MAGNO

Transforming EU food systems with innovative strategies for sustainable packaging

WP6 – Consumer acceptance and Innovative circular business model

D6.2 – Initial market analysis and exploitation

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2	Holistic And Ontological Solutions For Sustainability	HOLOSS	PT
3	Fraunhofer Gesellschaft Zur Forderung Der Angewandten Forschung Ev	FHF	DE
4	Asociacion Empresarial De Investigacion Centro Tecnologico Del Calzado Y Del Plastico De La Region De Murcia	CETEC	ES
5	Dnv Business Assurance Italy Srl	DNV	IT
6	Senior Europa Sociedad Limitada (KVELOCE)	KVC	ES
7	European Plastics Converters Eupc Aisbl	EUPC	BE
7.1	Polymer Comply Europe	PCEU	BE
8	Iris Technology Solutions, Sociedad Limitada	IRIS	ES
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Executive Summary

This document is the first version of a comprehensive Initial market analysis and exploitation strategy for MAGNO (D6.2). During the path to walk over the length of the project, the consortium will define a series of mechanisms starting on this deliverable to achieve a final joint and individual exploitation plan. It is expected to ensure the maximum impact of the project results, and their sustainability after the project length. This work will include two additional iterations, in M24 and M40. The deliverable series will represent a continuous joint effort lead by KVC but where all MAGNO partners will contribute intensively. This joint effort will be based on the overarching strategy outlined in Annex 1 "Description of Action" of the MAGNO's Grant Agreement. It will also count on the major contributions of EUPC and DNV which will complement the deployment of this plan.

This document establishes the initial framework for a comprehensive plan that will effectively manage the overall exploitation activities. It is also meant to serve as a guideline that all partners can consult to finetune their activities in coordination with the overall exploitation plan, during and after the project, to maximise the impacts of their R&I results towards the audiences they would like to target.

The deliverable starts with the process of defining Key exploitable results (KERs) and identifying the main stakeholder groups and subgroups interested on the latter, which will undergo validation and updates throughout the project's duration. Then, according to the task description, the document will include a market analysis, followed by CANVA for MAGNO results, to establish the initial picture of the market and the MAGNO plan, where the MAGNO results will be implemented. Also, this exploitation plan aims to contribute to the definition of a sustainable business model out of the project outcomes and to the compiling of sound business practices that could enrich the overall food packaging value chain.

Further, this document incorporates basic information required for the development of joint and individual exploitation path for each of the KERs as an Intellectual Property Rights (IPR) catalogue or brief reviews of novel approaches that could help to identify unique value propositions for MAGNO results. This way, MAGNO partners will be able to support the definition of value propositions based on features that currently help the overall food packaging value chain, reinforcing project position as well as for finding academic or market-based opportunities for MAGNO results. These reviews will set states of the art on each of the topics, showcase different discussions around them, and suggest Key Performance Indicators (KPIs) set to be able to offer a possibility to evaluate these variables within the KERs as well as discuss their suitability for the different value chain steps contributing to the work of technical WPs and the MAGNO ecosystem Digital Twin tool if necessary.All of this with a view on setting up a coordinated strategy between partners, technical and C&D objectives, target groups, and specifying the tools and channels to optimize the overall impact of MAGNO project and its results.

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Abbreviations

ARI	Agile Responsiveness Index
C&D	Communication and Dissemination
CC	Creative Commons
CCo	Creative Commons Zero
CSI	Consumer Satisfaction Index
GA	Grant Agreement
EC	European Commission
EU	European Union
FTO	freedom-to-operate
GPL	General Public License
KER	Key exploitable results
KPIs	Key Performance Indicators
NGOs	Non-governmental Organisations
NPS	Net Promoter Score
ROI	Return on Investment
RTOs	Research and Technology Organisations
SO	Secondary Objective
WP	Work Package

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1 Introduction

MAGNO will produce a series of academic, commercial, and non-commercial outputs that are expected to impact the EU society and the food packaging value chain in order to reduce waste pollution, most specifically plastic pollution, making the overall value chain more efficient. To achieve this, MAGNO has designed an integrated approach to exploitation that will be complemented and supported by the C&D plan, aiming at co-creation whilst putting forward the results of an enormous effort of matchmaking results across the EU food packaging value chain, in all its steps. In it, MAGNO will identify and evaluate outputs, stakeholders, and market dynamics. This seeks to set the foundations to maximize the impact of MAGNO as well as to generate a transversal societal behavioral change.

Hence, the Preliminary Exploitation Plan adopts a 360 approach by identifying key exploitable results, unique selling propositions, target audiences, market conditions, tools, activities, and goals to align them towards a calendar that would allow the ultimate success of the MAGNO project. This includes raising awareness, fostering understanding, and promoting acceptance of the innovative value chain features (including business models being set-up by the project) to create a community and ensuring this community has access to the knowledge needed to support the continued adoption and expansion of project results beyond its conclusion in a commercial or non-commercial way. Thus, C&D executes many of the through targeted formats and channels, contributing to raise awareness and understanding of the different value chain features and processes towards a more sustainable and less contaminant food packaging sector and purchasing habits, reducing environmental, social, and economic costs for all.

The implementation of the exploitation plan is based on a comprehensive on-going activity to define joint and individual paths and to coordinate both. This methodology helps design targeted and direct actions, including messages, content, channels, tools, and engagement activities whilst keeping a very high level of participation and flexibility. It also supports the development of adaptative exploitation strategies to maximize the project's impact while minimizing costs, including after its end. This will activate an internal iterative process that will touch upon all phases of the design and implementation, including, among others, the definition of Intellectual Property Rights proportional to the different results depending on the path to take, stakeholder mapping and market analysis.

In parallel, to effectively exploit, and disseminate, MAGNO's results, it is important to identify and understand the needs and priorities of the key stakeholders (including plastic industry, food industry, packaging industry, waste management organisations, scientific community, consumers, policymakers and regulatory bodies). For this, MAGNO also includes a multi-actor approach to inform and consult value chain stakeholders that would ultimately facilitate scientific advancement, community building, and evidence-based policymaking. Also, once identified, the aim of this multi-actor approach is to involve and engage external stakeholders in any of the several journeys that will be developed to disseminate and exploit the different sets of results.

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Further, to help MAGNO KERs gain traction in the market and to better define value proposition and alignment with the multi-actor approach participants, tentative customers, users and other audiences, the Canvas business model will be used, offering a systematic framework to define the situation of MAGNO and bridge the gap between MAGNO's innovations and the markets [1]. This is a visual tool that allows innovators to map out key aspects of their business in a single, easy-to-understand format. By breaking down the business into nine building blocks – including key partners, activities, resources, and customer segments – the Canvas enables a comprehensive view of how value is created and delivered to customers.

By explicitly articulating the value proposition in the Canvas, innovators deliver tangible benefits to customers [2]. Moreover, the Canvas encourages iterative testing and refinement of value propositions through methods like customer interviews, surveys, and prototyping. By gathering feedback early and often, innovators can validate assumptions, uncover new insights, and fine-tune their value propositions accordingly. Another advantage of the Canvas approach is its ability to foster collaboration and alignment across different stakeholders within an organization. This is key to embrace MAGNO multi-actor approach. Furthermore, the Canvas allows innovators to identify potential gaps or weaknesses in their business model and proactively address them. For example, by analysing the cost structure and revenue streams, innovators can ensure that their value propositions are financially viable and sustainable in the long run.

Also, this deliverable will be complemented with seven reviews, that can be found in section 6, on innovative related topics. By reviewing these topics such as adaptation to new digital technologies, consumer-centric approaches, agile methodology, data-driven decision-making, strategic partnerships, lean startup principles, and collaborative spaces, it is expected that the results and unique value propositions will be reinforced whilst strengthening market analysis itself by enabling businesses to dynamically adapt to market changes, prioritize customer satisfaction, leverage data insights, explore strategic alliances, accelerate product development cycles, and foster collaborative innovation, respectively. Through understanding innovations, consumer behaviours, embracing flexibility, utilizing data analytics, and cultivating a culture of collaboration, MAGNO can enhance their capabilities, identify emerging trends, and seize opportunities for growth in today's very competitive food packaging landscape.

Last but not least, dissemination and communication activities will make sure to enable enough reach to take project results to the targeted audiences, so that the exploitation strategies can be implemented smoothly even after the project ends. In this line, the project will look for additional networking and clustering activities that will contribute to build the necessary connections and relationships to leverage synergies with projects and initiatives closing the gap between knowledge, innovation, and the markets. Continuous monitoring and measurement of the D&C+E impacts and effectiveness will be carried out, utilizing KVC methodology for evaluation as laid down in the Deliverable 7.1. All of this, with an eye on the horizon of the project, aims to allow project innovative results to the market, making the project a meaningful tool for a more sustainable food packaging value chain that contribute to the well-being and sustainability of the environment, companies, and consumers.

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2 Exploitation methodology

The MAGNO exploitation strategy will be guided by the project's objectives, with the KERs already defined, and the KPIs set as minimum thresholds to ensure a successful exploitation activity. It is also necessary to align these features with the logic of the exploitation plan, filling knowledge gaps with a set of additional instruments envisaged to provide additional information whilst contributing to transform individual separate actions into a solid joint and meaningful strategy to maximize project impacts. To this end, this goal-oriented strategy includes a 360 methodological mix to connect goals, techniques and a deployment of activities that allows the final completion of the MAGNO goals.

2.1 Objectives set

Following a hierarchical logic, the first set of boundaries and guidance is provided by project objectives, especially the ones related to the exploitation plan (WP6 and WP7). They are summarized in table 1 as follows:

Table 1 - Project objectives

Primary objective	WP related	Secondary objectives
1: Identify the effects and impacts of littered plastic food packaging	**[WP2, WP3, WP4, WP5]**	SO1.1. To evaluate the effects of littered plastic food packaging on three main environments: terrestrial, fresh water and marine. SO1.2. To evaluate the impacts of alternative packaging design and bio-based feedstocks on the reduction of plastic packaging pollution of ecosystems. SO1.3. To understand and prevent the effects on climate change. Analysis of mitigation and/or adaption actions to current and future scenarios. SO1.4. To increase the adoption of sustainable packaging by including circular models in the value chain. SO1.5. To generate a series of strategies to reduce the impacts of plastics on human health, especially those substances of very high. SO1.6. To recognise the end-of-life strategies for the packaging of food systems. This includes the reuse and recycling of packaging.
2: Develop and validate a series of innovative	**[WP3, WP4, WP6]**	SO2.1. To create novel strategies to include the multi-actor approach. SO2.2. To study and optimise the whole packaging value chain in the food system.

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business strategies		SO2.3. To include modern business approaches in the packaging food system. SO2.4. To determine the best future design and production models. Promotion of effective and efficient packaging solutions. SO2.5. To reduce the dependency on fossil-based materials. SO2.6. To incorporate the circularity concept in new business models. SO2.7. To identify best practices to prevent and reduce plastic food packaging waste.
3: Include government and society (consumers) in the food packaging system loop	**[WP6, WP7]**	SO3.1. To promote the EU climate action amongst all the multi-actors involved in the food system. SO3.2. To obtain consumer acceptance of novel sustainable approaches with the possibility of reaching non-use of packaging in the future. SO3.3. To encourage the implementation of current and new legislation and directives regarding plastic usage.

2.2 Exploitation Plan

To ensure an optimal exploitation strategy that could achieve MAGNO goals, the exploitation strategy will seek to follow the Task 6.2.1 description that indicates which techniques should be used as a minimum viable product for MAGNO exploitation plan in general, and this initial deliverable in particular:

Subtask 6.2.1: Market Analysis and Circular Business approaches [Mo1-M36] [Lead: KVC; Participants: All] Market landscape studies will be implemented for the corresponding results (WP3-WP6) and will be analysed in three market analysis deliverable reports (at the beginning, at the middle and at the end of the project). A financial projection analysis will be performed to evaluate the profitability of the revenue model, to identify the need for future investments, and to define the possible cash flow in the food packaging value chain. The Business Model Canvas included in section 2.2 will be updated in accordance with the project and EU needs. Novel approaches for business will be identified and evaluated: i) adaptation to new digital technologies and processes (consumer engagement and overall efficiency monitoring), ii) consumer centric approaches (decisions and processes, prioritising customer satisfaction and engagement), iii) agile methodology (quickly adapting to changing circumstances and requirements), iv) data-driven decision-making (using data analytics), v) strategic partnerships (leverage complementary strengths and expand market reach), vi) lean startup (quickly develop and test new products or services), and vii) collaborative spaces (fostering a culture of collaboration to improve creativity, innovation and productivity).

