains while resting on its laurels?

Cartonpack always preferred the first options: risking (in a technical and data-based manner), listening to the market, understanding the gap which must be filled, and trying to fill it with continuous innovation.

Leadership, in this regard, translates in the capacity of resisting short-term pressures to ensure the organization's solidity and resilience.

Resilience is key in this company also in the eyes of the Logistics & Supply Chain Manager, Daniela D'Ambrosio, and Legal & Compliance Manager, Marco Gabriele, who see this core value as the ability of the company to rapidly face global unexpected events, as well as the ability to anticipate regulatory changes which could have a direct impact on Cartonpack's operations.

These peculiarities are what Cartonpack's CEO believes makes a company reach and maintain a long-term competitive advantage: a culture based on awareness, transparency, social responsibility, and prevention, stimulated by a leadership which educates, trains and listens.

4.1 SUSTAINABILITY BETWEEN RHETORIC AND REALITY

A. Unenforced Norms: The Problem of Absent Enforcement Mechanisms

The unenforced norms issue is one of the primary challenges in the packaging field, translating in the existence of a multitude of severe and stringent norms which, however, often remain pure and mere bureaucracy due to the lack of effective controls and enforcement.

This trend often takes the name of "regulatory gap" and has consequences both on the side of national and European due to the loss of credibility their regulatory introductions are subject to, but also on the side of those companies who concentrate all their efforts, resources, time, and know-how in continuously serving the market with innovations, which of course should be compliant with increasingly changing security, social and environmental standards. Many leading figures within the company, including Cartonpack's R&D Manager, Legal & Compliance Manager, and CEO, expressed the concept according to which the fact that regulations are introduced and their functioning is theoretically and technically (but not operatively) validated, does not imply there are equally sufficient verifying methods, incentives or sanctions to make them adoptable: this translates in a sort of injustice for companies which have to face and be compliant to regulations which require to adapt to numerous, resource-spending and effortful requirements.

Sustainability has nowadays become an increasingly popular topic, but this becomes dangerous when its significance is reduced to a mere slogan or commercial strategies. Sustainability should be considered as a social and ethical commitment, and it must be pursued through accurate and verifiable data and processes.

Consequences deriving from the lack of enforcement are various, but probably the most serious is the born of opportunistic behavior by companies who take the absence of control by authorities as a chance to not invest in sustainable transition as regulations theoretically require to, oppositely to companies which correctly apply regulations and, consequently, do not benefit of short-term advantages.

A technical aspect was introduced by Cartonpack's R&D Manager, Toni Azzella, which consists in the regulatory complexities worsened by norms like the already mentioned PPWR which provides ambitious waste reduction objectives, but slow certification

periods, as well as the lack of monitoring systems useful to monitor deadlines, therefore increasing risk for most diligent companies.
Another focal point was added by the Legal & Compliance Manager, who underlined a common issue for companies exchanging its products and services worldwide. This concerns lies in the regulatory inhomogeneity between European countries, which causes interpretation difficulties and lack of coherence between legislations and processes. This issue's main impact on companies is the unfair competition it generates between producers with different requirements and normative interpretations.
Thus, diligent companies are once again the penalized ones, since they lack incentives to responsibly innovate, due to them questioning whether their efforts will ever be recognized or awarded.
Of course, there are always ways to curb the problem, such as efforts by companies in combining security, environment, and quality principles in order to prevent and correctly face regulatory challenges. This integration translates in tools which can be beneficial for the company but, however, require significant investment, resource, and capital efforts which many companies are not willing to make without a fair and systemic control system.
From this discussion it is easy to understand that the lack of enforcement generates reluctance to adopt and promote virtuous practices. Diligent and compliant companies are therefore penalized by this issue from an economic point of view, and from a certain point of view it is more convenient for them to be incompliant than to systematically adapt to requirements and follow stringent norms.
Cartonpack's Logistics and Supply Chain Manager also highlighted the lack of proper controls on "Green" products' criteria, therefore generating a multitude of green-defined products which, however, do not present adequate requirements to be considered so. Also in this case, the lack of adequate verifying methods and controls gives producers chances to circumvent established legal frameworks, contributing to the spread of the "greenwashing" phenomenon.
Producers which put on the market uncompliant products, and do not face any meaningful consequence from this practice, create an uneven playing field that discourages innovation propension and long-term investments, making compliant

companies understand that regulatory compliance is often not ethically or economically advantageous.

Cartonpack's vision has not changed due to these prominent challenges, on the contrary, the company has always kept operating combining sustainability, risk and innovation principles, even though almost every interviewee admitted the difficulties derived from the lack of a credible, fair, and coherent regulatory ecosystem.

The lack of enforcement and controls is not just a technical matter; rather, it involves cultural and strategic malfunctioning that undermine responsibly operating companies' practices which go great lengths to conduct a sustainable transition effectively and compliantly. Sustainability must be pursued as a real and beneficial competitive advantage, rather than as an empty label, and to do so regulatory authorities must implement enforcement methods for regulations, and not only theoretically introduce them, therefore ensuring transparency, responsibility, and coherence along the whole market.

Laws must ensure not only sustainable products, along with mechanisms to control and enforce this, but also sustainable and fair practices for companies willing to adapt to stringent requirements and protection for their effortful commitment.

B. Is Sustainability Truly a Competitive Advantage? Evidence from the Case Study

The analysis of the challenges posed by the sustainability transition, brings to light a central question: is sustainability truly a competitive advantage?

To answer this questions, valuable contributions given by interviews and general evidence from the case study must be taken into consideration: sustainability represents a competitive advantage, but at some conditions, depending on how companies face sustainability-related challenges, contradictions and apply their green commitment.

Cartonpack's interviewed leading figures highlighted their willingness to not reduce sustainability at a mere slogan, and their propension to avoid the increasingly typical rhetorical approach: within the company, sustainability is treated as a strategic objective to pursue at every level of the organization, and it is supported by real data, analyses and deep knowledge of the sector and related practices.

This concept was deeply stressed by interviewees because in a sector like the packaging industry, it is easy to lapse into rhetoric, due to the tendency to banalize the concept and communicate sustainability-related information in a superficial way.
Cartonpack's peculiarity in this case is its ability to treat sustainability in a real, data-based and measurable manner, therefore differentiating the company in highly regulated, complex and dynamic markets. This approach derives from massive investments and is what distinguishes Cartonpack from competitors: believing in the power of long-term investments to access and meet the needs of a segment of the market that firms which decide to not invest are unable to reach. Cartonpack's sustainable investments focus on a multi-material model which enables the company to detain greater flexibility with respect to competitors who are satisfied with a univocal specialization. In addition to financial resources, this choice required the company to invest leadership, know-how and expertise across all organizational levels.
As previously discussed, many are the challenges related to sustainability, and they permeate every department within the organization.
Financially speaking, sustainable investments generate additional unavoidable costs, which, in Cartonpack, were faced by conducting careful strategic planning and return on investments analyses, which allowed the company to turn these massive costs, firstly seen as challenges, as leverage for long-term competitiveness and innovation.
From the operational point of view, ISO and BRC certifications and standards were powerful tools to discover neglected resources or inefficiencies within the company, therefore reducing waste and increasing compliance, productive efficiency, and quality. This once again demonstrates that sustainability, if well-managed, studied and analyzed, can turn into an effective competitive advantage.
The R&D department in Cartonpack managed innovation and sustainability through the further strengthening of efficiency and security criteria, translating in the production of mono-material products and plastic material's thickness reduction. In this way, the company was able to differentiate itself from competitors even before the introduction of sustainability regulations, therefore not being negatively surprised by upcoming production requirements and finding ways to maintain production integrity and quality.
As outlined earlier, the regulatory aspect brings numerous challenges to companies in this field, due to its complexity and inhomogeneity, which requires companies to

anticipately adapt technologies and therefore leveraging regulatory compliance as a strategy to succeed rather than an obstacle.

Major challenges like striking a balance between economic and financial sustainability and ecological impact were faced through the conduction of eco-design studies and analyses and development of biodegradable product solutions, once again demonstrating that sustainability must be pursued both ecologically and economically. Sustainability within Cartonpack is configured as a strategic asset which is managed through a data-driven, systemic and aimed decisions and investments. Cartonpack, contrarily to many of its competitors, applies its commitment towards sustainability by continuously innovating and finding new ways of managing risk related to this upcoming transition. This combination of factors ins what contributes to driving Cartonpack towards success and makes sustainability valuable source of competitive advantage for the company for the long-term. Challenges exist and are significant, but a winning company is a company able to find ways to face them properly, and Cartonpack is an emblematic example of this.

4.2 MANAGERIAL IMPLICATIONS: STRATEGIC RECOMMENDATIONS FOR INDUSTRY PLAYERS REGARDING TYPICAL CHALLENGES AND RISK MANAGEMENT STRATEGIES TO BALANCE SUSTAINABILITY AND INNOVATION

The multitude of challenges the packaging sector has to face require companies to accurately balance innovation and sustainability strategies both to face these challenges and leverage them to maintain their regulatory compliance and market competitiveness. Cartonpack's interviewees contributions were crucial for identifying the main strategies industry players can adopt to be prepared to face these difficulties and risks related to this balance.

As earlier noted, Cartonpack's CEO Gianni Leone believes in a sustainability free from rhetoric, which should instead be based on actual data and an holistic vision, therefore carefully evaluating strategic decisions, regulatory risks, environmental impact and financial consequences and benefits. This translates in a strict rejection of preconceptions and simplistic solutions, reflecting an era in which sustainability is often

solely driven by social pressures, rather than the understanding of the actual consequences and benefits of a sustainable transition.
This approach ensures, or at least helps, to pursue a meaningful green transition and apply sustainability in a data-driven manner, without relying on ephemeral sustainability trends and fashions, as well as maintaining and reaching a durable and long-term competitive advantage.
To do so, departments must be coordinated and cohesive, and concepts like sustainability and risk management must be considered as integrated and interdependent elements, rather than separate fields. In this regard, one of the most recurring concepts emerging from interviews was Cartonpack's leadership strongly belief in coordination and collaboration between departments, which ensures an informed workforce, aligned to reach common goals.
From the financial perspective, one of the most common challenges is the excessive technological personalization which can lead companies to be too dependent on external consultants, and to a long-term cost increase. This challenge can be mitigated through the adoption of well-defined contracts of scalable solutions which ensure the achievement of long-term economic sustainability and autonomy. Financial expertise should also conduct precise return on investment and expected benefits analyses, in order to be prepared to face long-term implementation periods and complex regulatory compliance.
Integrated management systems like previously discussed ISO and BRC standards also serve as powerful tools for mitigating waste and traceability risks. These standards and certification allow to create a synergy between security, quality and environment elements and also align every function towards continuous improvement. In this way, a risk management culture is spread across each layer of the organization, and every employee is invested with a role towards change management and objective achievement.
Regulatory compliance is further aspect largely stressed by interviewees. This field is complex and must be treated with attention, due to its close connection with technological innovation: technological developments must go hand in hand with a careful evaluation of regulations, due to their inhomogeneity and differentiation across various countries.

An additional method for handling the issue is through constant collaboration with competitors. This can seem paradoxical, but a proactive, and not reactive, compliance approach and exchange of ideas in technical meetings or consortia can be beneficial for companies to make their voices heard regarding regulatory inhomogeneity and complexity.

Risk management should therefore be systematically integrated in every project's initial phase, in order to let skilled teams and expertise identify weak spots of regulations and of the market.

Operational risks are also prominent in the packaging industry sector, and they must be curbed through supply chain diversification and planning, translating in the adoption of circular economy and automation strategies to enhance companies' resilience. Referring to the concept of waste, reintegrating waste within the production process has a double function, which is the reduction of environmental impact and general production costs, attractive benefits also in the eyes of stakeholders.

Moving to the sustainability landscape, Alessandra Curci, Cartonpack's Sustainability Manager, underlined the importance of a "realistic sustainability", translating in a sustainable but also saleable product. Strategies in this regard are represented by a complete life cycle analysis of the product, as well as the adoption of eco-design criteria which allow to balance regulatory environmental and commercial requirements.

Supply chain management represents a further critical dimension that companies must manage efficiently. Global events like Covid-19 pandemics, geopolitical crises or environmental disaster require companies to review their supply chain systems to enhance its resilience. A strategic recommendation on this matter is the adoption of digital systems that allow for an end-to-end monitoring of processes, as well as for a constant traceability of products, from their production to their final arrival.

A further focal point is represented by collaboration with social initiatives, like the aforementioned Plastic Bank initiative, which help companies to demonstrate their concrete commitment towards environmental sustainability and social impact.

Cartonpack's case study provide precious examples of powerful practices and strategies for many companies in the same field. Risk management must be considered as a leverage for innovation and development, rather than as a sole defensive measure. At the same time, an effective sustainability dimension can be pursued by integrating

sustainability principles within every layer of the organization, and it must be disconnected by rhetoric but, on the contrary, it must be based on data and technology, and guided by a foresight leadership. Operational flexibility, social awareness, market anticipatory skills and regulatory rigor must be all combined to reach a durable competitive advantage, in a world and context in which sustainability and innovation represent duties, requirements for companies desiring to succeed.

Chapter V

5. FINDINGS

The current research allowed to in-depth analyze Cartonpack S.p.A. case study. This company, an Apulian excellence, operates in the food packaging sector and its peculiarity is the presence of a strong integration between risk management, innovation and sustainability, and its leadership strongly believing this combination of elements can represent a strong leverage for competitive advantage, in a growingly complex and uncertain industrial landscape. This research is based on an empirical approach, and Gioia Methodology is used to collect interviews' evidence. The latter were conducted with the participation of nine corporate employees of the company, whose contributions were crucial to delineate a clear and precise overview of the company's perception and practices regarding regulatory compliance, market pressures, environmental challenges, as well as Cartonpack's ability to see apparent obstacles as opportunities to grow, differentiate, and develop new competencies and products, while strengthening its own market leadership, competitiveness and position.

One of Cartonpack's most effective strategic actions is its voluntary anticipation in the adoption of internationally recognized standards and certification like ISO and BRC, which were powerful in providing the company with ways to strengthen its traceability, lower its environmental impact and for resource optimization, all translating in stakeholder trust improvement and enhancement of reliability and reputation in the market. From this it is possible to understand the value Cartonpack assigns to these powerful tools, considering them as value generating tools, rather than mere regulatory compliance instruments. These were integrated and absorbed at every level of the organization, therefore making every human resource inside the company understand the potential of a well-structured Risk Management system.

Key principles emerged from conducted interviews were the core values of prevention, continuous improvement and inter functional communication which Cartonpack has at the base of its organizational model. The combination of these contributes to what distinguishes Cartonpack from its competitors: its proactive approach to risk. This key distinguishing factor is exemplified by the company's ability to turn challenges and risks like contaminations, global crises and pandemics, regulatory uncertainties and complexities, production inefficiencies, in opportunities, through its adaptive and

dynamic approach based on periodic meetings, precise and accurate data analyses and a foresight leadership structure. This approach allowed to make crucial decision such as the transition to AIA (Autorizzazione Integrata Ambientale) authorization, another complex circumstance in which the company could have chosen to retrocede, but instead it decided to make further progress and face the risk effectively, resulting in significant increase in volume of more innovative production and consequent sales.
Another noteworthy aspect is the stance Cartonpack takes regarding the connection between objectives of economic nature and environmental and social aims. The company's strategies in combining these two complex dimensions translate in a careful balance between impacts, expected returns on investments and costs, as well as eco-design solutions, compostable and recyclable materials usage, and photovoltaic systems adoptions.
Furtherly, the Plastic Bank collaboration initiative represents another example of Cartonpack's commitment towards sustainability not only as a slogan, but as part of the core strategy of the own company.
The company's anticipatory tendency allowed to quickly adapt to unexpected regulations, therefore reinforcing its resilience, therefore finding it easier to accede to new markets and enhancing its reputation.
A central element for this research was the comparison between theory and practice, whereas theories like the Dynamic Capabilities Theory, the Stakeholder Theory, the Contingency Theory and the Activity-Based View allowed to compare and contrast theoretical models with real-world applications.
Delving into the topic, the first mentioned theory, the Dynamic Capabilities Theory, explains Cartonpack's ability to appropriately use its resources to survive and prosper in complex, changing and uncertain contexts; secondly, the company's strategic commitment towards social and environmental causes is conceptualized in the Stakeholder Theory; the Contingency Theory, as third, provides a clear theoretical framework for underlining Cartonpack's ability to adapt to complex and increasingly changing regulations, with the aid of quality verifying methods and traceability measures, therefore allowing the company to adequately operate in such a intricate industry. Ultimately, Risk Management potential in discovering neglected resources or criticalities is aligned with what sustained in the Activity-Based View Theory.

The human factor is a core component of Cartonpack' success, as explained by every interviewee involved in the project.
Every employee in the organization, from those in the most operative functions to the managerial departments, are entirely involved in the achievement of common goals. This shared approach and language has at its base values like quality, security and sustainability, and these all translate in every resource being able to learn from mistakes, communicate ideas, therefore allowing to avoid mistake reiteration and anticipate complexities. A fundamental aspect almost every participant sees at the core of Cartonpack's corporate strategy is the consideration of risk as something which must not be avoided, but rather faced to enhance innovation, improve and deliver value. Risk must be addressed proactively rather than reactively, and this strategy is what enables Cartonpack to be a superior value-generating company.
Thus, evidence from research demonstrate not only peculiarities of a virtuous company like Cartonpack, but also that the integration between risk management, sustainability and innovation is possible and generates numerous advantages, but at some conditions; the leadership guiding the organization must be aware, foresight and free from rhetoric: it must pursue aimed investments and promote a continuous improvement-oriented corporate culture for the well-being both of the company itself and for its human resources. Such companies should think and act according to a proactive vision, rely on data rather than simplistic slogans, and adopt a forward-looking approach to adequately face complexities related to the globalization, sustainability transition and technological innovation era.
To conclude, it is evident how Cartonpack's ability to turn risks in opportunity is the key driver of its success. Its profound belief in learning from mistakes and leveraging difficulties as growth chances can effectively inspire companies seeking ways to face this complex environment in which it is often difficult to survive and prosper. Cartonpack serves as an emblematic example of how it is possible to build and maintain a long-term competitive advantage while not avoiding risks, but by confronting them in a direct way and through a strategic and well-defined approach.

5.1 THEORETICAL AND PRACTICAL CONTRIBUTIONS

This empirical research project provides a contribution to theory due to the combination of the three perspectives of Risk Management, Innovation and Sustainability. These dimensions are often treated and explained separately, while this thesis' objective was to effectively establish connections between them by drawing on theories and models as guiding references.

From the practical point of view, the analysis of the Cartonpack case study enabled to observe the application of discussed conceptualities into concrete operational decisions, challenges and adopted solutions. Findings emerging from this case study provide precious references for companies wanting to prosper in the packaging industry, and strategies to adequately face sustainable innovation-related risks in a glowingly complex and ever-evolving regulatory sector.

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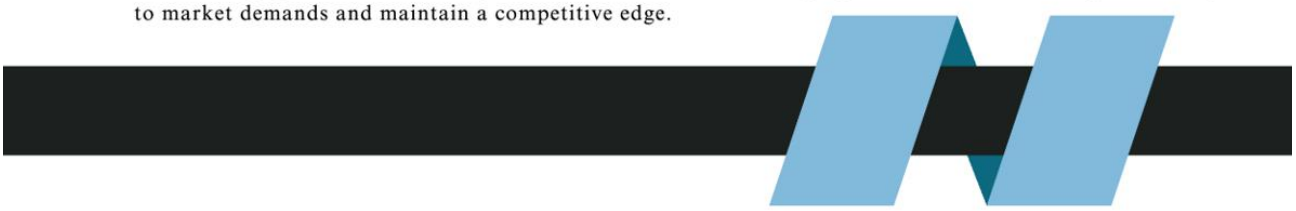
Annex: Interview Transcripts

CHIEF EXECUTIVE OFFICER

Name: Gianni Leone
Gender: M
Interview Date: 14/02/2025
Years of Experience: 25

I: WHAT WAS THE STRATEGIC VISION THAT GUIDED CARTONPACK'S TRANSFORMATION FROM A LOCAL MANUFACTURER TO AN INTERNATIONAL LEADER IN SUSTAINABLE MULTIMATERIAL PACKAGING, AND WHAT WERE THE KEY MOMENTS IN THIS GROWTH?

P: First of all, I would like to make a general premise that applies to all the meetings you will have. Everyone will bring their own experience and vision, but I believe a fundamental aspect will emerge: sustainability is a crucial and necessary issue, but it is often instrumentalized and exaggerated. This leads to the spread of preconceptions that can distort the perception of reality.
To address the issue correctly, it is essential to adopt a 360° perspective.
Defining a product, a behavior, or a strategy as sustainable requires an in-depth analysis based on concrete data and detailed information. Unfortunately, many decisions today are made based on preconceived ideas, without proper fact-checking.
A significant problem is represented by modern communication tools, which often summarize complex concepts in a few lines, generating misunderstandings.
In our sector, that of packaging, this phenomenon is particularly evident. Packaging, and in particular plastic, is constantly under the spotlight and the subject of heated debate at both regulatory and public opinion levels. European regulations have been introduced, some already adopted and others still under discussion, and there will certainly be further changes in the future.
Talking about sustainability is fundamental, but it is equally important to do so with awareness and precision, avoiding rhetoric, superficiality, and unverified information. The first rule for addressing this issue seriously is to be informed, analyze data, and delve into every aspect before drawing conclusions.
As a company, we have adopted a strategic approach to sustainability, consistent with our history and our evolution. We do not position ourselves dogmatically or with preconceived notions, but address the topic with an in-depth knowledge of the sector, its technologies, and its applications.
In the context of sustainable packaging, our strategy has been to follow the market's evolution in a rational and dynamic way. Some might think we had no alternatives, but in reality, our approach was proactive and allowed us to differentiate ourselves from the competition.
The transformation of Cartonpack from a local manufacturer to an international leader in sustainable packaging was guided by a clear vision: putting the market at the center of our decisions. Historically, we were born as a commercial company, which led us to develop a cross-cutting understanding of the sector's needs and its applications.
Packaging has an essential function: to protect, package, and enhance the value of the contained product. Our strategy was to offer a complete range of solutions for the fruit and vegetable sector, our core business, which over time has also expanded into the food industry. Unlike many competitors, who focus only on specific segments, we aimed for a cross-cutting approach, covering all market needs.
This strategy pushed us to develop expertise in different materials and technologies, avoiding becoming fixated on a single solution. A practical example: instead of specializing exclusively in plastic, we also invested in paper, cardboard, compostable materials, and molded pulp. This allowed us to respond flexibly to market demands and maintain a competitive edge.



Our evolution can be compared to that of a large multinational group, which manages internal divisions dedicated to different materials and technologies. We replicated this model on a smaller scale, but with the same ambition: to understand and anticipate market needs by developing innovative solutions.
However, this choice entails significant challenges. Following multiple materials, technologies, and applications requires a high level of expertise, fast learning, and strong innovation capability. It is certainly easier to specialize in a single area and improve progressively, but we chose the more complex path: being versatile and ready to respond comprehensively to market evolutions.
In conclusion, Cartonpack's strategic vision is based on a fundamental principle: understanding the market and setting no limits in the development of new solutions. This approach has allowed us to grow, differentiate ourselves, and tackle the challenges of sustainability in a concrete way, without preconceptions and with a strong focus on innovation.

I: WHAT DO YOU BELIEVE ARE THE FUNDAMENTAL LEADERSHIP SKILLS REQUIRED FOR SUCH GROWTH?

To achieve what we have discussed, it is essential to be able to analyze the critical points of each area and, like an orchestra conductor, manage to coordinate all the elements: some instruments must play first, others later, and all must combine and compensate each other. Leadership lies precisely in the ability to correctly interpret the market, understand what is necessary to achieve certain objectives, and do so with balance and coherence, avoiding poor choices that could compromise the result.
What drives this process is a leadership based on the quality of the products and services offered and on the ability to provide the market with valid and concrete answers. The more a company manages to meet the market's demands, the stronger its leadership position will be. Everyone would like to have the best product at the lowest cost, but to achieve this goal, an in-depth analysis and evaluation of every single internal activity within the company is necessary, identifying what can be done and what cannot.
Once again, leadership is built on this principle: becoming a point of reference for the market. When customers spontaneously turn to a company to solve specific problems, it means they recognize its technical and qualitative leadership. This position of reference is achieved by being guided by the needs of the market and implementing all necessary internal actions to meet them.
In summary, leadership is above all market leadership, which allows the company to grow. This growth, however, is also driven by leadership in terms of product portfolio, product quality, and service quality. In the packaging sector, it is fundamental to understand that, more than a product, it represents a service. It is an activity that requires large investments in capital and production, but in the end, what really makes the difference is the service offered.
Product quality, in fact, is an integral part of the service rather than the other way around: everything starts from the ability to offer excellent service, within which product quality is an essential and taken-for-granted component.

I: WHAT IS THE ROLE OF LEADERSHIP IN PROMOTING A CULTURE FOCUSED ON CONTINUOUS IMPROVEMENT, AND WHAT INITIATIVES HAVE YOU IMPLEMENTED, IF ANY, TO ENGAGE EMPLOYEES?

This is completely natural, because it is clear that everyone would always like to be able to predict and understand market dynamics, anticipating its movements and future directions. Risk is an inevitable component, but the daily goal is precisely to manage it effectively. We do not like to face problems only when they arise, because at that point it would already be too late. For this reason, we adopt a preventive approach, always trying to stay one step ahead.