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Thus, MAGNO Exploitation plans will implement a methodology based on a given set of minimum KPIs that could be maximized, for building an impact driven strategy whilst being able to measure the performance of the plan to ensure the sustainability and applicability of the project outcomes and KERs. MAGNO consortium will outline an initial exploitation pathway for each of the results, as well as mechanisms to keep exploring exploitability of other project activities. In line with this objective, MAGNO adopts a tailored approach to exploitation with a view on:

- Maximizing the impact of project results.
- Ensuring the sustainability of results beyond the project scope.

The following comprehensive exploitation strategy aims to optimize operations to achieve both goals, through commercial and non-commercial exploitation. At the same time, it seeks leveraging the acquired expertise, initiating new research, and fostering innovation activities through the expanded knowledge base. In this deliverable, MAGNO will put all this together to offer an initial point from where all aspects can be studied, intertwined and evolved to achieve the maximum possible impact across society. Thus, in order to ensure an effective achievement of exploitation goals for the project, the following activities will be performed:

- Providing a preliminary definition of the project's KERs: based on the information included in the Grant Agreement, offer a preliminary description of the KERs.

- Specifying the IP ownership and the envisioned IPR measures, and present the preliminary exploitation set of actions.

- Identifying MAGNO stakeholders incorporating the multi-actor approach. This will guide the selection of the most suitable dissemination formats and channels per target group. Identifying and tracking, in a reliable and continuous way, the stakeholders' needs related to the food packaging industry, in terms of development, use and its related applications, also contributing to the identification of new exploitable results.

- Performing a market analysis which provides essential insights to better understand potential exploitation venues for the project results.

- Implementing a Canva tool for MAGNO to identify features, including unique value propositions for MAGNO results in order to leverage opportunities for exploitation and sustainability.

- Reviewing novel approaches applicable to the food packaging value chain.

- Describing internal consortium processes, i.e., activity schedule, tasks and responsibilities for all the partners involved, to ensure effective implementation of dissemination, communication, and exploitation activities.

This activity will be coordinated with and supported by the C&D plan, that will contribute to:

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- Outline key messages, which will be used to inform stakeholders about the aims and final results of MAGNO and increase awareness of relevant targets about the main project objectives.

- Design dissemination measures, channels, activities, and tools to reach the expected impacts in terms of awareness, engagement, and acceptance supporting the uptake of the project's results.

2.3 Exploitation Key performance indicators

Without prejudice to achieving better results, the MAGNO project design envisages a set of minimum activities that needs to be implemented to ensure a minimum performance. The exploitation plan will also aim to achieve and surpass the thresholds set, but serving as a reference, this KPIs set in the GA are the following:

- **Scientific Journals:** At least 10 publications in one of the following (non-exhaustive list) journals: Biomaterials, Polymers, Food Packaging and Shelf Life, Food Chemistry, Business Horizons, Journal of Business Research.

  These publications should be peer-reviewed and demonstrate significant research contributions in the respective fields. The focus should be on advancing knowledge and providing practical applications in areas such as materials science, polymer chemistry, food preservation, and business research related to the project fields.

- **Practice Abstracts:** At least 10 practice abstracts targeting food multi-actors: End-user material will be produced in the form of several summaries for practitioners in the EIP common format ("practice abstracts"). The project details will also be submitted to the platform with the first deliverable submission. Guidance and templates for these practice abstracts are available on the EIP-AGRI web site: http://ec.europa.eu/eip/agriculture/en/content/eip-agri-common-format. A total target number of 10 practice abstracts is foreseen for the project.

  These abstracts should address practical solutions and innovative practices in sectors such as agriculture, forestry, rural development, and related areas. Topics should include strategies to prevent pollution in soils, water, and air, and cover various stages of the value chain, including production, packaging, and retail. The goal is to disseminate actionable information that stakeholders can apply directly in their practices.

- **Conferences:** At least 12 presentations at the following (non-exhaustive) international conferences: Emerging Food Packaging Technologies Conference (ICEFPT), Food Contact Materials and Risk Assessment Conference (ICFCMRA), Food Bioscience Conference (ICFB), Food Security and Stability Conference, Paris (ICFSS).

  Presentations should showcase the latest research findings, innovations, and best practices in food packaging technologies, risk assessment of food contact materials, biosciences, and food security. These conferences provide a platform to engage with

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international experts, stakeholders, and practitioners in the field. An event data base is already in place to activate this task and ensure the correct matchmaking.

- **Industrial Fairs/Exhibitions:** At least 3 presentations at the following (non-exhaustive) international fairs/exhibitions: EMBAX (International Trade Fair of Packaging, Printing and Reprography), COSMOPACK (Exhibition of Creative Packaging), FOODEX (International Exhibition for the Food and Drink Processing, Packaging, Food Ingredients, and Logistics Industries).

  These presentations should highlight innovative products, technologies, and methods relevant to the packaging and food industries. Participation in these fairs and exhibitions aims to attract industry interest, foster partnerships, and promote commercial applications of research findings.

- **Horizon Results Platform:** At least 6 results presented during the project execution. The Horizon Results Platform is designed to showcase significant outcomes of the project. Each result should be presented clearly, demonstrating its impact, relevance, and potential for further development or commercialisation. However, by the time in which MAGNO can present its results, this platform may not exist. In such case, alternatives will need to be identified to replace this KPI.

- **Horizon Impact Award:** One application. The application for the Horizon Impact Award should highlight a project result with significant societal, economic, or environmental impact. The submission should include evidence of how the project has made a tangible difference and its potential for future influence. However, by the time in which MAGNO can present its results, this platform may not exist. In such case, alternatives will need to be identified to replace this KPI.

- **Workshops:** At least 13 owned workshops with food system multi-actors. These workshops should focus on practical methods that can be directly applied by participants to improve their practices. Topics might include sustainable farming techniques, innovative packaging methods, and strategies for reducing food waste. The aim is to share knowledge, develop skills, and promote best practices among diverse stakeholders in the food system.

- **Innovation radar**: At least 6 project results. These results should be significant achievements of the project, demonstrating innovation, applicability, and potential for further development. Each result should be documented and shared with relevant stakeholders to maximise its impact and utility.

In addition to the aforementioned, other KPIs may be established throughout the project's duration to further enrich the catalogue of resources and maximize its impact on policymakers, academia, industry, consumers, and society at large. These additional KPIs could include metrics for stakeholder engagement, such as the number of policy briefs produced, collaborations with academic institutions, partnerships with industry leaders, and outreach activities targeting consumer education. By setting these supplementary KPIs, the project aims to ensure a

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comprehensive dissemination strategy that not only advances scientific knowledge but also translates research findings into practical applications and policy recommendations. This holistic approach will facilitate informed decision-making, foster innovation, and ultimately contribute to societal well-being and sustainable development.

2.4 Supporting Analysis Techniques

To craft a robust exploitation strategy, it is essential to leverage a variety of analysis techniques to enhance and legitimate the results. These techniques enable MAGNO to identify, assess, and capitalize on potential opportunities, enhancing the value derived from research and development efforts. These techniques are KER and IPR Identification Key Exploitable Results (KERs) are significant outcomes of a project that have potential commercial, social, or environmental value. Identifying KERs involves a systematic evaluation of project deliverables to determine their applicability beyond the immediate scope of the project. A CANVAS methodology as a strategic tool used for business model generation and innovation. A stakeholder analysis to examine the broader environment in which a project operates and seven reviews of Innovative Novel Approaches.

Integrating these techniques into the exploitation strategy involves a cyclical process of identification, analysis, and refinement starting with KERs and IPR Identification to pinpoint valuable outcomes and protect them legally. Then, use the CANVAS Methodology to conceptualize and refine how these outcomes can be transformed into a viable business model. Furthermore, to conduct a landscape stakeholder analysis to ensure that the business model is aligned with the market and its players. And then, perform a Review of Innovative Novel Approaches to keep the strategy innovative and adaptable to future changes. Together, these supporting analysis techniques provide a comprehensive framework for developing a robust and dynamic exploitation strategy.

1. **KERS steps and IPR identification:**

    1) Identification of all Key exploitable results (KERs). This activity is crucial in the lifecycle of a project, especially in the context of MAGNO, which involves research and innovation that also needs to be developed and tested. The process involves systematically identifying and analysing the outcomes of a project that hold significant potential for practical application and commercial exploitation. By focusing on KERs, stakeholders can pinpoint innovations, technologies, or processes that offer tangible benefits, such as solving a specific problem, creating new market opportunities, or enhancing operational efficiencies. This activity typically entails a comprehensive evaluation of the project's results to assess their readiness and value in real-world scenarios. It includes reviewing technological advancements, intellectual property assets, and market needs to determine which results can be effectively transformed into products, services, or processes that provide a competitive edge. Further, implementing an ongoing and iterative process within MAGNO ensures that the most promising aspects of a project are prioritized for

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further development, investment, and dissemination, thereby maximizing the project's impact.

2) Assessment of Intellectual Property Rights (IPR). This activity plays a pivotal role in protecting and leveraging the innovative outputs of MAGNO. This involves a thorough inventory, examination and matchmaking of the project's outcomes to identify any intellectual assets that may be eligible for legal protection of each KER. This process includes evaluating patents, trademarks, copyrights, trade secrets, and other forms of IP that could safeguard the unique aspects of the project's deliverables. By conducting an ongoing detailed IPR assessment, MAGNO partners will determine the novelty and patentability of their innovations, ensuring that they are adequately protected from unauthorized use or replication. Also, partners will consider the openness of innovation for the greater benefit of society when corresponds. This activity also helps in identifying any potential IP conflicts or infringements, allowing for proactive management of IP risks. These two first points will be presented in the following section of this deliverable before providing additional information that will enrich the third step of preparing the exploitation plans. Within this deliverable, the third step will be presented separately in section 8.
3) Preparation of joint and individual exploitation plans for the project partners. Once again, after pooling additional knowledge in previous section, in section 8 exploitation plans and temporal planning will be defined. It involves designing a process to help partners devising comprehensive strategies that outline how each partner will utilize the project outcomes, either collectively or individually. The joint exploitation plan focuses on collaborative approaches where partners work together to bring shared innovations to market, leveraging combined strengths and resources. On the other hand, individual exploitation plans cater to the unique goals and capacities of each partner, detailing tailored approaches for integrating the project's results into their respective operations or business models. This dual approach ensures that both the consortium's collective potential and each partner's individual interests are optimized. The preparation process will incorporate in previous sections rigorous market analysis, stakeholder mapping and novel approaches review to enhance the decision-making process on strategic planning to align the exploitation efforts with business and operational goals. Whilst the process ensures the involvement and a democratic decision-making based on co-creation schemes, the plans are essential for maximizing the impact and return on investment of the project's outputs, fostering innovation, and ensuring that each partner benefits from their participation in the project.

2. A Canvas methodology

The Canvas tool facilitates brainstorming, collaboration, and iteration, allowing businesses to explore different business model possibilities, test assumptions, and refine their strategies accordingly. By visually representing the interconnectedness of various business components, the Canvas tool enables businesses to gain a holistic understanding of their business model and identify areas for improvement or innovation.

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The Canvas tool works by guiding businesses through the process of identifying and articulating these key components of their business model. Businesses begin by defining their customer segments, understanding the different groups of customers they serve and their specific needs and preferences. Next, businesses outline their value propositions, describing the products or services they offer and how they solve customers' problems or fulfill their needs.

Channels and customer relationships are then mapped out, detailing how the business reaches its customers and interacts with them to deliver value and build long-term relationships. Revenue streams are identified, outlining the various ways in which the business generates income from its value propositions. Key resources, activities, and partnerships are identified to support the delivery of value propositions and sustain the business operations effectively. Finally, the cost structure is analyzed to understand the expenses associated with operating the business and delivering value to customers.

3. Landscape assessment

In the shape of a stakeholder identification, profiling, and mapping. Stakeholder mapping is a strategic tool used by businesses to identify and analyze the various individuals or groups who have an interest in or are affected by the organization's activities, decisions, or outcomes [3]. The process involves systematically identifying stakeholders, assessing their level of influence and interest, and determining appropriate strategies for engaging with them [4].

Stakeholder mapping begins with the identification of key stakeholders, which may include individuals or groups such as customers, employees, suppliers, investors, government agencies, community organizations, and advocacy groups. Once stakeholders are identified, they are categorized based on their level of influence and interest in the organization. This categorization helps prioritize stakeholders and determine the most effective engagement strategies.