This philosophy is rooted in the company culture and forms the basis of our risk management strategy. We are structured in an extremely solid way to monitor and mitigate any possible risk, whether managerial or strategic in nature. We carefully analyze market factors and trends to understand which actions to take and prevent any negative impact on business results and our future.

This process takes place through continuous dialogue between the various company roles, each of which contributes with its own expertise. On one side, there are those who analyze market trends; on the other, those who deal with internal management issues, such as workplace safety and environmental topics. In addition, we closely monitor changes in the sector that could compromise the company's long-term competitiveness. At the heart of everything is a constant flow of information and analysis, which then leads to concrete and strategic decisions.

The acquisitions we have made in recent years align exactly with this logic. Every new addition to our portfolio aims to reduce business risk and diversify the product offering, avoiding impulsive or irrational choices. The expansion into areas such as paper, cardboard, molded pulp, and films with special applications was driven by the need to follow market evolution, but always with a rational and balanced approach.

We do not believe that there is a single solution to the issue of sustainability. It is a complex topic that must be addressed with differentiated tools and strategies, adapting to specific needs and application contexts. For this reason, our approach involves careful and flexible analysis, capable of combining different technologies and materials according to the real needs of the market.

I: DO YOU BELIEVE IN A PROACTIVE APPROACH TO RISK, BASED ON PREVENTION RATHER THAN REACTION, FORECASTING FUTURE SCENARIOS, AND STRATEGIES TO MINIMIZE NEGATIVE EFFECTS?

The corporate culture is based on the dissemination of these principles, which are not just theoretical concepts but are transmitted and shared on a daily basis. Creating a culture means spreading ideas, stimulating awareness, and helping everyone understand what is happening in the market. It is essential that every person within the company has a clear vision of the context in which they operate, without being confined to an isolated or perspective-less role.

For this reason, we constantly encourage dialogue with the outside world and engagement with the market. The dissemination of information is a key element and is supported by constantly updated internal communication tools, through which we share data, analyses, and reflections. We create moments of discussion and exchange that allow each person to develop greater sensitivity and awareness.

The goal is to ensure that anyone, when faced with certain topics, already has all the tools needed to evaluate them clearly. If, instead, a person is confined to carrying out a single activity without any exchange, they risk remaining closed off to these aspects. For this reason, we continuously promote the sharing of ideas and knowledge, because we believe that only through discussion and continuous learning can a truly solid and dynamic corporate culture be created.

I: STARTING AS A FAMILY BUSINESS, DID YOU ENCOUNTER INTERNAL RESISTANCE TO CHANGE DURING YOUR JOURNEY OF TECHNOLOGICAL EVOLUTION? IF SO, WHAT STRATEGIES DID YOU ADOPT TO OVERCOME IT AND ENCOURAGE THE ADOPTION OF NEW TECHNOLOGIES?

It is a natural process, because there is no precise formula or on-off system that can be applied automatically. These changes happen gradually, through the daily management of evolving situations and the challenges that arise. There are no tools capable of suddenly transforming a company's reality; everything is built step by step, like a building that takes shape brick by brick, in a physiological way and in response to the company's needs.

In our case, the transition from a family business to managerial management was accelerated by the presence of an institutional investor. This brought about greater structuring and an acceleration of certain processes, leading the company to redefine its organizational structure. The dynamics are no longer solely those typical of a family business but become a combination of the company's founding values and the rigorous logic of managerial governance.

It is normal for there to be internal resistance, as with any change process. Each resistance must be addressed and managed individually, trying to involve all people in the company's evolution journey. In many cases, this approach brings the desired results, while in others it can prove more complex. However, it is part of business management and is an inevitable step.

If a company grows, evolves, and constantly faces new challenges, this transformation journey is not an option, but a necessity. It is a necessary evolution that allows the company to adapt, structure itself, and remain competitive over time.

I: HOW DID YOU STRUCTURE THE STRATEGY TO ANTICIPATE AND TRANSFORM REGULATORY CHANGES INTO OPPORTUNITIES?

As I mentioned earlier, over the past five, six, seven years, there has been a strong push toward sustainability, with regulatory changes moving in this direction. However, in the packaging sector, there is often more talk than actual implementation. What reaches the consumer and the average citizen is an amplified image compared to the concrete reality of the industry.

We constantly hear about "plastic free" and the elimination of plastic, but when you analyze what is actually happening in the sector, the numbers show that the change is much more limited than the general perception suggests. This is not because companies do not want to evolve, but because there are structural, economic, and practical limits that slow down the large-scale adoption of certain solutions.

An effective comparison is with electric cars. If it were truly the most efficient and economically sustainable system, we would all be driving electric vehicles today. In reality, their development is hindered by the lack of infrastructure, high costs, and technical limitations. The same applies to packaging: in theory, certain alternative solutions could be adopted, but in practice, one must consider the side effects. For example, if a less effective package compromises the protection of a food product, it results in much higher food waste than what would occur with traditional materials. It's a complex balance that must be evaluated carefully.

Faced with these regulatory changes, we chose a different approach compared to many other players in the market. Instead of clinging to a single solution and defending it at all costs, we decided to challenge ourselves. We analyzed market demands without adopting extremist positions, but rather by trying to deeply understand the context. We began working with materials that are now considered more sustainable, but gradually, carefully studying the evolution of the sector before making definitive choices.

This strategy is proving to be the right one. We are observing that the push toward sustainability, while strong in communication, is in reality more complex and multifaceted. There are certainly elements that support its spread, but also many factors that limit its full realization.

I: WHAT WILL BE THE MAIN FUTURE CHALLENGES FOR CARTONPACK IN SUSTAINABLE PACKAGING, AND WHAT STRATEGIC DRIVERS WILL BE ESSENTIAL TO FACE THEM AND MAINTAIN YOUR COMPETITIVE ADVANTAGE?

The challenges remain the same: understanding market trends and being ready to seize them in the best possible way. To succeed in this, significant work is required, involving technical investments, acquisition of know-how, and the development of professional skills. Over time, this commitment becomes increasingly intense, because our strategic choice was the most complex one: stepping out of our comfort zone and engaging in open competition with the market, putting ourselves to the test in a broader competitive context.

We could have remained within our established scope, relying on the knowledge and skills acquired over time, but this option would have entailed risks, including the possibility of losing touch with market evolution. Instead, we chose to take on new challenges, entering sectors and areas we had never explored before.

Our approach was gradual: initially, we studied the new contexts, then we started experimenting, later we refined our skills and, over time, we became more and more experienced, until we aimed for leadership in those areas. This growth process requires a continuous investment of resources and professional expertise, making everything increasingly complex as we move forward.

The real challenge for the future will be precisely this: to continue investing in growth, innovation, and the expansion of our skills, maintaining the ability to adapt to market evolutions without ever stopping.

I: HOW DO YOU ASSESS THE EFFECTIVENESS OF STRATEGIC DECISIONS IN RESPONSE TO CRITICAL RISKS, AND WHAT REVIEW PROCESSES, IF ANY, DO YOU USE TO CONSTANTLY IMPROVE THE STRATEGY?

The effectiveness of strategic decisions in response to critical risks can only and exclusively be assessed through numbers. This is why we are all called upon to monitor them carefully. Meticulous control of numbers and processes, constant analysis of performance, and a deep understanding of what we do are fundamental elements for effective management.

The perceptions and intuitions of the entrepreneur or manager are certainly important, but they must always be validated by data. Sometimes, one might have a conviction about a certain situation, but then, by looking at the numbers, it becomes clear that the reality is different.

The only objective method for evaluating business decisions is therefore data analysis. Numbers, as cold and impersonal as they may seem, are the essential tool for measuring performance and making informed decisions. For this reason, they must be constantly monitored and rigorously analyzed.

I: HOW DO YOU BALANCE OPERATIONAL SUSTAINABILITY WITH THE NEED TO GENERATE PROFITS AND GROW, AND HOW DOES THIS BALANCE GUIDE YOUR LONG-TERM STRATEGIC DECISIONS?

We have not adopted a sustainability-at-all-costs strategy, because sustainability, to be genuine, must truly bring benefits to society and consumers, as well as be accepted and embraced by the market. We are not a benefit corporation; we operate for profit in the interest of our partners, shareholders, and investors. For this reason, the initiatives we undertake must indeed move in the direction of sustainability, but they must also be understood and adopted by the market.

Even today, there are solutions demanded by the market, but many others are still not truly accepted. Our strategy is to offer a wide range of options and choices, remaining neutral with respect to individual solutions. While we have our own vision and opinion, we let the market determine which materials and approaches are best suited. Often, in fact, the market reasons more with its gut than with logic.

If a regulation imposes a change, then there is no room for discussion: companies must comply. However, as of now, there are still no strict regulations that impose absolute constraints on many sustainability-related issues. A symbolic example is the requirement that, starting in 2025, plastic bottles must contain at least 25% recycled plastic. In theory, this rule should already be in the implementation phase, but in reality, there are no effective controls. There is no body that precisely verifies whether each company complies with this percentage.
Just think of the major plastic bottle producers: despite being among the most visible players on the market, many have not yet implemented the use of recycled plastic in their bottles, and certainly not in the required percentages. This shows how the market is still confused and how sustainability, to be concretely adopted, must first find a balance with economic sustainability.
You cannot expect to impose a transition without considering the costs for the end consumer. If, for example, the packaging of a product goes from accounting for 5% to 20% of the final price, it becomes unsustainable for many families. Someone shopping at a discount store cannot afford to pay a surcharge just for the packaging, if they are already struggling to cover essential expenses like utility bills.
This is the reality of today's market: there are trends, evolving regulations, and grand statements about sustainability, but in practice, the change is gradual and also depends on the market's ability to absorb certain costs and adapt in a sustainable way not only environmentally, but also economically and socially.

I: THANK YOU FOR THE CONVERSATION. BEFORE WE CONCLUDE, DO YOU BELIEVE THERE ARE ANY OTHER ASPECTS OR ELEMENTS THAT COULD BE USEFUL TO ME?

It is essential to correctly frame the topic of sustainability. It is undoubtedly an important issue, but one must also consider the actual impact of packaging on global carbon footprint emissions. Environmentally speaking, packaging accounts for about 5% on a global scale, yet our sector is often at the center of attention and criticism. It's like picking on the lame horse, while there are industries with a significantly greater environmental impact that, however, receive less attention.
This media overexposure is partly the result of propaganda and the simplified communication of certain media and influencers. It is much easier to talk about plastic in the oceans than to carry out a detailed analysis of the Life Cycle Assessment (LCA). The latter requires data, technical knowledge, and an in-depth analysis of processes, while creating a post with the image of a turtle with a piece of plastic in its mouth is immediate and emotionally impactful.
What is needed is a change in perspective, which will take time. A higher level of awareness is necessary so that the average consumer, like Mrs. Maria who does her shopping at the supermarket, can better understand the data, the information, and the real meaning of sustainable choices. At the moment, many of these dynamics are completely outside common knowledge, but with clearer and more in-depth communication, it will be possible to reach a greater collective awareness.

CHIEF FINANCIAL OFFICER

Name: Federico Saraconi
Gender: M
Interview Date: 14/02/2025
Years of Experience: 8

I: WHAT ARE THE MAIN FINANCIAL RISKS YOU IDENTIFY WHEN EVALUATING INVESTMENTS IN TECHNOLOGICAL INNOVATION?

P: In any investment, it is essential to evaluate the return on investment by analyzing the impact on both production and the people involved.
When it comes to investments in technological innovation, it is important to structure well-defined contracts to avoid the risk of excessive customization by consultants.
If a system is overly customized, the company risks becoming too dependent on the consultant.
This aspect is crucial because, in cases of excessive customization, the cost of the investment is not limited to the initial expense but also includes recurring costs for potential updates and ongoing dependence on the service provider.

I: HOW DO YOU MEASURE THE EFFECTIVENESS OF THE BUDGET ALLOCATED TO INNOVATION AND RISK MANAGEMENT PROJECTS?

To evaluate the effectiveness of innovation projects, it is essential to monitor the results over time.
If the technological innovation involves production, one should assess whether the productivity of machines and personnel has improved.
If the innovation is implemented in other areas, such as administration, monitoring might focus, for example, on reporting, evaluating whether the time required to complete certain tasks has decreased—thus freeing up resources for other activities.
Observing results always requires a period of adaptation, as the effects of innovation are not immediate but emerge gradually as new tools and processes are integrated.

I: HOW DO YOU BALANCE THE HIGH INITIAL COSTS ASSOCIATED WITH NEW PROJECTS WITH THE EXPECTED LONG-TERM BENEFITS?

In the initial investment phase, the goal is always to optimize it by assessing whether there are tools or available funding that can help reduce the financial impact of the investment.
This is the first analysis to carry out in order to make the operation more sustainable.
Subsequently, as mentioned earlier, it is essential to determine the appropriate return on investment by analyzing the expected benefits and the time required to recover the costs, ensuring that the investment is truly advantageous in the medium to long term.