4. Novel approaches for business

In order to incorporate the value of novel business approaches, the project will review 7 different topics to help identify innovative value beyond the preliminary KERs. Also, the issue of identifying KPIs to measure the variables and try to incorporate them into the different business approaches will be addressed. To do so, according to the GA and Task description, the following topics will be reviewed:

- adaptation to new digital technologies and processes (consumer engagement and overall efficiency monitoring),
- consumer centric approaches (decisions and processes, prioritizing customer satisfaction and engagement),
- agile methodology (quickly adapting to changing circumstances and requirements),
- data-driven decision-making (using data analytics),
- strategic partnerships (leverage complementary strengths and expand market reach),
- lean startup (quickly develop and test new products or services), and
- collaborative spaces (fostering a culture of collaboration to improve creativity, innovation and productivity).

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2.5 Identification of initial value propositions

The MAGNO exploitation process needs, as a primary exercise, the identification and mapping of not only the project's expected results but also the dialogue with all stakeholders in the value chain to identify further needs, as well as exploring the MAGNO intermediate results to determine if a matchmaking exercise is possible. This is intended to unlock all potential for continued exploitation beyond its conclusion. Based on the nature of the outputs and the participating organizations, specific exploitation and sustainability strategies will be formulated in the later stages of the project. These strategies aim to identify how the project outputs can have a meaningful impact beyond the end of the project.

According to the EC, results are defined as "any (tangible or intangible) output of the action such as models, tools, data, knowledge, or information — whatever its form or nature, whether it can be protected or not — that is generated in the action, as well as any rights attached to it, including intellectual property rights". A Key Exploitable Result (KER) is a result selected and prioritized for its significant potential to be 'exploited', i.e. to be used and provide benefits further along the value chain of a product, process or solution. In addition, it may serve as a critical input to inform policy decisions, guide subsequent research efforts, or contribute to educational initiatives. Indeed, KERs can be either commercially exploited for the delivery of products or services or lay the foundation for further research, work, or innovations. Also, there may be secondary exploitation results coming from the intermediate work, or discussion with value chain stakeholders that may identify needs that were not preliminarily taken into account. Thus, in MAGNO, this process will also be complemented by the dialogue with the multi-actor approach consultations.

The MAGNO KER identification process is implemented through a three-step approach:

2.6 Key exploitable results

With these goals in mind, and even though after this deliverable, KERs will be revised on an ongoing basis in parallel with project development, that can be further explored in the GA, the MAGNO project proposes a basic set of Key exploitable results that concentrate the project's innovation potential and that it is expected to provide an answer to the challenges proposed in the previous set of goals. This list might be complemented in the future with feedback from ecosystem stakeholders, or workshops aimed at finetuning the joint and individual different results to pave the way for MAGNO's work to reach policy makers, markets and society in a meaningful sustainable manner:

KER1: Ecosystem Digital twin. Digital twins are the natural next step for evaluating the whole food packaging value chain (from raw materials, design, and manufacture to end of life approaches) by integrating numerical modelling with actual food systems.

The MAGNO Ecosystem digital twin created here will be able to replicate the entire food packaging value chain in terms of quality and quantity. In addition, this software can be used as a "What happens if" tool by providing accurate projections of the circularity and business status.

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MAGNO strategies will be tested, validated and approved using this tool. Ecosystem Digital twin will help discard those strategies that may not work properly and optimise those which show more promise. It will integrate machine learning (Natural Language Processing), automatic syntaxis analysis, key word search and data mining to create a database composed by selected knowledge automatically generated from the World Wide Web. To increase the reach of the Ecosystem Digital twin, all the data generated by the detailed study of circular value chains of packaging (explained in next subsections) will also be integrated. Finally, any possible gap not covered by the automatic and manual research will be covered by commercial datasets such as ZoomInfo or bright data.

The Ecosystem Digital twin will be programmed to replicate Europe as a whole. It will provide results based on the value chain, type of packaging and country-economy selected, covering a wide range of member states in Europe (Spain, Italy and Germany) and international countries such as Lebanon and Tunisia (among others) In the final version, MAGNO will show that with adequate databases, any country can be replicated.

KER2: Detailed study of current and future circular packing systems. MAGNO will provide a very detailed analysis of all the conventional (linear) and circular schemes, showing current tendencies and uncovering the best strategies to be adopted in the near future. By learning from the past, MAGNO will be able to shed light on the possibilities for a brighter future. Policy makers, EC projects, EU open databases, associations, food and packaging companies, universities, RTOs and consumers will be contacted by the MAGNO consortium to obtain real and up-to-date data.

The project activities will cover four different loops in the value chain:

i) Packaging manufacturing: in this loop the packaging design is studied, including the development of new materials, health and safety issues, the modification and implementation of alternative manufacturing routes and the availability of raw materials.

ii) Waste management: this loop will examine the outcomes of the packaging design and production stages at a large scale (involving packers, warehouses, and retailers), analyse how waste production can be minimised and its impacts on the environment (e.g., energy consumption, greenhouse gas emissions) and ecosystems (litter). This loop will also include analysis of packaging labelling.

iii) Packaging usage: this loop will be assessed from the point of view of several actors involved during these stages, including food packers, warehouse owners, retailers, and consumers. The main aspects that will be evaluated are the transportation, storage, and conservation of packaging food items.

iv) End of life: the way in which the circular value chain is closed by recycling the materials will be studied in this loop. Different types of collection and sorting systems, as well as baling and additional recycling processes (chemical or mechanical) will be investigated. Other usages for recycled materials in different

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industries and waste materials (reconverted to raw material) reintegration into the value chain are also included as well. These exhaustive studies will provide valuable knowledge regarding the current state of plastic food packaging and the move towards its more sustainable future. The findings will be incorporated into an Ecosystem Digital Twin to analyse a variety of future European scenarios and how different business strategies impact plastic food packaging.

KER3: Advanced circular business strategies. MAGNO will research all the circular business paths existing in the food system packaging sector. The end point of this project is to present those circular business strategies based on sustainability in order to promote the main subsectors of the packaging value chains such as raw materials, design, energy sources, production, distribution, and recycling. MAGNO will put all the pieces together to decrease environmental impacts and improve human health related to food packaging. At the same time, MAGNO will increase consumer acceptance and the implementation of EU legislation. In this context, new business strategies will be created and tested aided by an Ecosystem Digital Twin that will provide realistic scenarios to test all kinds of new approaches.

KER4: Health and environmental impacts. One of the MAGNO priorities is to reduce the impacts on human health, environmental pollution, and ecosystem degradation from plastic packaging. As part of the packaging design and consumer acceptance studies, MAGNO will perform detailed evaluations of microplastic generation depending on the material and conditions of the packaging used. The investigation will be divided into two parts: i) Involuntary human consumption of microplastic and how to avoid it. One of the immediate actions will be to promote non-use packaging and reduce the unnecessary extra materials for product labelling, and ii) Environmental effects of microplastics and evaluation of ecosystems (soil, water, air). The study will be extended to understand the effects on agriculture, global temperature, urban pollution, waters systems and fauna.

KER5. MAGNO Consumer acceptance web platform. MAGNO will create a web platform dedicated to increasing consumer acceptance, and integrating news, statistics and recommendations for best packaging practices. The main goals of implementing this consumer acceptance platform are: i) to demonstrate the potential reduction of plastic packaging pollution when multi-actor strategies are adopted by showcasing all project results, and ii) to create an environment in which innovation reaches society by incorporating the user in an engaging manner into the packaging value chain. The target audience of the platform is the general consumer, but it will also include information for different actors in the food packing sector. It will include a user-friendly interface which highlights the project outcomes (e.g., showing different packaging solutions and how they impact on the environment and human health, promoting non-use of packaging whenever possible). In addition, results and simulations pertaining to the implementation of sustainable packaging systems will also be presented in an appealing/friendly manner. Furthermore, the platform will also display the outcomes of any possible optimisation for different scenarios generated by the Ecosystem Digital Twin, contributing directly to the enhancement of the EU's standing.

Complementary, there will be other tools to keep deepening on this identification. On the one hand, brainstorming sessions and project reviews will be pivotal in uncovering new opportunities

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within research projects. During brainstorming sessions, to be set on a biannual basis in project presential meetings, WP leaders will share perspectives and creative ideas that can lead to novel approaches and solutions. This collaborative environment encourages out-of-the-box thinking and can reveal insights that might be overlooked in isolated work. Project reviews, on the other hand, provide a structured platform for evaluating progress based on deliverables, identifying challenges, and assessing the relevance and impact of the project's outcomes. By critically analysing the project's trajectory and outcomes, MAGNO can pinpoint areas with potential for further exploration and exploitation. This iterative process of ideation and evaluation not only fosters continuous improvement but also ensures that the project remains aligned with its goals while adapting to new findings and technological advancements. Together, these practices enhance the project's innovative capacity and its ability to generate valuable, exploitable results.

Externally, the project will also put the focus on extracting valuable insights from the multi-actor approach participants. Based on tools that are already available, such as the MAGNO engagement form and the MAGNO distribution list, that will be further complemented with stakeholders identified through the stakeholder mapping exercise, the project will set the basis for bilateral meetings from which MAGNO also expects to contribute to the identification of new exploitable results. From the start to the end of the project, ongoing interactions and several rounds of workshops and interviews with the partners will enable continuous validation and refinement of the results in line with the progress of the project. The tools to be used will be the aforementioned MAGNO Distribution List and MAGNO Engagement Form, which will lead to individual interviews, Tentative Focus groups and periodic surveys to gain insight into exploitable results and other key issues.

The table below is based on the information in the Grant Agreement and outlines the Key exploitable results (KERs) expected from MAGNO, also laid down in an earlier section (section2.2). These KERs will be consolidated and validated throughout the project according to its development. The information on the plans and actions will be reported in the corresponding deliverable reports and will contribute to updating the overall Plan of Communication, Dissemination (D7.1, D7.2 and D7.3) and also the Exploitation one (D6.2, D6.3 and D6.4).

KERs will be revised and if necessary updated to determine the project priorities based on three main parameters: i) Degree of innovation, ii) Exploitability, and iii) Impact on the Food system Industry. The sum of the three factors will define the importance of each KER and determine the proper exploitation strategy for the project and specific business strategies for the project partners. The table below shows the preliminary list of the main expected results and its corresponding exploitation route. Also, a full IPR catalogue including explanation of each mechanism in the table, and other alternatives, can be found in section 1.7.

Table 2 - preliminary list of the main expected results

Partner	Expected foreground	Type	Protection	Initial Potential Market
All	(KER1) Database pre-processed including the whole value chain of food packaging	Integrated System	Licensing	Food business operators, Market analysis, designer, producers.

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All	(KER5) Practice abstracts and practice methods	Result	Other protection	Operators, producers, developers in food sector
All	(KER1) Contribution to standardisation (either feedback on existing standards for their revision or proposals for new standards)	Result	Other Protection (in this case, Fair Use and Fair Dealing	Standardisation communities, incl. Manufacturer sector
IDE	(KER1) Ecosystem Digital twin software integrating all modules	Software	Licensing	Food multi-actors, researchers, and food operators.
IDE	(KER1) NLP algorithms to automatic extract information from the world wide web.	Software	Licensing	Researchers and academy
IRIS, IDE	(KER5) Web platform for consumer acceptance	Software	Ownership	Consumers, associations, policy makers.
All	(KER2): Detailed study of current and future of circular packing system.	Result	Other Protection as Fair Use and Fair Dealing	Business operators, policy makers
All	(KER3) Advanced circular business strategies.	Results	Other protection as Public Domain dedication	Business operators, policy makers
All	(KER4) Health and environmental impacts	Results	Other protection as Public Domain dedication	

2.7 Assessment of Intellectual Property Rights (IPR)

MAGNO will ensure I.P. protection during and after the execution of the project. Every partner involved with I.P. protection will identify any necessary IPR during the project execution. Therefore, no result will be publicly disseminated/communicated before being formally evaluated by each partner under the guidance of DNV and Project Coordinator. During the General Assembly, results defined as more generic can be disseminated to the broader target groups and stakeholders. The idea is to make every possible effort to have the I.P. as 'clean' as possible. In other words, the project aims at making the ownership clearly defined.