I: COULD YOU SHARE AN EXAMPLE OF A SIGNIFICANT FINANCIAL CHALLENGE THAT CARTONPACK HAS FACED AND EXPLAIN HOW IT WAS MANAGED TO MINIMIZE RISKS AND ENSURE THE COMPANY'S STABILITY?

We are currently managing a significant financial challenge related to a major innovation investment for Carton Pack. To minimize the risk, we have adopted a structured approach, dedicating over a year to the selection of the supplier and the definition of the contract before proceeding with the investment.

We have created a detailed handbook, a sort of operational guide that gathers all the necessary actions to be taken. This method helps to avoid unforeseen issues, allowing a clear vision of the project from the very beginning.
If the initial phase is not managed properly, there is a risk of starting the project and discovering, during its execution, flaws that could have been anticipated. For this reason, it is essential to dedicate the right amount of time to the initial assessment, without rushing to get started.
A thorough analysis allows potential critical issues to be identified in advance and helps reduce later problems, even though it is natural that some aspects only emerge during implementation.
The important thing is to carry out the maximum amount of preparation work before starting the project, in order to ensure more effective and structured management.

I: HAVE YOU FACED AN INCREASE IN COSTS DURING THE TRANSITION TO SUSTAINABLE SOLUTIONS? IF SO, HOW DID YOU MANAGE THIS TRANSITION, BALANCING SUSTAINABILITY AND ECONOMIC COMPETITIVENESS?

Sustainable solutions inevitably involve an increase in costs. For example, paper costs three times more than plastic, while molded pulp can be up to five times more expensive.
From our point of view, this impact is generally passed along the chain—in the sense that, as a manufacturing company, the cost is ultimately transferred to the end customer. Therefore, the issue does not fall so much on the company itself but rather on the end user, that is, the consumer.
It should be noted that the term "sustainable solutions" is not always entirely accurate, as the sustainability of a material must be demonstrated through a complete life cycle analysis. However, it is undeniable that these materials carry higher costs, both in terms of raw materials and logistics.
For example, a truck can transport a significantly larger quantity of plastic containers compared to paper ones, which results in higher transportation costs. Moreover, paper processing requires high gas consumption, further increasing production costs.
For us, however, this economic impact remains a cost that can be transferred along the supply chain, eventually reaching the final market.

I: HOW DO YOU MANAGE THE RISK OF FLUCTUATIONS IN THE PRICES OF SUSTAINABLE RAW MATERIALS?

As mentioned, the additional cost resulting from the adoption of new solutions is passed on to our customers. The objective is to understand the true cost of a new solution while at the same time trying to maintain the profit margin unchanged.
This means carefully analyzing all cost factors, from raw materials to production and logistics costs, in order to determine a price that is sustainable for both the company and the customer. The challenge lies in balancing the increase in costs with an effective pricing strategy, ensuring competitiveness in the market without compromising profitability.

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I: WHAT STRATEGIES DO YOU ADOPT TO OPTIMIZE CASH FLOWS DURING PERIODS OF INTENSIVE INVESTMENT, SUCH AS THE DEVELOPMENT OF NEW TECHNOLOGIES OR THE INTRODUCTION OF SUSTAINABLE MATERIALS?

The introduction of sustainable materials does not represent a true investment for us, but rather an evolution of our regular business, as it simply involves producing a variant of the standard product.
The situation is different when it comes to new technologies, which do fall under actual investments. As a manufacturing company, our main investment is in machinery, as it represents the core of our industrial process.
Cash flow management varies depending on the type of investment and the time of year. There are periods when the situation is more stable, and others when seasonal peaks can affect financial availability, making more careful planning of resources necessary.

I: DO YOU COLLABORATE WITH R&D OR PRODUCTION TO ENSURE THAT INVESTMENT DECISIONS ARE BASED ON A CLEAR COST-BENEFIT ANALYSIS OF THE INNOVATION?

Yes, there are connections between the various departments, both internal and external. When a project is launched, it is essential to ensure that it provides an adequate return—not only from a financial standpoint but also in terms of commercial and market impact.
For this reason, integration between departments is crucial in order to evaluate all aspects of the investment and ensure its long-term sustainability. A unified approach allows for more informed decision-making and maximizes the overall benefits of the project.

I: WHAT IS YOUR APPROACH TO MITIGATING THE FINANCIAL RISKS OF DELAYS OR FAILURES IN INNOVATION PROJECTS? DO YOU HAVE STRATEGIES IN PLACE TO MONITOR AND INTERVENE QUICKLY?

A delay in an innovation project does not represent a significant problem, as it ultimately just means starting later in an otherwise stable situation, without causing immediate critical impacts.
The approach to managing an innovation project always involves the initial definition of a timeline, which serves as a reference for the development phases. The person responsible for the project is tasked with monitoring its progress, ensuring that milestones are met, and regularly reporting on the status of the activity, in order to maintain control over the project's evolution.

I: THANK YOU FOR THE CONVERSATION. BEFORE WE CONCLUDE, DO YOU BELIEVE THERE ARE ANY OTHER ASPECTS OR ELEMENTS THAT COULD BE USEFUL FOR ME?

No

CHIEF OPERATING OFFICER

Name: Marco Gabriele
Gender: M
Interview Date: 14/02/2025
Years of Experience: 10

I: WHAT OPERATIONAL CHANGES HAVE YOU INTRODUCED WITH THE ADOPTION OF ISO 9001 AND ISO 14001 CERTIFICATIONS, AND WHAT CONCRETE IMPROVEMENTS HAVE YOU OBSERVED IN EFFICIENCY, QUALITY, AND SUSTAINABILITY?

P: The first consideration I can make is that the adoption of the certifications has helped bring order to business management, allowing us to standardize what Cartonpack has always tried to do in the best possible way. These are not processes that revolutionize the company, but rather tools that enhance it, enabling better organization of what already exists.
One of the positive effects of this process is that, just like when tidying up a house, unexpected resources are discovered, inefficiencies that were previously hidden are identified, and it becomes easier to better optimize human resources, enhancing the contribution of each person to the company's success.
Standardization also represents an important fight against waste, which can involve time, materials, energy, or procedures. Often, the lack of standardization makes processes less efficient, whereas more structured management allows streamlining and improving workflow.
We introduced significant process changes to reduce product variance from expected standards. Moreover, we improved performance monitoring by introducing new KPIs that were not previously evaluated systematically. Employee engagement has also become more effective, with a more structured approach to training and information sharing.
In particular, we implemented One Point Lessons (OPLs), graphic and concise tools that, in just a few points, guide operators in procedures and daily operations on machines and in the plants. This has improved operational clarity and the management of production activities.
Another relevant aspect concerns supplier selection, which now takes place with particular attention to sustainability criteria. This process did not result in upheaval, but it allowed for improved overall management, ensuring more conscious and strategic choices.
As a result of these changes, we have observed several benefits:

- From a process standpoint, the frequency of real-time detected errors has decreased.
- From a performance standpoint, there is greater adherence to predefined standards.
- From a sustainability standpoint, we have achieved a reduction in waste and an improvement in the use of internal resources, with a circular economy perspective.
- From a quality standpoint, there has been a significant reduction in non-conformities.

These improvements demonstrate that certification and standardization are not mere bureaucratic obligations, but tools that bring concrete benefits, helping to make the company more efficient, sustainable, and competitive.

I: HOW HAS THE INTEGRATED ISO/BRC SYSTEM INFLUENCED RISK MANAGEMENT IN OPERATIONAL PROCESSES, ESPECIALLY IN HYGIENIC-SANITARY SAFETY AND SUSTAINABILITY, AND CAN YOU CITE A CONCRETE CASE OF PREVENTION OR MITIGATION?

Can you cite a concrete case of prevention or mitigation?

The HACCP approach to quality management is undoubtedly an integrated method that allows us to systematically and regularly monitor what we have identified as the critical points of the process. This principle was already present in the company before the adoption of a formal management system, since serving highly regulated markets requires rigor and constant attention to both process and product.

The materials we produce fall under the MOCA regulation (Materials and Objects in Contact with Food), which imposes high standards in terms of quality and safety. Our efforts have always been aimed at ensuring products that meet expected standards and maximum standardization.

Even before the introduction of management systems, the company had developed structured processes—initially informally, then gradually formalizing them with the expansion of the company and the evolution of technologies available on the market. This allowed us to optimize the coding and lot tracking of the product throughout the entire production cycle, both for raw materials and semi-finished goods coming in, and for finished products going out.

Thanks to this structure, we can now guarantee complete traceability of the product at every stage of the production process and the technologies used. Moreover, this system allows for more precise management of any non-conformities, enabling rapid and effective interventions.

The adoption of the BRC standard represented a further step forward in this journey, helping us to further improve already existing processes. Although many of the tools were already in use to meet the requirements of our target markets, BRC provided an even more solid framework and fostered continuous improvement.

Over the years, this topic has remained in constant evolution, because the goal is to always stay up to date with the best technologies available on the market.

A concrete example of prevention and risk mitigation of contamination was the intervention carried out in 2022 in the flexible film division, which deals with the processing and transformation of printed film through processes such as lamination, cutting, and printing.

In this part of production, flexible film was being cut using cutters with snap-off blades. Although no actual contamination had ever occurred, risk analysis revealed a potential critical point: during work shifts, a snap-off blade could accidentally break and end up inside a reel during the winding phase.

If a risk matrix were applied, considering the probability of the event and its impact, the result would be highly critical. Even with a medium probability, the presence of a blade fragment in film intended for the food industry would have a devastating impact on the company's reputation and could generate significant damage.

For this reason, after assessing the food safety risk, we initiated an improvement action, which included:

- The complete elimination of snap-off blade cutters in the company.
- An analysis of suppliers and the best technologies available on the market.
- The widespread adoption of fixed-blade cutters, which cannot break or accidentally disperse into the product.

This intervention represented another step forward in our commitment to safety, demonstrating how preventive risk analysis can lead to concrete improvements in the quality and reliability of our processes.

I: WHAT KPIS DO YOU USE TO MEASURE OPERATIONAL EFFICIENCY, AND HOW DO THESE DATA HELP YOU IDENTIFY IMPROVEMENTS AND MANAGE CRITICAL EVENTS SUCH AS DISRUPTIONS OR REGULATORY CHANGES?

As a matter of company policy and culture, we use performance indicators in a targeted way, avoiding excessive or superfluous use. This approach is based on the belief that, in a company with numerous production processes, measuring everything without a clear criterion can turn into a stylistic exercise without real usefulness.

Our goal is therefore to focus on a few essential KPIs, concentrating on truly significant aspects. For example, in the area of quality and food safety, even though we could measure an infinite number of parameters, we choose to monitor a single key indicator: the non-conformity rate. For us, this KPI is more than sufficient to evaluate the quality of our work.

As for efficiency, we use a widely adopted industrial indicator, OEE (Overall Equipment Effectiveness). This KPI allows us to evaluate at a glance the availability of the plant, the quality of the finished or semi-finished product, and the overall performance of the plant itself.

We also directly measure production waste in some processes, while in other cases we calculate it ex post, using formulas consolidated over time.

On the sustainability front, the most significant KPI for us—as an energy-intensive company—is an energy efficiency indicator. We monitor the ratio between the kilograms of product produced and the kilowatt-hours consumed in the production process (Kg/KWh), which allows us to keep the energy efficiency of our plants under control.

Regarding the supply chain, another fundamental KPI is the on-time delivery rate, which allows us to assess the reliability and efficiency of logistics.

On a daily basis, these four or five KPIs are discussed directly in the departments through a 10-minute daily meeting involving the production planning team, shift supervisors, and maintenance. Any issues that are not resolved immediately are then explored in the weekly meeting, which lasts about an hour and is also attended by the operations director. This meeting serves to analyze critical issues that have emerged from the field and to find more structured solutions.

Finally, on a monthly basis, a meeting is held with the finance team and the CEO, in which production data is analyzed from a broader perspective.

We do not believe in universal models that apply to every business reality, but we strive to develop a monitoring system that is truly effective for our needs, ensuring more targeted and functional management.

I: WHAT STRATEGIES AND PROTOCOLS DO YOU ADOPT TO ENSURE A RAPID AND EFFECTIVE RESPONSE TO UNFORESEEN CRITICAL EVENTS, MINIMIZING THE IMPACT ON OPERATIONS AND THE SUPPLY CHAIN?

From a strategic point of view, the first fundamental step is always risk analysis and assessment. However, this process would be meaningless if it were not accompanied by continuous and timely monitoring.

In the past, this activity was managed on paper and based on operators' declarations. Since 2017, thanks also to technological innovations and Italian regulations, the company has adopted a much more structured approach, establishing a true synergy between Carton Pack and Industry 4.0.

Today, our production processes are "talking," thanks to a two-way dialogue between the company's information system and the machines' PLCs, which allow us to monitor in real time what is happening at machine level. This system not only ensures more accurate control, but also enables us to detect process deviations—that is, deviations from the predefined standards.