Beyond preliminary work, from M13of the project, DNV, with the support of the consortium partners, will prepare a preliminary list of the results and partners involved as part of the exploitation strategies. Hereby, minimising later conflicts is the target from project inception. This list will be revised and updated throughout the project, including all the outcomes of the

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R&D activities. Furthermore, the exploitation of the results is available for each partner unless other conditions are agreed upon by all partners involved. A list of the relevant background I.P. from each partner will be incorporated in the C.A. The access rights by the other partners in the project are also stated in the same document. Table 2, presented previously, shows a brief list of the partners' background (including know-how and expertise), and table 2, above highlighted foreground I.P. This process will be complemented with the following steps:

- **Conducting an IP Audit exercise:** This audit involves cataloging all potential IP assets, examining existing patents, trademarks, copyrights, and trade secrets, and assessing their current status and scope. The results of this process will be presented in the next iteration of this deliverable (D7.3). The audit will help in understanding the strengths and weaknesses of the existing IP portfolio and in planning the necessary steps for further protection and exploitation [5].

- **Evaluating feasibility and Freedom to Operate:** Once potential IP assets are identified, the next step is to evaluate their feasibility. This involves conducting prior art searches to ensure that the innovation is novel and non-obvious compared to existing knowledge and patents. Additionally, a freedom-to-operate (FTO) analysis is crucial to ensure that the commercialization of the innovation does not infringe on existing patents. This step helps in mitigating the risk of legal disputes and in identifying any necessary licenses or collaborations [6].

- **Securing IP Protection:** It is a multi-faceted process that includes filing patents, registering trademarks, and securing copyrights. For patents, this involves preparing and submitting detailed patent applications that meet the legal requirements of the jurisdictions where protection is sought. It is advisable for partners to seek the assistance of IP attorneys or agents to navigate the complex legal landscape and to ensure robust protection. For software and creative works, copyright registration can provide additional legal safeguards, while trademarks can protect brand names and logos [7].

- **Managing and Leveraging IP:** Once IP protection is secured, effective management and leveraging of these assets will be made by project partners that will be holding the exploitation rights of each of the deliverables. This involves maintaining up-to-date records of IP rights, monitoring for potential infringements, and enforcing rights when necessary. Licensing agreements can be a powerful tool for leveraging IP, allowing other entities to use the innovation in exchange for royalties or other considerations. Additionally, forming strategic partnerships and alliances can enhance the commercial potential of the IP assets [8].

- **Continuous Review and Adaptation:** The IP landscape is dynamic, with constant changes in technology, market conditions, and legal frameworks. Therefore, continuous review and adaptation of the IP strategy are essential.

Complementary considerations will be made for any other potential result that could be subject to a future business impact on project outcomes. Thus, in chapter 6, a catalogue and in-depth analysis of each of the I.P. alternatives will be provided so partners can also consider all available

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options. Chapter 6 will also establish the decision-making process as well as outline the different options that could be applied to each result. Establishing the basis for reaching consensus among the IP owners on the subsequent exploitation of the joint results and assessing appropriate IP protection measures are key stages in the development of effective exploitation strategies.

Each step is integral to maximizing the value and impact of the innovation, ensuring that it can be effectively protected, commercialized, and leveraged for sustained competitive advantage even after the project ends. The preliminary exploitation strategy for each of the results related to the project KERs is already envisioned in Chapter 9, to allow project partners to work towards a successful technology and knowledge transfer and fuel both project and post-project uptake.

2.8 IPR Catalogue

In order to communicate and decide internally on joint and individual modalities of Intellectual property (IP) rights for MAGNO results, it is necessary to set up the basis of the framework by making an inventory of all mechanisms for protecting and exploiting innovation. This will be done not only by addressing traditional IP rights. Whenever the nature of the result allows it, MAGNO will focus on open access alternatives to foster collaborative innovation and widespread dissemination of knowledge. By choosing the appropriate mechanism, MAGNO can balance protection, dissemination, and collaboration to maximize the impact of its work. Below is a list of IP rights alternatives, including both conventional and open access options, so MAGNO partners can have all the tools to consider when studying joint and individual options:

- Patents: They grant exclusive rights to inventors for a fixed period, typically 20 years, allowing them to exclude others from making, using, or selling the invention without permission. Patents are ideal for protecting novel, non-obvious, and useful inventions (WIPO, 2020).
- Trademarks: Trademarks protect symbols, names, and slogans used to identify goods and services. They help distinguish products from competitors and build brand recognition. Trademarks can be renewed indefinitely as long as they are in use [9].
- Copyrights: It protects original works of authorship, such as literary, musical, and artistic works. Copyright provides the creator exclusive rights to reproduce, distribute, perform, and display the work, typically for the life of the author plus 70 years.
- Trade Secrets: Trade secrets protect confidential business information that provides a competitive edge. This includes formulas, practices, processes, designs, instruments, or compilations of information. Protection lasts as long as the information remains secret and provides economic value.
- Industrial Designs: Industrial design rights protect the aesthetic aspects of an object, such as its shape, pattern, or color. This encourages innovation in the design of manufactured goods. Protection usually lasts between 10 to 25 years, depending on the jurisdiction [10].

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- Open Access Licenses: Open access licenses, such as Creative Commons (CC), allow creators to grant public permissions to use their works under specified conditions. CC licenses range from allowing unrestricted use to permitting only non-commercial use with proper attribution. These licenses promote sharing and collaboration while protecting the creator's rights [11].
- Open-Source Licenses: Open-source licenses apply to software, enabling anyone to use, modify, and distribute the software freely. Popular open-source licenses include the GNU General Public License (GPL), MIT License, and Apache License. These licenses encourage innovation and collective improvement of software [12].
- Public Domain Dedication: Creators can choose to dedicate their works to the public domain, relinquishing all their rights and allowing anyone to use the work without restrictions. Tools like Creative Commons Zero (CC0) facilitate this process, promoting maximum dissemination and use of knowledge and creativity [13].
- Data Sharing Agreements: Data sharing agreements are used to share data among organizations or researchers under agreed terms. These agreements define how data can be used, ensuring that the data provider retains some control while enabling valuable research and collaboration [14].
- Patent Pools: Patent pools are agreements between multiple patent holders to license their patents to one another or to third parties. This can reduce litigation risks, lower transaction costs, and promote innovation, especially in complex fields like biotechnology and telecommunications [15].
- Compulsory Licensing: Compulsory licensing allows governments to permit the use of a patented invention without the patent owner's consent under certain conditions, such as public health needs. This ensures that essential innovations remain accessible [16].
- Fair Use and Fair Dealing: Fair use (or fair dealing in some jurisdictions) allows limited use of copyrighted material without permission for purposes such as criticism, comment, news reporting, teaching, scholarship, or research. This balances the rights of creators with public interest [17].

2.9 Preparation of joint and individual exploitation plans for the project partners.

The joint MAGNO exploitation plan will be further explained in section 8, but this process should follow these steps:

SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats): Analysis that would help understanding the internal and external factors that can impact the exploitation of project results. This analysis should be performed separately for each result to capture their unique perspectives and combined for a holistic view. The SWOT analysis aids in identifying key areas for strategic focus and potential collaboration [18].

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Defining Exploitation Objectives: Clear and measurable exploitation objectives should be defined. These objectives should align with the overall goals of the project and the specific goals of individual stakeholders. Objectives can include market penetration, revenue generation, technological advancement, or societal impact. Setting clear objectives ensures that all stakeholders have a common understanding of what success looks like [19].

The Joint Exploitation Plan Development itself: The joint exploitation plan focuses on collaborative efforts, concrete activities and shared resources among project partners. This plan should include:

- Resource Sharing: Identifying resources that can be pooled together, such as funding, facilities, and expertise.
- Market Strategy: Developing a unified market strategy that leverages the strengths of all stakeholders to penetrate target markets.
- Risk Management: Establishing a joint risk management framework to address potential challenges and uncertainties.
- Intellectual Property (IP) Strategy: Developing a shared IP strategy to manage patents, trademarks, and copyrights, ensuring fair distribution of IP rights and benefits [20].

Individual Exploitation Plan Development

The MAGNO individual exploitation plans should allow each stakeholder to pursue specific opportunities that align with their unique goals and capabilities. This plan should include:

- Tailored Market Strategies: Developing specific market strategies that cater to individual stakeholder needs.
- Customized IP Management: Managing IP rights in a way that supports individual stakeholder exploitation while respecting joint agreements.
- Resource Allocation: Allocating resources effectively to maximize individual stakeholder benefits.
- Monitoring and Evaluation: Establishing mechanisms for ongoing monitoring and evaluation to track progress and adapt strategies as needed [21]

Integration and Alignment: Integrating joint and individual exploitation plans is crucial for coherence and efficiency. Regular meetings and communication channels will be in place to ensure alignment and to address any conflicts or overlaps. This integration ensures that the efforts of all stakeholders are synergistic and that the overall project goals are met.

Implementation and Monitoring: Implementing the exploitation plans requires coordinated efforts and continuous monitoring. This includes:

- Action Plans: Developing detailed action plans with timelines, responsibilities, and milestones.
- Performance Metrics: Establishing performance metrics to measure progress towards exploitation objectives.

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- Regular Reviews: Conducting regular reviews to assess performance, address challenges, and make necessary adjustments.

Feedback and Continuous Improvement: Continuous feedback and improvement are essential for successful exploitation. Collecting feedback from stakeholders and learning from the implementation process can lead to refinements and enhancements of the exploitation plans. This iterative process ensures that exploitation strategies remain relevant and effective in achieving their goals.

In conclusion, a structured methodology for developing joint and individual exploitation plans ensures that all stakeholders can effectively leverage project results. By following this process, MAGNO partners will be able to close the gap between innovation, markets and audiences maximising the impact and value of MAGNO innovations, driving both individual and collective success. By the end of this deliverable, in section 8, concrete plans for each result, as well as the preliminary joint planning, will be established to allow a smooth running of preparatory activities and its execution.

3 Landscapes assessment

In the realm of the food packaging sector, stakeholder mapping assumes a pivotal role, primarily focused on exploiting MAGNO project findings. It provides businesses with a visual representation of their stakeholder landscape, helping understand the dynamics of stakeholder relationships and develop MAGNO strategies for managing these relationships effectively to close the gap between innovation and the markets. By identifying key stakeholders, assessing their needs and expectations, and prioritizing engagement efforts, businesses can enhance stakeholder satisfaction, mitigate risks, and build support for their initiatives [22]

3.1 Methodology

This section outlines the methodology adopted for stakeholder analysis in the MAGNO project. A participatory approach was used, combining collaborative techniques with partners and complementary online research to gain a comprehensive understanding of the stakeholders within the food packaging ecosystem.

3.1.1 Objectives

The specific objectives of stakeholder mapping within the MAGNO project include identifying key stakeholders, analysing their relationships and impacts, and devising collaboration and sustainability strategies. By leveraging stakeholder mapping alongside weighted KPIs and optimised business strategies generated from Subtask 6.2.2, the MAGNO project can navigate strategic decisions and foster collaborations effectively. This comprehensive approach ensures that MAGNO remains responsive to evolving market landscapes and maximizes its impact in driving sustainable business practices in the food packaging value chain.

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3.1.2 Quintuple Helix of Stakeholders approach

This exercise was based on the theory of the Quintuple Helix of Stakeholders model. This model includes public administration, industry, civil society, research and education, and transversally, the environment. It fosters tackling global issues through interdisciplinary and transdisciplinary collaborative exchange of knowledge and expertise among the different subsystems, promoting sustainable development. This approach plays a crucial role in communicating, disseminating, and exploiting the project features and results, while also enhancing the project's impact. Below a graphic illustration of the structure of the quintuple helix:

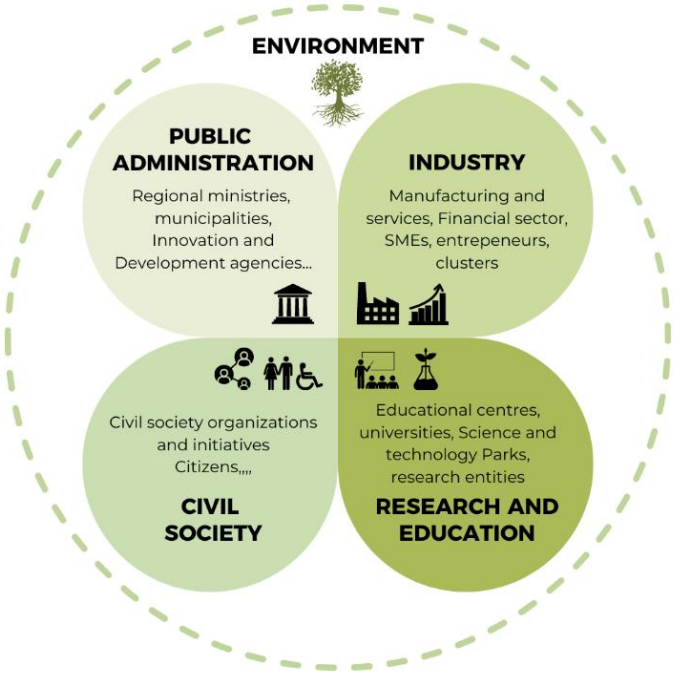

Figure 1 - Quintuple Helix of Public Engagement

3.1.3 Stakeholder Mapping

Stakeholders are often plotted on a matrix with two axes: one representing their level of influence over the organisation, and the other representing their level of interest or involvement in the organisation's activities. Stakeholders with high influence and high interest are considered key players and require proactive engagement and management. Those with high influence but low interest may need to be kept satisfied or informed to mitigate risks or gain support for initiatives. Stakeholders with low influence but high interest may require regular communication or consultation to address their concerns and build goodwill. Finally, stakeholders with low influence and low interest may require minimal engagement or monitoring, although they should not be entirely disregarded as their perceptions or actions could still impact the organization indirectly.