A perfect production process does not exist, and it is normal for variations to occur from the ideal parameters. However, our ability to promptly identify these deviations and intervene quickly represents a strategic advantage.

In the past, this monitoring was carried out manually with the available means.

With the progress of digital technologies and the evolution of the 4.0 transition, the IT sector and industrial automation have made this system increasingly reliable, thanks to integration with electronics and machinery.
Once risk assessment is completed, performance indicators are monitored, and process deviations are analyzed on production lines and plants, the next step is to intervene in case of discontinuities or anomalies.
Regarding the supply chain, we adopt a strategy common to many companies, but with an even stronger commitment to supplier diversification to avoid production disruptions.
Operational management follows a well-defined structure, with daily, weekly, and monthly meetings, also attended by the CEO. One of our fundamental rules is the immediate shutdown of production processes when risks related to food safety or worker safety are identified.
To support these controls, we have an internal laboratory that allows us to perform tests on products. However, to ensure additional levels of verification, we also collaborate with accredited external laboratories, which independently monitor the quality of our products.

I: WHAT CHALLENGES OR RISKS DID YOU FACE WHEN INTRODUCING INNOVATIVE TECHNOLOGIES, AND HOW DID YOU OVERCOME THEM?

This is an interesting question, one I have reflected on for a long time. When a company grows and continues to do so through constant and significant investments, it is inevitable that the introduction of new technologies brings important advantages, but at the same time entails a series of risks.
Carton Pack has always had a natural vocation for continuous investment, particularly in capital goods functional to the transformation of raw materials and the production of products aligned with market needs.
There is also a more “romantic” aspect to this vision, which concerns the way the company has faced entrepreneurial challenges over the years. Doing business in Southern Italy—and doing so successfully for over seventy years—requires not only rigor in investments and processes, but also a certain degree of strategic foresight. In this sense, the leadership of Gianni Leone, one of the most visionary people I know, has played a fundamental role.
Growing sustainably means anticipating market needs and equipping oneself with the necessary technology to effectively respond to changes. This approach has led us, over the years, to introduce a wide variety of technologies and heterogeneous systems, precisely because our philosophy is not to launch a product and wait, but to observe and understand market movements, and then equip ourselves with the most suitable solutions to best serve our customers.
Sometimes, this also means acquiring companies rather than new technologies, depending on the most effective strategy.
Doing business in the South, as we know, is not easy. However, the financial effort this entails can be mitigated through funding opportunities and incentives available at regional, national, and European levels. For example, in the past we have benefited from funding from the Region of Puglia, from tools provided by national legislation, and more recently from European resources linked to the PNRR and the Transition 5.0. Knowing how to tap into these funding levers is a crucial element to support a continuous and structured investment plan.
Beyond the financial challenge, another key aspect in introducing new technologies is change management. Change management is not just about production processes, but above all about people.
Technological changes involve cultural transformations—often slow and complex—that require support, training, and a solid corporate structure capable of actively supporting and involving all organizational levels. It is essential to create constant dialogue with those involved in production processes, gathering their ideas and experiences, so that the technological transition occurs effectively and with shared commitment.
Another challenge, often underestimated, is the compatibility between new technologies and existing infrastructure.

The adoption of a new technology always appears to be a major step forward, but if it is not properly integrated with systems already in use, the risk is that it will remain unused or that the investment will materialize only financially, without resulting in real operational benefit. This is the worst-case scenario, because not only does it block the modernization process, but it also prevents the company from turning innovation into a real competitive advantage.
In all these scenarios, the market remains our compass.
When the market demands, is about to demand, or shows signs of evolution toward certain products or technologies, Carton Pack chooses to embrace the challenge of change, investing and adapting with maximum flexibility.

I: ARE THERE TRAINING PROGRAMS DEVELOPED TO SUPPORT TEAMS DURING SIGNIFICANT CHANGES, SUCH AS NEW TECHNOLOGIES OR ISO CERTIFICATIONS, AND HOW DO YOU ENSURE A RAPID ADAPTATION OF PERSONNEL?

Changes and adaptations never happen quickly. Those who approach these processes with the idea that everything can take place in a short time risk overreaching.
Even the management models you mentioned and have referred to in this work are fundamental tools for creating a unique, integrated, and structured training plan. For us, this means a synergistic effort between the Human Resources department and the other people involved in the various company processes.
The unified training plan is something we strongly believe in and that involves a significant number of people within the company. It may seem like a simple concept, but in reality, it is essential.
To support this commitment, the company has a training room with a capacity of 80 people—an ideal number to manage training for all staff through multiple shifts. This room is frequently used, as adopting new technologies, managing change, and learning to maintain company standards are processes that require continuous and thorough training.
In addition to classroom training, we also place great importance on on-the-job training, meaning direct support at machine-side on all newly adopted technologies. This approach allows for the consolidation of skills and ensures that change is effectively absorbed by the entire organization.

I: DO YOU COLLABORATE WITH THE R&D TEAM TO ALIGN OPERATIONAL PROCESSES WITH INNOVATION GOALS? IF SO, HOW?

Every day there is an intense exchange of information between the teams involved in prototyping, researching new materials, and transforming ideas into concrete products. This process does not end with the design phase, but continues through to the machine setup stage—a step that is anything but trivial and requires close collaboration among colleagues.
Internal communication between departments is a crucial aspect and must always be carefully monitored. Effective corporate communication allows problems to be anticipated and resolved proactively, avoiding issues that could arise in later stages.
When the flow of information is well managed and shared, the entire production process benefits, ensuring greater efficiency and reducing unexpected events.

I: THANK YOU FOR THE CONVERSATION. BEFORE WE CONCLUDE, DO YOU BELIEVE THERE ARE ANY OTHER ASPECTS OR ELEMENTS THAT COULD BE USEFUL TO ME?

I want to share a reflection that might be useful to you: the human aspect is crucial to the success of innovation. The involvement of people, effective communication, and the ability to make everyone feel part of the change are fundamental elements.

The idea is to allow each person to claim the change as their own, to adopt that piece of transformation within the company, and to imagine having a part of it to take care of. Creating this corporate culture is a complex process, because it is both a cultural and a human change, but precisely for this reason, it is also stimulating and compelling.

I believe this is one of the keys to success, because it concerns change leadership, but also the value of people. When it's said that companies are made of people, it really is true: technology may arrive late, processes may change a thousand times, but if the change is shared and experienced together, then it works.

At the same time, it is essential to constantly monitor the market and customers, to understand the challenges they are facing, and to be close to them by anticipating their needs and offering concrete solutions.

Finally, a reflection that I probably wouldn't have made a few years ago, but that I now consider essential: it is no longer conceivable to separate industrial and production processes from a strong focus on environmental sustainability. Integrating ESG indicators with operational ones is not only a necessity, but also a strategic opportunity that can make the company more resilient and competitive in the long term.

R&D MANAGER

Name: Toni Azzella
Gender: M
Interview Date: 14/02/2025
Years of Experience: 11

I: WHAT ARE THE MAIN CRITERIA YOU USE TO IDENTIFY TECHNOLOGICAL INNOVATION OPPORTUNITIES?

P: The identification of technological innovation opportunities in the food packaging industry is primarily based on environmental sustainability needs, efficiency (both in production and use, by the customer as well as the end consumer), and food safety.
Regarding environmental sustainability, we were one of the first companies to use, in almost all of our products, 100% recycled and fully recyclable plastic. With regard to paper and cardboard packaging, we mainly use materials sourced from sustainably managed forests, and as far as films are concerned, we aim for them to be compostable or at least recyclable.
We are constantly committed, through the study of shapes that allow it, to a substantial reduction in the amount of plastic material used in our products. We also strive to contribute to the recyclability of materials by simplifying the separation of components or using mono-materials that are easily handled in recycling centers.

I: WHAT ARE THE INNOVATIVE TECHNOLOGIES YOU HAVE INTRODUCED IN THE COMPANY THAT HAVE PROVEN TO BE MOST SUCCESSFUL IN TERMS OF EFFICIENCY, SUSTAINABILITY, OR PRODUCT IMPROVEMENT?

P: In recent years, mainly through technologies aimed at reducing the thickness of plastic materials (and consequently their weight) without compromising the functionality of the products, in order to reduce resource usage for the benefit of environmental sustainability, as well as to lower production costs.
Regarding films, we offer our customers advanced barrier properties—materials that prevent the penetration of oxygen, light, or moisture—thus contributing to extending the shelf life of food products.

I: WHAT ARE THE MAIN RISKS YOU ENCOUNTER IN THE DEVELOPMENT OF NEW TECHNOLOGIES OR PRODUCTS?

P: One of the main risks is certainly represented by potential non-compliance with regulations.
The food packaging industry is, in fact, highly regulated, with laws concerning food safety, the environment, and material recycling. This is made more difficult by the fact that regulations change frequently and that there are differences between various countries.
For example, one of the most recent European regulations is the PPWR (Packaging and Packaging Waste Regulation), in force from February 1, 2025, with the goal of contributing to the transition toward a circular economy by establishing a per capita packaging waste reduction of 15% by 2040.
Another risk is that new packaging materials must be tested and approved for food use, which can require long and costly periods to obtain the necessary certifications.

I: WHAT STRATEGIES AND TOOLS DO YOU ADOPT TO MANAGE AND MITIGATE THESE RISKS, ENSURING THE SUCCESS OF THE PROJECTS?

P: Mainly a strategic planning followed by a methodical approach to the evaluation of potential risks (technological, economic, regulatory, etc.) through a SWOT analysis (Strengths/Weaknesses/Opportunities/Threats) and FMEA (Failure Mode and Effects Analysis), used by our Research and Development team to identify from the outset potential sources of errors in products or processes, recognizing their importance and assessing them in order to develop preventive measures to avoid them. In this way, it is possible to avoid or significantly reduce high control and error costs.
We also make use of small-scale testing: laboratory tests and pilot trials to assess the quality, safety, and reliability of new packaging and related materials under real conditions. Our tests include compatibility between materials and food, resistance to changes in temperature and humidity, and environmental degradability analysis.

I: WHAT DIFFICULTIES DO YOU ENCOUNTER IN INTEGRATING SUSTAINABLE MATERIALS INTO YOUR PROJECTS, AND WHAT SOLUTIONS DO YOU ADOPT TO MEET REGULATORY REQUIREMENTS AND MARKET DEMANDS?

P: Sustainable materials often do not offer the same performance as traditional materials such as plastic (for example, in terms of strength, durability, and ability to protect against external agents like moisture and oxygen). Therefore, to improve the performance of sustainable materials, we also collaborate with companies and university research centers (such as the University of Bari and Foggia) that are active in the development of materials that enhance food preservation and extend shelf life. Sustainable materials, especially bioplastics, are often more expensive than traditional materials such as conventional plastic, and this can make packaging more costly, with impacts on the final price of the product. The two main strategies we are implementing to increasingly introduce sustainable materials into food packaging are focusing on an economy of scale while simultaneously carrying out innovations in production to reduce costs.

I: HOW DO YOU INCORPORATE FEEDBACK FROM CLIENTS AND STAKEHOLDERS IN THE DESIGN OF NEW PRODUCTS? DO YOU HAVE STRUCTURED MECHANISMS TO COLLECT AND IMPLEMENT IT?

P: For years, we have established constant feedback with major national and international large-scale retail chains (GDO), from which we receive the most important and useful information. They communicate to us both their needs and those of the end consumers, gathered through market research, surveys, or focus groups; this includes information regarding needs, preferences, and issues related to packaging. We use these tools to understand what type of packaging would be most appreciated in terms of ease of use, aesthetic appeal, preferred materials (including sustainable ones), practical features (easy opening, preservation, etc.), product protection and preservation, and the ease of disposal or recycling of the packaging.

I: HOW DO YOU MEASURE THE SUCCESS OF THE TECHNOLOGIES DEVELOPED BY THE R&D TEAM?

P: The main methods we use are the evaluation of innovation and novelty. This can be measured in terms of "patentability," that is, whether the innovation is sufficiently new to deserve protection through a patent, or if it has a tangible impact in overcoming previous technical limitations. We measure the success of the technologies developed also in terms of reliability and operational performance. In other words, whether the technology offers clear advantages in terms of efficiency, reduction of costs, and performance compared to previous solutions. We therefore also evaluate the results of benchmark reports with competing technologies, long-term reliability, and the feedback return from the initial cycle of the new packaging.

I: DOES YOUR R&D DEPARTMENT COLLABORATE WITH OTHERS IN DEVELOPING INNOVATIVE SOLUTIONS? CAN YOU PROVIDE EXAMPLES OF PROJECTS WHERE THIS COLLABORATION WAS FUNDAMENTAL?

P: Yes, our Research and Development Department collaborates constantly with every area of the company, and there would be many examples. Referring to production, what comes to mind is that when we started producing rPET trays for crates, their design was not only focused on meeting product performance requirements, but also on how to best manage them within the production process of the machinery and logistics.

We tackled issues such as the optimal sheet thickness, cutting (longitudinal and transverse), corner punching, hot drilling, the risks of product non-de-stacking, etc. Even the custom sizing of boxes for pallet formats was addressed, as well as load-bearing capacity (opting for the vertical solution because it is more resistant in terms of load collapse and product integrity); also, the weight of the packages had to comply with regulations for handling by personnel (both internal and customers).

Labeling also involved a careful study to make it easily and quickly visible, even when the package is placed on very high shelves. Other examples of collaboration with other departments, where packaging design must make choices also based on the information we receive, include, for example, with the Quality and Certifications Office, when we develop plastic or paper products that must be heat-sealed by film.

Beyond material compatibility, we study the best shape to maximize sealing, while still making the package conveniently usable for the consumer.

I: WHAT HAS BEEN THE MOST COMPLEX RECENT TECHNOLOGICAL INNOVATION PROJECT AND WHAT LESSONS HAVE YOU LEARNED ABOUT RISK MANAGEMENT AND THE RESULTS ACHIEVED?

P: An example of this is our latest patented packaging, namely the CartonShell® 2.0. It is a cardboard packaging with a cellophane window, therefore fully recyclable as paper, and highly modular because it can be made in any shape (fitting within a square/rectangular footprint) and height, for containing fruits and vegetables.

It features a closure with a circular tab with a spreading effect and a gradual increase in protrusion, along with linear stabilizing elements on the lid designed to keep it more securely closed and to prevent collapse due to cardboard deformation or the weight of other packages.

It has the great advantage of being easily filled and closed both manually and mechanically. I would love to show you both the packaging and the patent, which has been formulated in a particularly complex way to cover all possible variants and therefore ensure it is protected against any kind of counterfeiting.

In turn, to minimize risks, we have carried out thorough research in advance to rule out the possibility that something similar already existed on the market. The results come to us not only through customer appreciation of the particularly innovative features of our packaging, but also—and above all—through the increasing sales orders we are seeing.

I: HOW DO YOU MONITOR MARKET TRENDS AND EMERGING TECHNOLOGIES TO REMAIN COMPETITIVE IN THE SECTOR?

P: Monitoring market trends and emerging technologies is crucial to maintaining competitiveness in the food packaging design and production industry. Being up to date on market developments and technological innovations allows our company to anticipate consumer demands, meet regulatory requirements, and develop innovative solutions that address future challenges.

We therefore regularly analyze market data and trends, monitor competitors, collaborate with universities and research centers, monitor and participate in industry conferences and events (such as trade fairs, including international ones, throughout the year), and engage in networking and collaborations with well-known companies as well.

I: THANK YOU FOR THE CONVERSATION. BEFORE WE CONCLUDE, DO YOU BELIEVE THERE ARE ANY OTHER ASPECTS OR ELEMENTS THAT COULD BE USEFUL TO ME?

P: I believe the contribution that Artificial Intelligence can offer should not be overlooked, even in the areas of Risk Management and Technological Innovation, which are key topics of research. As the Research and Development Office, for example, we are constantly updated on all the possibilities that AI is bringing to the sector.

Thank you for the interview and best of luck with your research and professional future.

PRODUCTION MANAGER

Name: Marco Gabriele
Gender: M
Interview Date: 14/02/2025
Years of Experience: 10

I: WHAT ARE THE MAIN RISKS THAT CAN AFFECT THE EFFICIENCY OF PRODUCTION PROCESSES?

P: The risks that can affect the efficiency of production processes fall into several categories: operational, compliance and quality, environmental, technological, and financial.
From an operational point of view, one of the main risks is related to the procurement of raw materials. If supplies are not diversified and the arrival of materials is not planned well in advance, the risk of interrupting the production process is very high.
Non-compliance is an equally critical risk. If production is not adequately monitored and defects occur in products intended for export, the recall of goods could prove extremely costly, with a significant impact on company costs and reliability.
Environmental risks are becoming increasingly relevant. A concrete example was the hailstorm three years ago, which caused damage to products and interruptions in the production process. With ongoing climate change, it is essential to protect facilities from extreme weather events.
Technological risks are often underestimated but can have a devastating impact. A noteworthy case is that of Parmigiano Reggiano producers during the earthquake in Emilia Romagna: thanks to disaster recovery systems, their know-how was not lost, allowing for a rapid recovery. The loss of critical data could seriously compromise a company, making it essential to bridge the digital gap between those operating in production processes and the growing business digitalization.

I: HOW DO YOU ASSESS AND MANAGE THESE RISKS TO ENSURE OPERATIONAL CONTINUITY AND MAINTAIN HIGH STANDARDS OF PRODUCTIVITY?

P: The approach is based on a structured risk assessment, using a probability and impact matrix. Risks are identified and monitored through specific KPIs, such as OEE (Overall Equipment Effectiveness).
The prevention and mitigation measures adopted include:
• diversification of suppliers to avoid shortages of raw materials and semi-finished products,
• automation of processes in the context of Industry 4.0 and 5.0,
• standardization of processes thanks to ISO 9001 and ISO 14001 certifications,
• use of more sustainable materials and implementation of the circular economy, with the reuse of scraps and production waste,
• investments in renewable energy sources to reduce energy consumption and contain costs.

I: WHAT HAVE BEEN THE MOST SIGNIFICANT CHANGES IN PRODUCTION PROCESSES RELATED TO SUSTAINABILITY?

P: Carton Pack follows the market and continuously invests in new technologies. One example is the adoption of the functional barrier in extrusion, a technology used for over twenty years and now regulated by European Regulation 1616/2022, demonstrating our ability to anticipate the market.
In the rigid department, about 70% of production scraps are reintroduced into the production cycle, transforming them into new raw material. Additionally, all production processes are optimized to avoid the use of water, thus reducing waste.

From an energy standpoint, the company has 4 MW of photovoltaic panels, which help offset electricity consumption.
In the flexible printing sector, we use solvent-based inks, recovering dirty solvents through an internal distillation system to reuse them in the production process. Furthermore, thanks to an advanced environmental treatment system, emissions are transformed into oxygen, preventing the release of volatile organic compounds into the atmosphere.
Finally, a relevant aspect concerns environmental monitoring: groundwater checks have confirmed that Carton Pack does not pollute the soil or subsoil, unlike other areas upstream of the facility.

I: WHAT TECHNOLOGIES HAVE YOU IMPLEMENTED RECENTLY TO IMPROVE PRODUCTIVITY?

P: In recent years, we have invested in the modernization of our machinery fleet, increasing productivity and efficiency:
• renewal of printing machines, improving performance,
• 25% increase in the thermoforming machinery fleet, transforming a storage area into a production area,
• implementation of a new thermal power plant serving the production processes,
• tripling of the capacity for distilling ink-contaminated solvents,
• creation of a centralized compressor room to ensure continuity in the supply of compressed air to production processes, avoiding operational shutdowns,
• upgrading of micro-perforation and laser die-cutting systems, with innovative and higher-performing machinery,
• transition to a new, more modern and high-performing MES (Manufacturing Execution System), capable of interacting with the machines according to the principles of Industry 5.0.

I: WHAT ARE THE MAIN RISKS RELATED TO THE USE OF NEW SUSTAINABLE MATERIALS IN THE PRODUCTION PROCESS?

P: The adoption of new sustainable materials presents several critical issues. The first risk is that these materials may not be compatible with existing technologies, both in terms of machinery and production processes.
Even when compatibility is ensured, problems may arise related to printability and sealability compared to traditional materials.
Another significant risk is the high cost of these materials. If the market is not ready to bear the price, their large-scale adoption can become difficult. Customer acceptance is therefore a key element to consider before implementing sustainable solutions on a large scale.

SUSTAINABILITY MANAGER

Name: Alessandra Curci
Gender: F
Interview Date: 14/02/2025
Years of Experience: 15

I: WHAT ARE THE MAIN ENVIRONMENTAL RISKS THAT YOU MONITOR IN THE SUSTAINABLE PACKAGING SECTOR?

P: The starting point is certainly regulatory compliance, meaning adherence to current regulations. However, the aspects we evaluate, which are constantly evolving, concern several key factors.
One of the main elements is the disposal of packaging, which must be managed sustainably to reduce environmental impact. Added to this is the assessment of the impact on natural resources and the analysis of the entire production process, with particular attention to the CO_2 emissions generated.
Another fundamental point is the study of the recyclability of packaging. Packaging can be reusable or fully recyclable, depending on the material and the technologies used in its production. The goal is to ensure solutions that minimize waste and optimize the product's life cycle.

I: WHAT DIFFERENCES HAVE YOU OBSERVED WITH THE ADOPTION OF THE INTEGRATED SYSTEM AND HOW DOES IT SUPPORT YOU IN ENSURING COMPLIANCE WITH ENVIRONMENTAL REGULATIONS?

P: The integration of the quality, safety, and environmental axis represents a significant advantage for the company, making the adoption of an integrated management system a strategic element.
This approach makes it possible to unify improvement objectives, optimizing employee involvement and streamlining roles within the organization.
Furthermore, it allows for the creation of a single documentation system, avoiding the dispersion of resources and the management of separate information flows that could be conflicting or misaligned with each other.
An integrated system facilitates the monitoring of processes, reducing the risk of overlaps or authorization requests that could impact other business aspects. This unification helps prevent regulatory issues, both in the environmental field and in terms of health and safety at work.
The benefits resulting from this approach are not only economic, thanks to greater operational efficiency, but also organizational, improving the overall management of the company and making the implementation of improvement strategies more fluid.

I: WHAT HAVE BEEN THE MAIN CHALLENGES IN THE IMPLEMENTATION OF SUSTAINABLE MATERIALS AND HOW HAVE YOU OVERCOME THEM?

P: The company conducts ongoing studies on eco-design, seeking to balance ecological needs with economic ones. A sustainable product must be not only environmentally sound but also commercially competitive. If a product has a reduced environmental impact but an excessive cost, it risks not being sold, rendering the investment in sustainability useless.
In the development process, the main objective is to minimize environmental impact throughout the entire life cycle of the product, considering:
- the design and production phase, optimizing materials and processes to reduce resource consumption,
- the product's impact during its use by the consumer,
- its recyclability and end-of-life management.

The approach is not limited to designing a more sustainable product from a transport perspective but considers the entire life cycle, from production to distribution, up to disposal.
Currently, the company is focusing on solutions that ensure recyclability and is developing new lines of biodegradable or reusable products. Another area of research concerns the use of less environmentally impactful inks and chemicals, to further reduce the toxicity of the materials used.

I: WHAT INNOVATIVE TECHNOLOGIES DO YOU USE OR PLAN TO USE TO REDUCE ENVIRONMENTAL IMPACT?

P: The packaging we produce is recyclable or made with recycled raw materials, contributing to the adoption of a circular economy model within the production processes.
Currently, in 70% of our processes, waste is reintroduced into the production cycle through a cold-processing method.
In the rigid packaging sector, for example, the scraps generated during the production of trays are recovered through granulators, transformed into flakes, and then reused as raw material in the extruders for the production of new sheets.
Another important aspect concerns resource management:
• We do not use water in the production process, thus reducing the environmental impact related to water consumption.
• The energy used is offset by the photovoltaic system, contributing to more sustainable production.
Regarding printed packaging, we adopt a solvent distillation system, which allows us to separate and recover the used solvent, reintroducing it into the printing process. This is also a form of circular economy, reducing waste and improving consumption efficiency.
Finally, a fundamental aspect of our environmental commitment is the use of a thermal oxidizer, which prevents the emission into the atmosphere of chemical substances resulting from the printing process. Thanks to this system, we release only oxygen into the atmosphere, helping to reduce the environmental impact of our production cycle.

I: DO YOU HAVE SPECIFIC CRITERIA FOR SELECTING SUPPLIERS WHO SHARE YOUR ENVIRONMENTAL COMMITMENTS?

P: We do not have rigid and specific criteria for supplier selection, but we work with large partners, often much larger than us, especially in the raw materials sector such as plastic and paper.
Plastic manufacturing companies, in particular, are large industrial giants that are already steering their strategies toward more advanced sustainability. As a result, it is natural for us to share certain values related to sustainability, even though we do not currently adopt structured and binding selection criteria in this area.

I: HOW DO YOU MEASURE THE IMPACT OF SUSTAINABILITY INITIATIVES ON CORPORATE REPUTATION AND CONSUMER BEHAVIOR? DO YOU HAVE TOOLS TO COLLECT AND ANALYZE MARKET FEEDBACK?

P: In this case as well, we do not have direct contact with the end consumer, so we do not receive immediate feedback from the market. We do not produce directly for the consumer, but for large-scale distribution or for companies that in turn interface with the mass retail channel.
As a result, our brand is not visible to the end consumer. For example, someone buying a bag of salad at the supermarket does not know that the packaging was produced by Carton Pack. This makes it more difficult to obtain direct feedback on preferences or perceptions from the final market.
However, the mass retail channel and many companies we have been collaborating with for years are increasingly taking paths focused on sustainability. Even if the consumer does not directly perceive our role, the commitment of major brands is reflected throughout the entire supply chain.