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3.1.4 Newcombe Stakeholder Matrix

The stakeholder engagement matrix [23] is a well-established tool used for the initial methodological structure during internal stakeholder identification and landscape assessment. This matrix helps to systematically organize and visualize the collected information, categorizing stakeholders based on their interest and influence.

Using the Newcombe stakeholder matrix, a clear overview of the stakeholder landscape can be gained in the field of food packaging, highlighting key players and their roles. Also facilitating grouping them in bigger categories that can allow MAGNO build cost-effective campaigns enabling the project team to prioritize engagement efforts and develop targeted strategies.

Although emphasis is placed on managing stakeholders closely and meeting the needs of those with significant interest and influence, the other groups should not be ignored. The matrix ensures that all stakeholders are considered, helping to balance attention and resources effectively across the spectrum as shown below in the following image:

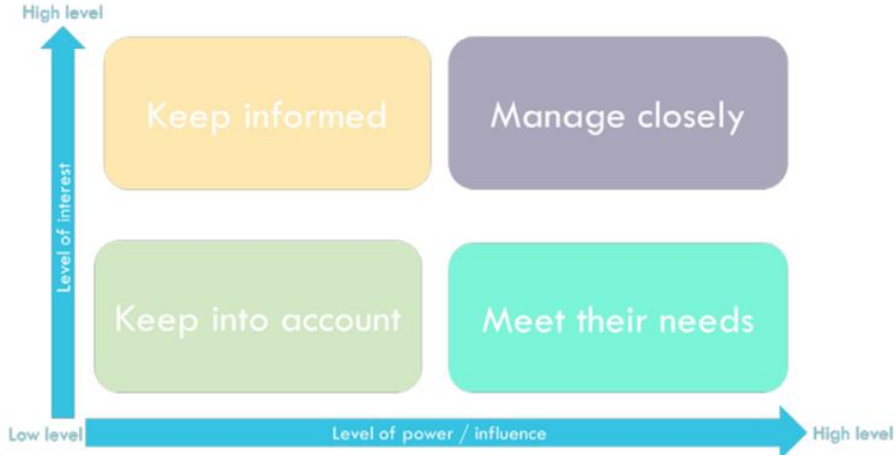

Figure 2 - Stakeholder engagement matrix, following approach of Robert Newcombe

With this in mind, the stakeholder analysis followed a three-step approach as described below:

1) **Understanding the Food Packaging Value Chain:**
   a. MAGNO's Food Packaging Value Chain Phases.
   b. Type of stakeholders typically involved in the sector, with due consideration of the quintuple helix model.
2) **Data Collection**
   a. Preparatory Activities: Review of documents and establishment of a collaborative process framework.
   b. Brainstorming, Bilateral Meetings and Collaborative Approach: Engage with partners and stakeholders for insights.
   c. Systematizing Information: Organise data using tools like Excel.
   d. Complementary Online Search: Conduct targeted online searches to supplement data.

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3) **Stakeholder Mapping**
   a. Stakeholders' Main Activities: Identify and define stakeholder and main activities within the food packaging sector's value chain.
   b. Stakeholders within the Value Chain: Determine types of stakeholders associated with each value chain phase.
   c. Key Stakeholder Assessment: Evaluate stakeholders based on their interest and influence in the project and the sector at large.
   d. Newcombe Stakeholder Matrix: Utilize the Newcombe stakeholder matrix to categorize stakeholders based on interest and influence and determine appropriate engagement actions.

3.1.5 Food Packaging Value Chain and Circular Model

This section outlines its key stages and stakeholders, emphasizing their roles and interactions. MAGNO's approach focuses on tackling plastic pollution, optimizing packaging effectiveness through sustainable practices, and promoting innovative business strategies.

MAGNO is dedicated to developing circular solutions within the food packaging value chain, transforming linear processes into sustainable ones. Integration across the value chain is crucial for sustainability and innovation. Understanding this value chain is crucial for MAGNO's success and for this exercise. By identifying the MAGNO circular approach, the project pinpoints key intervention points and assesses its real impact, developing effective sustainability and innovation strategies based on the crossroad between results, stakeholder profiles and circular model phases. The model, as laid down in Deliverable 1.4 is shown if figure 3:

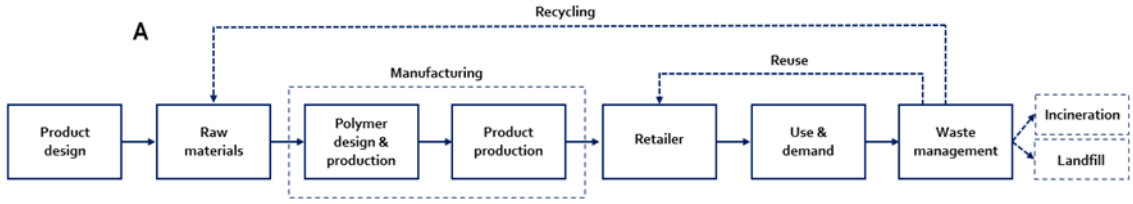

Figure 3 - MAGNO Food Packaging Value Chain Phases

Combined with the Quintuple Helix model, stakeholders can be grouped within this model to ensure effective engagement actions, identify synergies and uncover potential collaboration areas as shown in table 3.

Table 3 - Main Types of Stakeholders in the SH quintuple helix model

Helix	Category	Description

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Industry	Industry Stakeholders	These stakeholders are primarily involved in the manufacturing and production of food packaging materials and products. They play a vital role in innovating packaging solutions and driving industry standards.
	Manufacturer Stakeholders	Manufacturers provide machinery, equipment, and services related to packaging production. They contribute to the operational aspects of the packaging value chain.
Policy Makers and Regulators	Policy Makers and Regulators	Policy makers and regulators set standards, regulations, and directives governing the food packaging industry. They ensure compliance with environmental and health standards.
Research and Education	Education and Research Development Institutions	These institutions focus on research, development, and education in food packaging and related fields. They contribute to knowledge advancement and innovation.
Civil Society	Consumer Organisations	Consumer organisations advocate for consumer rights and provide insights into consumer preferences and behaviours. They influence market trends and consumer awareness.
	Community Organisations	Community organisations focus on local engagement, sustainability, and community resilience. They drive grassroots initiatives and community-based solutions.
Environmental and Transversal Stakeholders	NGO's	Non-Governmental Organizations (NGOs) focus on environmental, social, and sustainability aspects of the food packaging industry. They drive awareness and advocate for change.
	Media Outlets	Media outlets provide information and coverage on industry developments, trends, and issues related to

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		food packaging. They shape public opinion and discourse.
	International Organisations	International organisations provide global governance, research, and advocacy on food packaging issues. They coordinate efforts and set global agendas.

3.1.6 Data collection for Stakeholder Analysis

This section details the data collection methodology used for stakeholder analysis in the MAGNO project, emphasizing the collaborative processes, systematic organization, and strategic profiling of stakeholders in the food packaging ecosystem that included:

Preparatory Activities

The initial stage involved a comprehensive review of foundational documents to establish the necessary structure and steps for the subsequent stakeholder analysis. This preparatory work laid the groundwork for a thorough and collaborative data collection process, ensuring all relevant factors were considered from the outset. Initial steps included informal e-bilateral or e-thematic-focused discussions to set the stage for effective collaboration.

Bilateral Meetings and Collaborative Approach

By a consultation process consisting in brainstorming exercise, partners did leverage their diverse expertise, to identify companies and relations in the value chain. This involved engaging project partners through informal e-bilateral and e-thematic-focused discussions. Over this collaborative effort including around 200 companies (that can be checked in Annex A), a series of company profiles was identified to open discussion and matchmaking process that will guide the overall exploitation strategy. The process was complemented by identifying gaps in the value chain and being filed with desk research.

This approach also helped us to identify industry and transversal partners that are related to businesses, including investors, local decision-makers, and social and environmental actors that can work closely, act as multiplayers or as regulators with the project team in identifying suitable solutions. This holistic approach seeks the long-term sustainability of the project and will enhance its impact. Beyond this, by fostering this co-creative multi-stakeholder environment and complementing it with some knowledge transfer activities, MAGNO partners will expand their knowledge about stakeholders and sustainable business practices and actions in the food packaging industry.

Systematizing Information

The data collected from these discussions were systematically organized into an Excel table. The table was created and structured according to some preestablished parameters, which serve to

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register detailed information related to stakeholders, such as their main business activities, relationships within the value chain, their contact information and general characteristics.

Project partners contributed by listing stakeholders they deemed relevant. This structured approach ensured that all relevant information was captured comprehensively and consistently as is presente in figure 4 but can also be checked in Annex 1.

Company name	Main business activities	Value chain step	Relationships within the value chain			Website	Company Size	City	Country	Comments
			Customers	Competitors	Initiatives					
Südpack	Producer of flexible packaging materials for food, technical products and pharmaceutica		Food producers, pharma companies, technical companies	Packaging producers	CEFLEX, Circular Plastics Alliance, Danish Food Cluster, ELIPSO, FPE, ZLV, IKK, IHK, HolyGrail 2.0, OPRL, Packaging Valley, KIDV	www.suedpack.com	Medium - Large	Ochsenhausen	Germany	Locations in Europe,
Amcor	Producer of packaging for food, beverage, pharma, home and personal care		Food producers, pharma companies, personal and home care producers	Packaging producers	AEPW, Ellen MacArthur Foundation, Plastics Pacts, Earthwatch Institute	www.amcor.com	Large	Zurich	Switzerland	Global company, from Australia
Constantia Flexibles	Producer of flexible packaging for food, pharma		Food producers, pharma companies	Packaging producers	CEFLEX, Sustainable Packaging Coalition, FPE, alufoil, 4evergreen, "Stop Waste - Save Food"	www.cflex.com	Medium - Large	Vienna	Austria	Globally active
Koehler Paper	Producer of paper		Food producers, pharma companies, cosmetics companies	Paper and packaging producers	Blauer Engel, PEFC, FSC	www.koehlerpaper.com	Medium - Large	Oberkirch	Germany	Family owned, globally active, produces packaging paper among other categories

Figure 4 - Extract from the Stakeholder Mapping and Profiling Table provided by Magno Partners

Complementary Desk Research

In addition to the information provided by project partners regarding potential stakeholders, in order to fill gaps identified, an extensive desk search was conducted using targeted keywords. This approach aimed to deepen the understanding of the types of stakeholders relevant to the food packaging sector.

By incorporating keyword-driven internet searches, it was possible to supplement the partners' insights with a wider range of data. This allowed capturing a more detailed and accurate picture of the stakeholder landscape, ensuring that the profiling was both thorough and representative of the diverse interests within the food packaging ecosystem. This dual approach, combining partner input with extensive online research, has significantly enhanced the robustness of the stakeholder analysis, providing a solid foundation for effective engagement and collaboration throughout the project as shown below.

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Name	Category	Sector	Activity Type	Status	Country (base/HQ)
Industry					
Graham Packaging Iberica S.l.	Sociedad limitada unip	Industry	Fabricación artículos acabados mat	Active	Spain
Flexible Packaging Europe (FPE)	Industry Association	Industry	Flexible packaging made of different	Active	Germany
BioPak (UK)	Company	Industry/Trade	Food service packaging madre from	Active	UK
Ecoologic	Company	Industry/Trade	Comercio online de vajillas biodegra	Active	Spain
O-I Glass, Inc	Company	Industry	Glass Packaging	Active	Finland/Switzerland
ALPLA	Company	Industry/Trade	DESARROLLO Y LA FABRICACIÓN DI	Active	UK
CANPACK	Company	Industry	Manufacturer of beverage packaging	Active	Poland
KM Packaging Services Ltd.	Company	Industry/Supplier	Leading supplier to the global food n	Active	UK
TetraPack	Company	Industry	Soluciones de envasado y procesam	Active	Suecia
UPM-Kymmene	Company	Industry/Supplier	Fabricación de pulpa de celulosa, pa	Active	Finland
Coopbox (Eastern)	Company	Industry	Food packaging		Italy
Manufacture					
SEALPAC GmbH	Company	Manufacturer	Manufacturer for packaging machines. Develop		Germany
Policy Makers and Regulators					
European Food Safety Authority (E	Local and Regional Au	Regulatory Body	Provides scientific advice on food-related risks, including packaging safety		
European Parliament Committee	Local and Regional Au	Regulatory Body	Legislative oversight on environmental and food safety issues, including pa		
European Environment Agency (EE	Local and Regional Au	Regulatory Body	Provides information and assessments on environmental issues, including		
Directorate-General for Health an	Local and Regional Au	Regulatory Body	Manages EU policies on food safety and health, including packaging regula		

Figure 5 - Extract from the Stakeholder Mapping and Profiling Table derived from online search.

3.2 Results

The results are structured considering the methodology and steps described in the sections above.

i. Stakeholders' Main Activities

Below is a summary of the primary activities identified among stakeholders. Geograhically this analysis has been based in input from MAGNO partners. In the food packaging value chain, the majority of stakeholders belong to the industry sector. As mentioned before, desk research was conducted to expand upon these findings, incorporating insights from the Quintuple Helix model. Below you can find the classification, organised by main activities and corresponding subcategories, attempts to encompass most activity types and operations within the sector, as well as concrete examples for each.

Table 4 - Stakeholders in the Food Packaging Value Chain

Main Activity	Subcategories	Examples of Stakeholders
Packaging Materials Production	Flexible Packaging Producers	Südpack, Amcor, Constantia Flexibles, Michelman Packaging Solutions, CDM Packaging
	Paper and Paper-Based Packaging Producers	Mondi, Koehler Paper, Gascogne, Seda, Nissha Metallizing Solutions

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	Plastic Producers	Alpla, Faerch, RPC, Berry Global Inc., Greiner, ITC Packaging
Packaging Products Manufacturing	General Packaging Producers	Multivac, Groupe Guillin, Coopbox, ITC Packaging, Viscofan
	Specialized Packaging Producers	DART Products Europe, Faerch, Greif, Linpac (KP), United Caps
Food Production	Food Producers	Nestlé, Mondelez, Unilever, Kraft Heinz, Mars Incorporated
	Consumer Goods Producers	Procter & Gamble, Unilever
Food Processing	Food Processors	Frischpack Gruppe
Retail and Distribution	Grocery Stores	REWE Group, ALDI Nord, ALDI Süd, EDEKA, Schwarz-Gruppe
Recycling Operations	Recycling Operators	Lobbe Umweltservice GmbH & Co KG, Remondis, SUEZ, Veolia Environnement S.A.
Raw Materials and Chemicals	Chemicals and Polymers	Dow Chemical Company, BASF SE, Borealis AG, SABIC, TotalEnergies, ExxonMobil Chemical
	Specialty Materials	NatureWorks LLC, Avantium N.V., Arkema
Consumer and Environmental Advocacy	Consumer Advocacy Groups	European Consumer Organisation (BEUC), Which?, Test Achats/Test Aankoop, UFC-Que Choisir, OCU
	Environmental Organizations	Greenpeace European Unit, Friends of the Earth Europe, Zero Waste Europe, Surfrider Foundation Europe, WWF
Research, Innovation and Education	Universities and Research Institutions	Wageningen University & Research, ETH Zurich, Technical University of Munich, National Food Institute, Technical University of Denmark
Regulation and Industry Associations	Regulatory Bodies	European Packaging and Packaging Waste Directive, EUROPEN, FEAD
	Industry Associations	European Bioplastics Association, The European Plastics Converters (EuPC), European Federation of Corrugated Board Manufacturers (FEFCO)

Within the different phases of the value chain, the most dominant activities are represented by producers of flexible and plastic packaging. Stakeholders like Südpack and Alpla lead in providing versatile packaging solutions that cater to a broad spectrum of industries including food, pharmaceuticals, and consumer goods. The rising importance of sustainable and eco-friendly packaging is evident from the participation of companies like BioPak (UK) and UPM-Kymmene, who focus on environmentally responsible packaging solutions. Some of them are

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engaged in initiatives like CEFLEX, Circular Plastics Alliance, Ellen MacArthur Foundation, and others.

Moreover, food producers and retailers significantly influence packaging trends and sustainability initiatives, with major players like Nestlé and REWE Group leading the charge towards environmentally friendly packaging solutions. This shift is further supported by the efforts of recycling operators and environmental organisations.

The role of machinery and equipment providers, like Multivac and SEALPAC GmbH, is vital for maintaining efficiency and innovation in packaging production processes. Additionally, chemicals and materials suppliers like Henkel and Dow Chemical Company drive the development of new materials and technologies, enhancing the functionality and sustainability of packaging.

Additionally, the presence of regulatory frameworks and active industry associations in this context, ensures that the sector adheres to high standards of sustainability and consumer safety. Meanwhile, research institutions also play a crucial role in promoting best practices and sustainable policies within the industry.

ii. MAGNO Stakeholders within the Food Packaging Value Chain

MAGNO's typology of Stakeholders:

- Researcher: Conducts studies and develops innovations in packaging materials and technologies.
- Developer of Sustainable Packaging: Designs eco-friendly packaging solutions to minimize environmental impact.
- Packaging Converter and Recycler: Transforms raw materials into packaging products and recycles used packaging materials.
- Food Business Operator: Produces, processes, and distributes food products, influencing packaging requirements and sustainability practices.
- Food Packaging Producer: Manufactures packaging materials specifically for the food industry to ensure food safety and quality.
- Consumer: Influences packaging practices through preferences for sustainable packaging and participation in recycling programs.
- Local and Regional Authorities: Implement waste management policies and regulations, impacting packaging waste handling and disposal.

The tables below (table 5 to 8) present the types of stakeholders associated with each value chain phase. For each phase, specific examples of stakeholders are provided along with a brief description of their typical operations within that phase. It's important to note that while these examples offer insight into the general types of stakeholders and their operations, they are not exhaustive, and a single stakeholder may be involved in multiple phases of the value chain.

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Table 5 - Stakeholders within MAGNO Food Packaging Value Chain Phases

Value Chain Phase	SH activities' Subcategories	MAGNO typology of stakeholder	Operations within the value chain phase
Product Design	Sustainable packaging design, Innovation research, Material optimisation	Developers of sustainable packaging; Researcher	These entities conduct research and design innovative packaging solutions focusing on sustainability.
Raw Materials	Raw materials extraction, Material suppliers, Material processing	Packaging Converter and Recycler	They procure raw materials such as paper, plastics, and metals and convert them into packaging materials.
Polymer Design & Production	Polymer formulation, Polymer synthesis, Additive development, Converters, Masterbatchers	Researcher; Packaging Converter and Recycler	These companies specialize in designing and manufacturing polymers specifically for packaging applications.
Product Production	Manufacturing	Food Packaging Producers; Food Business Operator	They produce a wide range of packaging materials and products, ensuring quality and consistency.
Retailer	Distribution, Wholesalers, Retail chains, E-commerce	Food Business Operator	Retailers play a crucial role in distributing packaged products to consumers, driving demand for packaging.
Use & Demand	Consumer use, Market demand, Product consumption	Consumer; Food Business Operator	Consumer preferences and usage patterns influence packaging trends and consumption behaviour.
Waste Management	Collection, Transport, Disposal, Sorting	Local and Regional Authorities; Packaging Converter and Recycler	These entities manage the collection, transport, and disposal of packaging waste, ensuring proper disposal.
Recycling	Sorting, Processing, Re-manufacturing, Upcycling	Packaging Converter and Recycler; Local and Regional Authorities	They specialize in processing recyclable materials, diverting them from landfills for reuse or remanufacture.

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Incineration	Waste-to-energy, Thermal treatment, Combustion facilities	Packaging converter and recycler; Local and Regional Authorities	Non-recyclable packaging waste is incinerated to generate energy, contributing to waste-to-energy processes.
Landfill	Waste disposal, Landfill management, Environmental monitoring	Packaging converter and recycler; Local and Regional Authorities	Non-recyclable and non-combustible packaging waste is disposed of in landfills, managed by waste operators.
Reuse	Repurposing, Refillable packaging, Circular economy initiatives	Developers of sustainable packaging; Consumer; Food Business Operator	These entities promote reuse initiatives, extending the lifecycle of packaging materials and minimizing waste.

While this table primarily focuses on stakeholders within the industry sector of the food packaging value chain, it is important to acknowledge the contributions of other identified stakeholder types, whose participation and influence span across various phases of the value chain. The table below highlights additional relevant stakeholders with transversal influence in the sector and environmental matters:

Table 6 - Transversal Stakeholders within MAGNO Food Packaging Value Chain Phases

Type of Stakeholder	Examples	Role throughout the Value Chain	Value Chain Phases
Regulatory Bodies and Industry Associations	European Commission, European Packaging and Packaging Waste Directive	Set standards, provide guidelines and advocacy. Ensure compliance and promote best practices.	All phases, significant impact on Product Production and Waste Management
Research & Innovation Institutions	Wageningen University, Technical University of Munich	Innovate and develop new sustainable packaging technologies.	Product Design, Polymer Design & Production
Environmental Organisations	Greenpeace, Rethink Plastic Alliance	Advocate for reduced plastic usage and better waste management practices.	Product Design, Waste Management, Recycling

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Consumer Advocacy Groups	European Consumer Organisation (BEUC)	Influence packaging design and materials through demand and advocacy for sustainable options.	Product Design, Use & Demand, Waste Management

iii. Stakeholder Analysis and Engagement Strategy in the Food Packaging Value Chain

To identify the key stakeholders in the food packaging value chain, an assessment was conducted utilizing the Newcombe Matrix as a guiding tool. This evaluation aimed to ascertain their potential levels of interest and influence on both the project and sector at large and determine possible engagement actions.

Table 7 - Stakeholder Classification Matrix

Influence \ Interest	High Interest	Medium Interest	Low Interest
High Influence	Key Players (Manage Closely)	Keep Satisfied	Keep Satisfied
Medium Influence	Keep Informed	Keep Informed	Monitor
Low Influence	Keep Informed	Monitor	Monitor

- Manage Closely: For primary stakeholders requiring high levels of commitment and ongoing attention.
- Keep Satisfied: For secondary stakeholders, ensuring their needs are met without intensive engagement.
- Keep Informed: For tertiary stakeholders, providing regular information without high interaction.
- Monitor: For quaternary stakeholders, with minimal effort but keeping them on the radar.

The following table shows an extract of how the classification took place:

Table 8 - Extract from SH Interest-Level Classification

Stakeholder Name	Interest	Influence	Engagement
Südpack	High	High	Manage Closely
Amcor	High	High	Manage Closely
Constantia Flexibles	High	High	Manage Closely
Koehler Paper	High	Medium	Keep Informed
Mondi	High	High	Manage Closely

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Nissha Metallizing Solutions	Medium	Low	Monitor
Seda	Medium	Low	Monitor
Michelman Packaging Solutions	High	Medium	Keep Informed
CDM Packaging	Medium	Low	Monitor
Coopbox	High	Medium	Keep Informed
Nestlé	High	High	Manage Closely
Mondelez	High	High	Manage Closely
Procter & Gamble	High	High	Manage Closely
Unilever	High	High	Manage Closely
Kraft Heinz	High	High	Manage Closely
Mars Incorporated	High	High	Manage Closely
Frischpack Gruppe	Medium	Low	Monitor
REWE Group	Medium	High	Keep Satisfied
ALDI Nord	Medium	High	Keep Satisfied
ALDI Süd	Medium	High	Keep Satisfied
EDEKA	Medium	High	Keep Satisfied
Schwarz-Gruppe	Medium	High	Keep Satisfied
Lobbe Umweltservice GmbH & Co KG	Medium	Low	Monitor
Remondis	Medium	Medium	Keep Informed
Alpla	High	High	Manage Closely
Ampacet	High	Medium	Keep Informed

Primary Stakeholders:

These stakeholders are key players that need to be managed closely. They hold significant interest and influence in the food packaging value chain, making them crucial for decision-making and shaping industry practices. For instance, companies like Mondi, Multivac, and Groupe Guillin are key players in packaging materials production and manufacturing. They drive innovations, set industry standards, and have strong relationships with food producers and retailers.