If, for example, a brand like Bonduelle launches a campaign related to sustainability, it is natural that its suppliers, ourselves included, must adapt to those requirements. This creates a cascading effect, where sustainability demands propagate from the top of the supply chain down to the producers of packaging and materials.

I: HOW DO YOU COMMUNICATE THE VALUE OF YOUR SUSTAINABILITY INITIATIVES TO STAKEHOLDERS, CUSTOMERS, AND INVESTORS? DO YOU USE TOOLS SUCH AS REPORTS OR CERTIFICATIONS TO SHOW PROGRESS?

P: We communicate the value of our sustainability initiatives primarily through our website, where all detailed information can be found.
In addition to the website, we use some social media pages to share updates and relevant initiatives.

I: DO YOU COLLABORATE WITH INSTITUTIONS, RESEARCH BODIES, OR ENVIRONMENTAL ORGANIZATIONS TO DEVELOP SUSTAINABLE SOLUTIONS? WHAT SIGNIFICANT RESULTS HAVE YOU ACHIEVED?

P: Currently, we do not collaborate with institutions, research bodies, or environmental organizations for the development of sustainable solutions. However, it is an area that we consider of great interest and that we will definitely evaluate in the future.

I: THANK YOU FOR THE CONVERSATION. BEFORE WE CONCLUDE, DO YOU THINK THERE ARE ANY OTHER ASPECTS OR ELEMENTS THAT COULD BE USEFUL TO ME?

P: Sustainability in the company stems from the integration of governance, people, and the environment—three elements that must work together synergistically to generate a positive impact.
A fundamental aspect is the need to unify the staff and create a shared vision. Decisions made in one business area inevitably have repercussions on others: what the operations manager implements in production processes directly affects finance, just as a reduction in CO_2 emissions also brings benefits to workers by improving the environment in which they operate.
It is equally important to avoid a reckless approach to sustainability, which could lead to poorly thought-out or ineffective choices. The direction to follow is one of thoughtful and strategic change, avoiding superficial trends or fads and focusing on truly effective and measurable long-term solutions.

QUALITY MANAGER

Name: Michele Picci
Gender: M
Interview Date: 14/02/2025
Years of Experience: 20

I: WHAT ARE THE MAIN RISKS THAT YOU MONITOR TO ENSURE THE HYGIENIC AND SANITARY SAFETY OF PACKAGING MATERIALS?

P: The main risks we monitor concern possible external contamination, particularly those deriving from clothing and direct contact of personnel with machinery.
To mitigate these risks, we adopt strict safety protocols that include the use of personal protective equipment (PPE), such as caps, beard covers, gloves, and specific company clothing.
These tools are essential to ensure compliance with hygiene and health standards and safety in production processes.

I: WHAT TOOLS DO YOU USE TO ENSURE CONTINUOUS COMPLIANCE WITH ISO 9001 AND ISO 14001 STANDARDS?

P: The standards require the monitoring of all production phases, with specific records based on the production processes, lines, applications, and operations to which they are dedicated. This system allows us to ensure constant and precise control over every phase of the production process, guaranteeing quality and compliance with company standards.

I: WHAT HAVE BEEN THE BENEFITS OF THE INTEGRATED SYSTEM ISO 9001, ISO 14001, AND BRC/IOP RELATED TO YOUR AREAS OF RESPONSIBILITY?

P: Thanks to the integration of procedures into quality systems, we have been able to reshape and refine our processes over the past twenty years. Our journey began in the 2000s with ISO 9000 certification, followed by ISO 14000 and finally BRC.
These are voluntary certifications that allow us to adopt structured procedures to ensure the quality and compliance of our products. These standards apply not only to the incoming raw materials but also to semi-finished and finished products, ensuring that every phase of the production process meets the required specifications before delivery to final customers.

I: HOW DO THE OPERATIONAL TEAMS AND THE QUALITY TEAM COLLABORATE TO ENSURE COMPLIANCE WITH STANDARDS?

P: The operational and quality teams also interact in case of non-compliance reports. In these cases, the various departments involved come together to assess the reports and define the necessary corrective actions, with the aim of preventing the recurrence of errors and continuously improving the processes.

I: WHAT HAVE BEEN THE MOST SIGNIFICANT QUALITY INCIDENTS AND HOW WERE THEY RESOLVED?

P: One of the most significant quality incidents concerns, for example, an incorrect cut of the coil strip. If a customer requests a finished strip of 300 mm, but a strip of 295 mm is delivered, or one of 300 mm and another of 290 mm, the product is out of specification and outside the acceptable cutting range.
Every material produced must comply with precise dimensional tolerances, which include acceptable percentages both in the positive and negative range. When these thresholds are exceeded, the material cannot be considered compliant and must be managed with corrective actions to prevent the error from recurring.

I: WHAT INNOVATIVE TECHNOLOGIES DO YOU USE TO IMPROVE QUALITY CONTROL, SUCH AS AUTOMATED MONITORING OR ARTIFICIAL INTELLIGENCE, AND DO YOU PLAN TO INTRODUCE OTHERS IN THE FUTURE?

P: In the future, we will definitely move towards new technologies to further improve quality controls, which are currently carried out in-line and recorded by operators.
At present, based on the critical points of the production line, a series of key parameters are monitored and verified in three fundamental phases: start, during, and end of production.
The goal is to optimize these controls by making them increasingly precise and efficient, reducing the margin of error and ensuring an ever higher level of quality.

I: WHAT HAS BEEN THE IMPACT OF BRC/IOP CERTIFICATIONS ON CUSTOMER TRUST AND ON THE PERCEPTION OF THE QUALITY OF YOUR PRODUCTS?

P: The BRC/IOP certifications have made it possible for Carton Pack to enter new, particularly strict markets, representing an added value for our customers. Since 2007–2008, we have been BRC certified, a certification that is especially in demand in Germany and the United Kingdom.
Thanks to these certifications, we have been able to open new markets and, at the same time, take advantage of these standards to operate in other countries. Those with technical expertise know that these certifications require constant monitoring of numerous activities, ensuring compliance with high quality and safety standards.

I: WHAT ARE THE MAIN CHALLENGES YOU FACE IN THE STANDARDIZATION OF QUALITY CONTROL PROCESSES, ESPECIALLY CONSIDERING THE DIVERSITY OF MATERIALS OR PRODUCTION LINES?

P: Obviously, there is an effort to standardize processes, but each processing operation and each product has its own specificity. The goal is to optimize both productivity and quality, ensuring the best possible outcome for each production line. The final product can be a plastic film, a container, a tray, or any other item we produce, adapting to market needs and the specific requests of customers.

LEGAL & COMPLIANCE MANAGER

Name: Marco Gabriele
Gender: M
Interview Date: 14/02/2025
Years of Experience: 10

I: WITH THE GROWING ATTENTION TOWARDS SUSTAINABILITY, HAVE YOU NOTICED ANY SIGNIFICANT REGULATORY CHANGES? IF SO, WHICH ONES?

P: Yes, absolutely. The latest nationally relevant regulatory changes stem from the transposition of European directives and regulations, with very recent updates, dating back just two months.
One of the most significant topics concerns European Regulation 1616/2022, which has had a direct impact on our production processes, particularly on coextrusion, a technology we have been using for over twenty years.
This technique allows the encapsulation of layers of post-consumer recycled plastic – mainly sourced from water bottles – between two layers of virgin PET. In this way, 20% of the plastic used is virgin, while 80% is recycled, while still ensuring food-grade compliance for contact with food.
Regulation 1616/2022 has recognized and regulated this technology at the EU level, classifying Carton Pack not only as a producer of plastic materials but also as a recycler. This regulatory recognition further enhances a process that we developed 25 years before the intervention of the European legislator.
From the point of view of regulatory compliance, we were already prepared. Over the years, we have obtained BRC certification, implementing traceability, labeling, and product tracking ahead of the requirements imposed by the regulation.
However, the regulatory debate remains open. We actively participate in European consortia and in the technical working groups of the European Commission to ensure that new regulations are applicable and functional to industrial realities, avoiding excessive bureaucratic constraints.
The goal must be to protect the environment and consumers without hindering innovation and industrial development in Europe.

I: AND REGARDING THE RISKS, HAVE YOU NOTICED ANY CHANGES OR NEW CHALLENGES? IF SO, WHICH ONES?

P: We do not believe that there has been an increase in risk, but rather an increase in the heterogeneity of regulations between different national and European regulations.
It would be useful to standardize the regulations with a single unified text, as has been done in other areas, to facilitate the work of businesses and prevent divergent interpretations among the various Member States.
Another challenge is the growing consumer expectations regarding traceability and transparency of packaging. Consumers are increasingly attentive to these issues, and food packaging plays a key role in ensuring the safety and traceability of products.
Carton Pack is well organized to meet these needs and sees this challenge as an opportunity to strengthen its position in the market.

I: HOW DO YOU MANAGE THEM TO ENSURE COMPLIANCE AND LEGAL PROTECTION?

P: Compliance is ensured through continuous investments and constant innovation in materials, products, and machinery. We adopt a proactive approach, anticipating regulatory changes to remain consistently aligned with legal requirements.

I: HAVE YOU ADDED NEW FIGURES OR COMPETENCIES TO THE LEGAL TEAM TO ADDRESS THE MORE STRINGENT ENVIRONMENTAL REGULATIONS AND RELATED RISKS? WHICH ROLES OR COMPETENCIES HAVE YOU CONSIDERED A PRIORITY?

P: Yes, three years ago we hired an HSE (Health, Safety & Environment) specialist with the aim of monitoring and improving the environmental impact of industrial processes.
We also established an HSE office within the Operations department to manage health, safety, and environmental sustainability in a structured way.
A concrete example of Carton Pack's environmental commitment is the monitoring of groundwater. The inspections revealed that:
• upstream of the plant, the aquifer is contaminated by pesticides and fertilizers originating from the intensive grape farming in the area,
• downstream of the plant, there are no contaminations, demonstrating that Carton Pack's operations do not pollute either the soil or the groundwater.
In terms of atmospheric emissions, we use thermal oxidizers that convert pollutants into oxygen, contributing to minimal environmental impact.

I: HOW DO YOU ENSURE ONGOING COMPLIANCE WITH EVOLVING INTERNATIONAL REGULATIONS?

P: We have implemented a system of internal and external audits, also relying on consulting firms and accredited laboratories (Accredia) to ensure high standards of compliance and quality.

I: HOW DOES THE INTEGRATED ISO 9001 AND ISO 14001 SYSTEM SUPPORT THE COMPANY IN LEGAL COMPLIANCE AND IN MANAGING SUSTAINABLE PACKAGING REGULATIONS?

P: The adoption of an integrated management system has made it possible to structure an effective approach to quality and environmental sustainability.
The ISO 9001 and ISO 14001 certifications support risk management by identifying opportunities for continuous improvement and ensuring legal compliance at every stage of the production process.

I: DO YOU COLLABORATE WITH PRODUCTION, QUALITY, AND R&D TO ENSURE REGULATORY COMPLIANCE?
IF SO, HOW?

P: Yes, we collaborate through weekly meetings with the various company functions and with functional overlaps that facilitate operational coordination.

I: WHAT STRATEGIES DO YOU USE TO MONITOR AND ANTICIPATE EMERGING SUSTAINABILITY REGULATIONS?

P: Anticipating emerging sustainability regulations is a complex challenge. It is a goal that we all strive to achieve consistently, but in practice it requires continuous monitoring and a well-structured strategy.
To ensure constant alignment with the evolution of regulations, Carton Pack adopts various strategies:

1. Regulatory monitoring through specialized companies
2. The company uses regulatory monitoring services provided by external specialized firms, which allow us to receive timely updates on new European and national directives and regulations.
3. Specialized legal consultancy
4. We work closely with legal consultants who are experts in environmental and regulatory law, who support us in interpreting and applying new provisions, reducing the risk of non-compliance.
5. Participation in European consortia
6. Joining consortia and industry associations at the European level allows us to play an active role in regulatory discussions and to prepare in advance for the implementation of new regulations, as in the case of European Regulation 1616/2022. Being part of a network allows us to gather information directly from institutions and to contribute to the definition of rules, rather than passively undergoing them.
7. Collaboration with companies and suppliers
8. Carton Pack maintains constant dialogue with suppliers and industry competitors to share information and face regulatory challenges together. Working in synergy with other companies in the sector allows us to be more responsive to new provisions and to find shared solutions.
9. Participation in trade associations
10. In Italy, we have recently joined the Industrial Association, which offers continuous updates on regulations and facilitates interaction with other companies in the sector. Although we maintain a low profile from this point of view, we are beginning to reap the benefits of this participation, both in terms of regulatory updates and institutional representation.

In summary, our approach is based on a combination of proactive monitoring, collaboration with experts, and participation in industry networks. This enables us to anticipate regulatory changes, promptly adapt our production processes, and maintain high standards of compliance.