Major food producers like Nestlé, Mondelez, Procter & Gamble, and Unilever operate in the value chain step of food production and processing, with their main relationships being with consumers and retailers. They actively participate in industry initiatives and collaborations to promote sustainable packaging solutions. Additionally, organizations such as European Bioplastics, EUROPEN, and Rethink Plastic Alliance play pivotal roles in advocating for sustainable packaging policies and practices at the European level. Institutions like the European Commission and waste management companies like Remondis also fall into this category due to their significant influence over regulatory frameworks and waste management practices.

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Some controversies in this sector often revolve around the environmental impact of plastic packaging, with companies like PepsiCo facing criticism over plastic waste. Similarly, while Nestlé and Kraft Heinz are advancing sustainability efforts, they have also been scrutinized for the environmental footprint of their extensive packaging. This scrutiny, while challenging, presents a positive opportunity for stakeholders to engage in sustainability projects, enhancing their corporate reputation and driving innovation in eco-friendly packaging solutions. Addressing these issues can also meet regulatory demands and consumer expectations, fostering a more sustainable industry and opening new market opportunities.

This SH classification includes companies in the following profiles:

Packaging converter and recycler
Consumer
Developers of Sustainable Packaging
Food Business Operator
Industry Association
Local and regional authorities; Waste Management/Recycling
NGO
Polymer Design & Production
Producers of Food Packaging
Research/Development/Education Institution
Waste Management Authorities

Secondary Stakeholders:

These stakeholders need to be kept satisfied, since they possess high influence but varying levels of interest in packaging specifics. For example, companies like Coca-Cola European Partners and PepsiCo have significant influence over packaging standards through their market dominance but may have medium interest in packaging innovations compared to primary stakeholders. Similarly, major retailers such as REWE Group, ALDI Nord, ALDI Süd, EDEKA, and Schwarz-Gruppe influence packaging practices through their purchasing decisions and sustainability goals, although their primary focus might not be on packaging innovations. Balancing their expectations and requirements while ensuring sustainability goals are met is essential to keep these stakeholders satisfied. This stakeholders classification includes companies in the following profiles:

Retailer; Food Business Operators
Producers of Food Packaging

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Tertiary Stakeholders:

These stakeholders are meant to be kept informed, since they exhibit high interest but varying levels of influence in the food packaging value chain. Companies like Koehler Paper, Michelman Packaging Solutions, and Coopbox are highly interested in packaging innovations and sustainability but may have moderate influence compared to primary stakeholders. They play important roles in advancing packaging technologies and materials. Retail giants like Carrefour, Tesco, Auchan, and Walmart, although influential in terms of market reach, may have moderate influence over packaging practices compared to major producers and converters. Similarly, organizations like Closed Loop Partners and Ecoologic are highly interested in promoting circular economy principles but may have limited influence compared to industry giants. Keeping these stakeholders informed about industry developments and collaborating on sustainability initiatives can foster positive relationships and support for packaging innovation efforts.

This SH classification includes companies in the following profiles:

Packaging converter and recycler
Community Organisations
Consumer
Developers of Sustainable Packaging
Food Business Operators
Industry Association
Media/Industry News
NGO
Packaging Material Suppliers
Polymer Design & Production
Producers of Food Packaging
Research/Development/Education Institution
Waste Management Authorities

Other (quaternary) Stakeholders:

This group comprises stakeholders with moderate to low interest and influence in the food packaging value chain, which therefore require monitoring. Companies like Nissha Metallizing Solutions, Gascogne, and CDM Packaging may have moderate interest, but limited influence compared to primary stakeholders. They provide essential products and services within the value

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chain but may not drive significant industry-wide changes. Similarly, smaller players like Barbier Groupe, Crocco, and Polymer-Chemie may have limited interest and influence in packaging innovations and sustainability practices.

Groups such as Transition Network and Greenpeace European Unit focus on community engagement and environmental activism, contributing to broader societal awareness but with less direct impact on industry practices.

iv. Action Plan (IAP2 spectrum)

Using the matrix and the IAP2 spectrum [24], specific actions can be defined for each stakeholder group. Here is a brief note on how these groups will be aimed towards specific C&D+E activities that will be further developed in the Communication and Dissemination strategy as well as within this deliverable in section 8:

- **Inform**: Provide factual and transparent information to stakeholders who need to be aware of developments but do not require active involvement. **Target: All groups**
- **Consult**: Solicit feedback and opinions from key stakeholders to ensure their perspectives are considered in decision-making. **Target: All groups**
- **Involve**: Actively include stakeholders in certain aspects of the project to ensure their concerns and aspirations are understood and addressed. **Target: Primary and secondary**
- **Collaborate**: Work in direct partnership with stakeholders on every aspect of the project, ensuring a shared decision-making process. **Target: Primary**
- **Empower**: Give stakeholders the ability to make direct decisions in specific areas of the project, ensuring their interests are tangibly reflected. **Target: Primary and tertiary**

4 Market analysis

The food packaging industry in the European Union (EU) is experiencing significant growth, driven by increasing urbanization, a rising demand for convenience foods, and heightened awareness of environmental issues. These drivers, in addition to the environmental and sustainability regulations, should provide the operational framework for EU food packaging value chain. This market is highly fragmented, with numerous players engaging in mergers, acquisitions, and technological advancements to enhance their competitive positions [25]

Market Drivers

- **Convenience and Consumer Preferences:** The shift towards convenience foods due to busy lifestyles has significantly increased the demand for packaged foods. This trend is particularly strong in urban areas where consumers seek ready-to-eat and easy-to-prepare food options [25].

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- **Environmental Concerns and Regulations:** Stringent environmental regulations and the EU's commitment to sustainability drive innovation in the packaging industry. There is a growing emphasis on developing biodegradable and recyclable packaging materials to reduce plastic waste and support a circular economy [26].
- **Technological Advancements:** Innovations in active and intelligent packaging, which enhance the shelf life and safety of food products, are gaining traction. These technologies include fiber-based packaging materials that offer sustainable alternatives to traditional plastics [26].

Industry Structure

The European food packaging market is characterized by a diverse range of materials, including plastics, paper and paperboard, metal, and glass. Each material type serves specific purposes and meets different consumer and regulatory requirements. For instance, plastic packaging is popular due to its versatility and cost-effectiveness, while paper-based packaging is preferred for its environmental benefits [25].

Key Players

Without prejudice of what can be explained in previous section on stakeholder mapping, major companies in the EU food packaging market include Amcor Plc, Huhtamaki Group, International Paper Company, and the Tetra Pak Group. These companies are actively investing in sustainable packaging solutions and expanding their production capacities to meet the growing demand [25].

Regulatory Environment

The EU's regulatory landscape plays a crucial role in shaping the food packaging industry. Policies such as the European Green Deal and the Single Use Plastics Directive aim to reduce plastic waste and promote the use of sustainable materials. Compliance with these regulations requires significant investment in new technologies and materials, influencing market dynamics and competitive strategies [27].

Market Trends

- **Sustainability:** There is a clear shift towards sustainable packaging solutions. Companies are developing packaging that is not only recyclable but also compostable and biodegradable. For instance, innovations such as the use of marine waste for producing shrink films are emerging [25].
- **Consumer Awareness:** Increasing consumer awareness about environmental issues is driving demand for eco-friendly packaging. Consumers are willing to pay a premium for products with sustainable packaging, influencing manufacturers to adopt greener practices [26].

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- **Supply Chain Resilience:** The COVID-19 pandemic highlighted the need for resilient supply chains. Companies are now focusing on local sourcing of materials and enhancing their supply chain strategies to mitigate risks associated with global disruptions [25].

Challenges

Despite the positive trends, the industry faces several challenges. The cost of raw materials is rising, which impacts on the profitability of packaging manufacturers. Additionally, the transition to sustainable packaging solutions requires substantial investment in new technologies and infrastructure [25].

Growth Projections

The European food packaging market is projected to grow significantly over the next few years. The market is expected to increase from USD 338.34 billion in 2021 to USD 478.18 billion by 2028, reflecting a compound annual growth rate (CAGR) of approximately 5.6% [28]. This growth is driven by the increasing demand for convenience foods, advancements in packaging technologies, and a growing emphasis on sustainability. Flexible packaging, in particular, is expected to witness the highest growth due to its cost-effectiveness and high performance [29].

Initial Financial Projections

The financial outlook for the EU food packaging market remains robust. Key players such as Amcor Plc, Mondi Group, and Berry Global are investing heavily in expanding their production capacities and developing innovative packaging solutions. For example, Amcor's recent acquisition of New Zealand-based Moda Systems is expected to enhance its portfolio and provide comprehensive packaging solutions, contributing to its revenue growth[29]. Overall, the industry is expected to see continued investment in sustainable packaging solutions, driven by both regulatory requirements and consumer demand [30].

Future Outlook

The future of the food packaging market in the EU looks promising, with continued growth expected due to increasing consumer demand for convenience foods and sustainable packaging. Companies that innovate and adapt to regulatory changes will likely emerge as leaders in this evolving market. The focus on sustainability, driven by both consumer preferences and regulatory mandates, will remain a critical factor shaping the industry's trajectory [31]

5 Canvas methodology

The Canvas Business Model is a strategic management tool that provides a visual representation of a company's value proposition, infrastructure, customers, and finances. This comprehensive chart serves as a blueprint for developing new business models or refining existing ones. By organizing key elements into nine essential components—customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities,

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key partnerships, and cost structure—the Canvas Business Model enables entrepreneurs and managers to identify and analyse the interconnections within their businesses. This approach fosters clarity, encourages creativity, and facilitates a holistic understanding of how a business creates, delivers, and captures value.

The different business strategies for MAGNO will target the whole packaging value chain (raw materials, design, production, usage and end of life), and the main market segments dedicated for the upscale of the MAGNO developed strategies as shown in the different reports. All multi-actors will be involved to explore the complete food system, as shown in the figure below on MAGNO Sustainable Business Model. This model will be compared with each of the MAGNO KERs to finetune on each potential applications beyond the project's life. Specific value propositions will be defined based on delivering the value of the innovative sustainable products at an appropriate and competitive cost. Figure below shows a canvas of the sustainable business model using a 3-bottom line (social, economy, and life cycle) approach for measuring performance. This scheme considers the needs of multi-actor, gives priority to consumers, and promotes environmental stewardship [32]. These principles will guide the joint MAGNO exploitation plan as well as the individual ones.

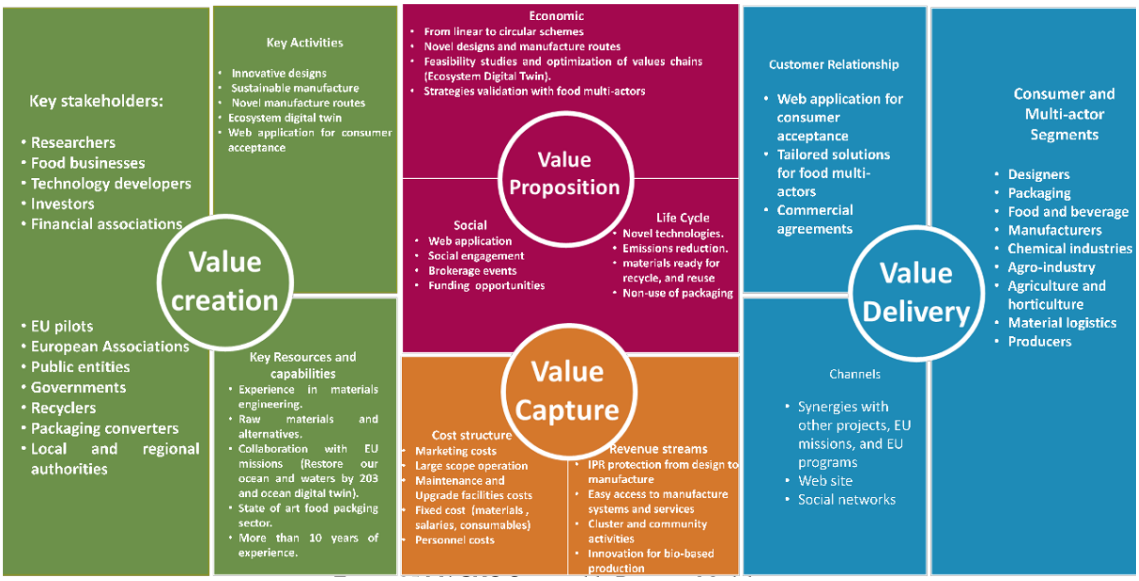

Figure 6 - Principles of the business plan

Below is a breakdown of the different aspects and its relation to the project results, as considered in the initial canvas to enable brainstorming and evaluation.