I: DO YOU COLLABORATE WITH EXTERNAL EXPERTS, LAW FIRMS, OR TRADE ASSOCIATIONS TO ADDRESS COMPLEX REGULATIONS ON SUSTAINABILITY AND NEW ENVIRONMENTAL STANDARDS?

P: Yes, we rely on legal experts, environmental consultants, and trade associations to address the most complex regulations and maintain constant alignment with developments in the sector.

I: WHAT HAS BEEN THE MOST COMPLEX CASE OF MANAGING A LEGAL RISK RELATED TO ENVIRONMENTAL REGULATIONS FACED BY THE COMPANY, AND WHAT LESSONS WERE LEARNED FROM THAT EXPERIENCE?

P: One of the most complex cases we have faced in terms of environmental legal risk management was the transition from the Single Environmental Authorization (AUA) to the Integrated Environmental Authorization (AIA), a long and demanding process that required a significant adaptation of the plant and our operational procedures.
Carton Pack, unlike many companies in the sector, operates with highly heterogeneous production processes, managing both the printing and converting of flexible and rigid materials. For the production of printed films, we use solvent-based flexographic printing, a process that, in Italy, requires annual reporting of solvent use.

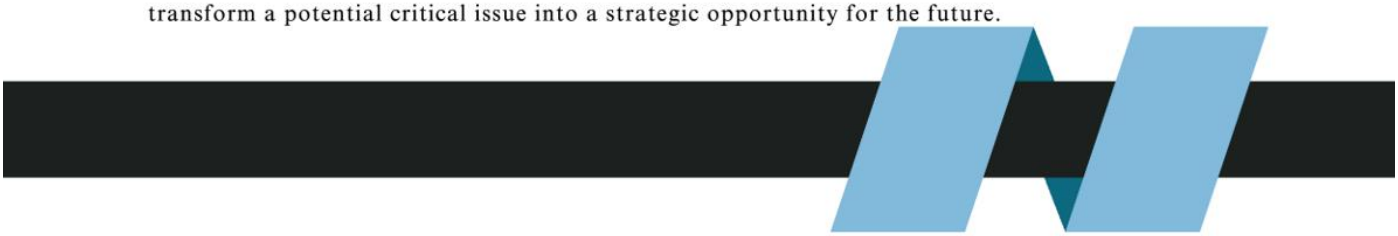
This reporting includes the submission of a solvent balance to the competent authorities, certifying:
• Total quantity of solvents used in the process
• Emissions into the atmosphere and reduction through environmental control systems (thermal oxidizer)
• Recovery and reuse of solvents in the production cycle
For years, the company operated under the regime of the Single Environmental Authorization (AUA), which regulates atmospheric emissions and the management of stormwater. However, following a significant increase in production volume, we came close to the threshold of 200 tons of solvents used annually, beyond which the AUA would no longer have been sufficient.
The risk was that exceeding the limit of 200 tons per year would render the AUA inapplicable, forcing us to either halt production or find alternative solutions. The available options were:

1. Reduce production, which would have had a negative impact on sales and the company's competitiveness.
2. Convert the process to water-based printing, with the risk of compromising product quality and incurring significant costs for plant conversion.
3. Transition to the Integrated Environmental Authorization (AIA), a bureaucratically and financially demanding path, but one that would ensure sustainable growth in the long term.

We chose to undertake the AIA process, a decision that required a deep technological and structural modernization of the plant.
The adaptation process to the AIA
The transition to the Integrated Environmental Authorization was a multi-year process that required:
• A plant modernization plan, with the strengthening of environmental control systems and improvements in solvent management systems.
• A Monitoring and Control Plan (PMC) for real-time monitoring of emissions, stormwater quality, and waste management.
• An update of internal management, with new procedures and staff training to ensure compliance with the new regulatory standards.
The process concluded with the approval of the AIA, which replaced and incorporated all previous authorizations (air emissions, water management, waste, fire safety, etc.).
Many lessons were learned, such as:

1. Planning and forecasting are fundamental
2. The issue was identified in advance thanks to constant monitoring of the solvent balance. Had we not assessed the risk in time, we would have found ourselves in an emergency situation.
3. The AIA is a strategic opportunity, not just a regulatory obligation
4. Although initially the transition to the AIA seemed like a bureaucratic burden, it has proven to be a competitive advantage. It has allowed the removal of production constraints and strengthened the company's environmental reputation.
5. Change management is a cultural challenge
6. Adapting to the AIA required not only investment in infrastructure but also a cultural transformation within the company. Training staff and making them active participants in the improvement process was crucial.
7. Regulatory compliance is a competitive advantage
8. Implementing more advanced technologies and adopting stricter standards improved the company's operational efficiency and sustainability, facilitating access to new markets.
9. Collaboration with institutions and industry associations is essential
10. Throughout the process, dialogue with certification bodies, trade associations, and specialized consultants proved crucial in addressing regulatory complexities.

The transition to the AIA was one of the most challenging and demanding projects undertaken by Carton Pack, but it brought significant benefits in terms of sustainable growth and the company's consolidation in the packaging sector. This case demonstrates how a proactive approach to regulatory compliance can transform a potential critical issue into a strategic opportunity for the future.



LOGISTICS & SUPPLY CHAIN MANAGER

Name: Daniela D'Ambrosio
Gender: F
Interview Date: 14/02/2025
Years of Experience: 18

I: WHAT HAVE BEEN THE MAJOR LOGISTICS-RELATED RISKS FACED IN RECENT YEARS AND HOW HAVE YOU MANAGED THEM?

P: One of the major risks is related to timing, especially in recent years, due to global events such as the Covid-19 pandemic and environmental disasters, including the congestion of the Red Sea caused by conflicts and geopolitical instability. A significant example was the incident in the Suez Canal a couple of years ago, which congested maritime traffic, with a significant impact on transportation, considering that a large part of our shipments takes place by sea, through containers. This generated delays and major logistical difficulties.
In addition to timing-related issues, there have also been incidents of environmental disasters that damaged goods during transport. A concrete case we faced was the damage to a ship carrying containers with our materials. These containers were contaminated and, consequently, we could not accept or process the goods, even though the damage was only external. As a company operating in the food sector, we cannot take the risk of using potentially compromised materials, so the goods were returned to the sender.
These episodes may occur occasionally, but situations such as maritime congestion, the crisis in the Red Sea, the blockage of the Suez Canal, and the effects of the pandemic have had a more systemic and lasting impact. Even though our production never stopped, many companies experienced slowdowns due to reduced staff presence, resulting in delays in supplies.
To cope with these difficulties, we had to reorganize the management of orders and shipments, adapting to different timelines. This required a reorganization of the supply chain, redistributing orders among different suppliers depending on their origin and planning procurements more carefully to minimize impacts on production activities.

I: WHAT HAS BEEN THE IMPACT OF DIGITALIZATION ON MONITORING AND LOGISTICAL EFFICIENCY?

P: Digitization has allowed us to significantly improve load traceability in recent years. In the past, we did not have a clear and detailed view of the behavior of goods during transport, often assuming many pieces of information as given. With the adoption of more advanced systems, this aspect has been progressively optimized.
Today, we can monitor the load from the moment of departure to arrival, with greater precision in material traceability thanks to more advanced technologies.
This enables us not only to control transportation but also to track the use of goods within our production processes up to the final delivery phase.
Digital streamlining has therefore had a positive impact on the entire product life cycle, from raw materials to finished products, ensuring more accurate control and greater operational efficiency.

I: WITH THE INCREASING FOCUS ON SUSTAINABILITY IN RECENT YEARS, HAVE YOU MODIFIED YOUR SUPPLY CHAIN BY PRIORITIZING SUPPLIERS WITH ADVANCED ENVIRONMENTAL PRACTICES? IF SO, WHAT CRITERIA HAVE YOU ADOPTED FOR THIS SELECTION?

P: With regard to raw material purchases, we have paid close attention and adopted targeted strategies. A concrete example is the agreement signed a few years ago with Plastic Bank, a company involved in social plastic that operates mainly in Indonesia. This organization works on two fronts: on one hand, the ecological aspect, by collecting plastic—particularly bottles—from beaches and reintroducing it into the cleaning and conversion cycle; on the other hand, the social aspect, by creating job opportunities for disadvantaged people, thus helping to fight poverty. Indonesia is one of the countries facing the most severe environmental issues related to plastic, so this business model has a significant impact.

Through the agreement with Plastic Bank, we purchase a specific quantity of material that allows us to classify our finished product as social plastic. The process is based on mass balance: a certain quantity of plastic enters in the form of pellets, and an equivalent amount is used in our products.

In addition to this collaboration, we have launched a thorough selection of suppliers, choosing those who share our projects for greater sustainability. One of the main directions we are following concerns the use of mono-material structures, avoiding multilayer materials that make disposal more complex and often destined for unsorted waste. Our choice is oriented towards fully recyclable materials, such as polyethylene or PET, to ensure greater sustainability.

Another important aspect is the reduction in the weight of both rigid and flexible packaging, in order to decrease the amount of plastic released into the market. This objective is independent of the supplier selection and is a corporate decision aimed at minimizing environmental impact.

An additional supplier selection criterion concerns the use of plastic derived from recycled material. There are various types of recycling:

• Chemical recycling, which allows the material to be brought back to its original form, always certified for food contact,

• Mechanical recycling, which enables the reintegration of production scraps into new processes,

• The use of bio-based materials, produced through natural oils and fibers, such as oils derived from trees or used cooking oils.

The integration of a significant percentage of these oils into film production allows for a substantial reduction in CO_2 emissions. In some cases, with a content of 70% of these components, a total elimination of CO_2 emissions in the material's production can be achieved.

The choice of suppliers is also based on their certification and their commitment to these innovative materials. More and more customers are starting to request films certified in this way, a sign of the market's growing attention towards more sustainable solutions.

I: HOW DO YOU COLLABORATE WITH SUPPLIERS TO ENSURE THE TRACEABILITY OF MATERIALS? HAVE YOU ADOPTED ANY TECHNOLOGIES OR TOOLS TO MONITOR THEIR ORIGIN AND COMPLIANCE?

P: Yes, we have significantly improved traceability, making it complete as previously anticipated. The labeling system allows for a direct link between all stages of the supply chain: the supplier's label, our internal label, and the one intended for the customer are synchronized with each other, making it possible to trace back from the initial reel to the finished product and its origin.

In addition to product traceability, we have integrated a document management system that connects all documents, ensuring more efficient and structured handling. When the material leaves the supplier and arrives at our facility, it is accompanied by all the necessary documentation, including certifications that attest to its origin and compliance. This aspect is particularly important for materials intended for export, as they must be accompanied by specific analyses and certifications required by the various destination markets.

I: WHICH KPIS DO YOU USE TO MEASURE THE EFFECTIVENESS OF THE SUPPLY CHAIN? (LEAD TIME, ON-TIME DELIVERY RATE, PERCENTAGE OF COMPLIANT MATERIALS)

P: We have an internal qualification system that considers various factors, starting with the origin of the material—an aspect that directly affects delivery times and price. The choice of origin involves balancing these two elements: if the material comes from Italy, delivery times are faster, but the cost is higher; on the other hand, imported materials may offer more advantageous prices, but with longer procurement times. The management of these aspects depends on operational needs, evaluating whether it is more convenient to prioritize price or delivery speed based on order scheduling.

Another fundamental criterion in supplier qualification is punctuality in deliveries. If the material is of Italian origin, we expect greater reliability in delivery times, and this aspect affects the score assigned to the supplier. Punctuality, lead time, and price are consequential factors, but the top priority always remains quality.

An additional crucial aspect is document accuracy, which includes not only material conformity certifications but also order confirmations and all documentation necessary to ensure product traceability along the entire supply chain. Proper management of these documents is essential to maintaining high standards of quality and compliance.

Finally, a factor that influences supplier qualification is technical expertise and the support offered. This concerns both the commercial team and the technical laboratory of the supplier. When other scores are equal, the technical competence of the supplier can make the difference, ensuring better support in the implementation and use of the purchased materials.

I: HOW DO YOU COLLECT AND INTEGRATE CUSTOMER FEEDBACK TO IMPROVE LOGISTICS PERFORMANCE AND MEET REQUIREMENTS FOR PUNCTUALITY, QUALITY, AND SUSTAINABILITY?

P: Regarding the logistics and supply chain aspect, my role is closely linked to the procurement and purchasing of raw materials. However, I constantly collaborate with colleagues who manage the more specific aspects of logistics.

We do not collect customer feedback directly, as we do not have direct contact with them. Our main point of reference is the sales team, which acts as the front office with the customer and is responsible for gathering criticisms, compliments, and needs.

Currently, we do not have a structured system or a centralized database to store this feedback, and the process is still managed in a more direct and regional manner.

The sales team represents our main interface with the customer and plays a fundamental role in guiding and adapting, when necessary, decisions related to purchasing, logistics, and supply management, based on the requests and reports received.