Value Creation

Key Stakeholders

- Researchers: Individuals or institutions conducting studies relevant to the project.
- Food businesses: Companies involved in the production, distribution, and sale of food products.

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- Technology developers: Entities developing new technologies applicable to packaging and sustainability.
- Packaging converters and recyclers: Companies that convert raw materials into packaging and recycle used packaging.
- Investors: Financial entities providing capital for the project.
- Financial associations: Organizations supporting financial activities and investments.
- EU pilots: Experimental or pilot projects within the EU framework.
- European Associations: Organizations operating at a European level in related sectors.
- Governments: National, regional and local governmental bodies or agencies

Key Activities

- Innovative design: Development of new and improved packaging designs.
- Sustainable manufacture: Production processes that minimize environmental impact.
- Novel manufacture routes: New methods and pathways for manufacturing.
- Ecosystem digital twin: A virtual model of the packaging ecosystem for analysis and optimization.
- Web platform for consumer acceptance: An online platform to engage and gain acceptance from consumers.
- Citizen science for social innovation: Involving citizens in scientific research to drive social change and innovation.

Key Resources and Capabilities

- Experience in materials engineering: Expertise in the development and use of materials.
- Knowledge and expertise on Raw materials and alternatives.
- Alignment with EU mission: Restore our ocean and waters by 2023 and the Ocean Digital Twin.
- State of the art food packaging sector: Leading knowledge and technology in food packaging.
- Capabilities in software analysis and development for Digital Twin: Skills in creating and analysing digital twin technology.
- Teams with over 10 years of experience in the sector: Experienced personnel with extensive sector knowledge.

5.2 Value Proposition

Economic

- From linear to circular schemes: Transitioning from traditional to circular economy models.
- Novel design and manufacture routes: Innovative methods for creating and producing packaging.
- Feasibility studies and optimization of value chains (Ecosystem Digital Twin): Assessments and improvements using digital twin technology.

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- Strategies validations with food multi-actors: Confirming strategies through collaboration with various food sector stakeholders.

Social

- Web application for consumer acceptance: Online tools to engage consumers.
- Social engagement: Activities to involve and engage society.
- Brokerage events: Meetings to facilitate business and research partnerships.
- Funding opportunities: Financial support options for project activities.

Life Cycle

- Novel technologies related to food packaging: Advanced technologies for packaging.
- Emissions reduction: Strategies to lower environmental emissions.
- Waste-free production models, ready for reuse and recycling: Processes designed to eliminate waste and enable reuse/recycling.
- No use of plastic packaging: Avoiding plastic use in packaging.

5.3 Value Delivery

Customer Relationship

- Web application for consumer acceptance: Engaging consumers via an online platform.
- Tailored solutions for multi-actors: Custom solutions for different stakeholders.
- Commercial agreements: Formal business arrangements to support project activities.

Channels

- Synergies with other projects, EU missions, and EU policies: Collaboration with related initiatives and policies.
- Website: Project information and interaction platform.
- Social networks: Use of social media to engage and inform stakeholders.
- Consumer and multi-actor segments.
- Designers: Professionals involved in packaging design.
- Packaging: Companies producing packaging materials.
- Food and beverage: Companies in the food and beverage sector.
- Manufacturers: Producers of goods requiring packaging.
- Chemical industries: Companies providing materials and processes for packaging.
- Agro-industry: Agricultural businesses needing packaging solutions.
- Agriculture and horticulture: Farmers and growers using packaging.
- Material logistics: Logistics companies handling packaging materials.
- Producers: Overall producers in need of sustainable packaging.

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5.4 Value Capture

Cost Structure

- Marketing costs: Expenses related to promoting the project and its outcomes.
- Large scope operation: Costs associated with the extensive nature of the project.
- Maintenance and upgrade facilities costs: Expenses for keeping facilities operational and updated.
- Fixed costs (materials, salaries, consumables): Ongoing operational expenses.
- Software development (Digital Twin): Costs for creating and maintaining the digital twin technology.

Revenue Streams

- IPR Revenue from design to manufacturing: Income from intellectual property rights related to design and manufacturing.
- Easy access to manufacture system and service for market actors: Revenue from providing manufacturing systems and services.
- Innovations for biodegradable packaging production: Income from new biodegradable packaging solutions.

From this starting point, a financial projection analysis will be conducted on internal workshops planification that will be made in the following months to be able to get results in line with the project development. It is expected that MAGNO will be able to offer preliminary results in the next iteration of this deliverable (D6.3). However, at this stage, the structure of this financial projection can be presented following a series of authoritative sources [33]. The structure will be as follows:Table 9 - Structure of the financial projection

Phases	Steps
1. **Executive Summary**	Purpose and scope of the analysis Key findings and recommendations
2. **Market Analysis**	Industry overview Market trends and growth projections
3. **Revenue Projections**	Sales volume projections Pricing strategy Revenue forecast
4. **Cost Projections**	Direct costs (raw materials, labour) Indirect costs (overhead, logistics) Total cost forecast
5. **Profitability Analysis**	Projected income statements Gross margin analysis Break-even analysis

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6. Investment Needs	Capital expenditure requirements ROI analysis Funding plan
7. Cash Flow Analysis	Projected cash flow statements Working capital analysis Liquidity ratios
8. Risk Analysis	Sensitivity analysis Scenario analysis
9. Conclusion	Summary of findings Strategic recommendations

6 Innovative reviews

In addition to the previous preparatory work, MAGNO conducts a non-systematic review to identify and evaluate novel business approaches. This review will employ search methods that include the wording of each of the novel approaches stated in the GA with a combination of boolean operators and synonyms to flexibilize results and be able to reach all topics, using a combination of purposive sampling and snowball sampling techniques to gather relevant literature and sources [34]. This involves selecting initial key studies and sources known to cover these topics comprehensively, followed by examining their references to uncover additional relevant material [35]. Sources may include academic articles, industry reports, case studies, and reputable business media [36]. The review should prioritize recent publications to capture the most current trends and innovations [37].

Taking into account the innovative nature of these topics, the time scope will be limited to the last 10 years. The objective is to identify key trends and innovations within specific areas such as adaptation to new digital technologies, consumer-centric approaches, agile methodology, data-driven decision-making, strategic partnerships, lean startup practices, and collaborative spaces aimed at helping define unique value proposition for MAGNO results, as well as joint and individual exploitation journeys.

The evaluation process involves qualitative analysis, where the selected literature is examined for recurring themes, successful case studies, and emerging patterns[38]. For each novel approach, identify specific strategies, tools, and outcomes associated with its implementation [39]. Summarize key insights and best practices, noting any contextual factors that influence the success or challenges of these approaches [40]. Employ content analysis to categorize the findings into thematic clusters, facilitating a comparative analysis across different approaches [41]. This will help in highlighting synergies and distinctions among the approaches, such as how agile methodology and lean startup principles can complement each other in fostering rapid innovation as in [42] and [43]. Conclude the review by synthesizing the insights into actionable recommendations for businesses looking to adopt or refine these novel approaches, ensuring that the findings are presented in a way that is accessible and applicable to practitioners in the field [44].

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6.1 Adaptation to new digital technologies and processes

The food packaging industry is undergoing a significant transformation driven by the adoption of new digital technologies. These advancements are enhancing consumer engagement, improving efficiency monitoring, and ensuring traceability throughout the supply chain.

Consumer Engagement

Digital technologies are revolutionizing how consumers interact with food packaging. Smart packaging, which includes QR codes, Near Field Communication (NFC) tags, and augmented reality (AR) features, is becoming increasingly prevalent. These technologies provide consumers with instant access to product information, such as nutritional content, sourcing details, and usage tips, fostering greater transparency and trust [45].

For instance, QR codes on packaging allow consumers to scan and receive detailed information about the product's journey from farm to table. This not only satisfies the growing consumer demand for transparency, but also enhances brand loyalty and engagement [46]. Augmented reality applications further enrich the consumer experience by providing interactive content, such as recipes, promotional games, and brand stories, directly on their smartphones [47].

Moreover, social media integration with smart packaging enables brands to engage with consumers more dynamically. By encouraging consumers to share their experiences and feedback through social platforms, companies can build stronger relationships and gather valuable insights into consumer preferences and behaviours [48].

Efficiency Monitoring and Traceability

The integration of digital technologies in food packaging also plays a crucial role in efficiency monitoring and traceability. Internet of Things, as successor of the Radio Frequency Identification (RFID), and also blockchain technology are pivotal innovations in this domain.

IoT devices, ranging from temperature sensors to GPS trackers, are strategically deployed throughout the supply chain to capture diverse parameters such as location, temperature, humidity, and motion. These devices continuously transmit data to a centralized platform, providing stakeholders with real-time insights into the status and condition of goods in transit [49].

Compared to RFID, IoT-based monitoring solutions offer greater flexibility and scalability. Unlike RFID, which necessitates dedicated readers and infrastructure, IoT devices leverage existing internet connectivity, such as Wi-Fi or cellular networks, for seamless data transmission [50]. Moreover, IoT sensors are characterized by their smaller form factor, lower cost, and ease of deployment, making them suitable for a broader array of applications and industries[51].

Furthermore, IoT technology facilitates more granular and contextual data collection. For instance, temperature sensors embedded in IoT devices provide precise temperature readings at

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multiple points along the supply chain, ensuring compliance with temperature-sensitive regulations and enhancing quality control [52]. Similarly, GPS trackers offer real-time location data, enabling precise tracking and route optimization, which is crucial for enhancing supply chain efficiency and customer satisfaction [53]

Blockchain technology, on the other hand, provides an immutable ledger for recording every transaction within the supply chain. This enhances traceability by enabling all stakeholders to access a transparent and tamper-proof history of the product's journey. In the event of a food safety issue, blockchain can quickly pinpoint the source of contamination, facilitating prompt recalls and minimizing health risks [54]. This technology is particularly valuable in meeting regulatory requirements and assuring consumers of the safety and authenticity of their food products [55].

Case Studies

Several case studies illustrate the successful implementation of these technologies in the food packaging industry. For example, Walmart has partnered with IBM to utilize blockchain for tracking leafy greens from farm to store. This initiative has significantly reduced the time required to trace the source of contamination, from weeks to mere seconds, demonstrating the potential of blockchain in enhancing food safety [55].

Another example is the use of smart packaging by Nestlé, which incorporates QR codes to provide consumers with comprehensive product information, including ingredient sourcing and sustainability efforts. This initiative not only boosts consumer trust, but also aligns with the company's commitment to transparency and sustainability [46].

Key Performance Indicator proposal

The SCVI can be calculated based on various metrics related to IoT-enabled real-time monitoring, such as the percentage of products tracked in real-time, the frequency of data updates received from IoT devices, and the accuracy of data captured by IoT sensors. Additionally, factors like the timeliness of alerts and notifications generated by the monitoring system in response to deviations from predefined thresholds can also contribute to the SCVI.

By regularly measuring the SCVI, companies can gauge their progress in enhancing supply chain visibility through IoT-based monitoring solutions. A higher SCVI score indicates greater transparency and control over supply chain operations, enabling proactive decision-making and risk mitigation strategies [49].

Combining both dimensions, a metric that could be feasible according to the overall trends in the field could be to combine QR codes with the "Supply Chain Visibility Index" (SCVI). The SCVI quantitatively assesses the extent to which a company achieves end-to-end visibility across its supply chain processes, including production, transportation, and distribution. The SCVI could be calculated based on several factors, including Data Granularity, Real-time Accessibility, Accuracy and Reliability, Integration and Interoperability and Actionability: The extent to which real-time data enables stakeholders to take timely and informed actions to address supply chain disruptions, optimize inventory levels, and improve overall efficiency. For the sake of

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transparency, monitoring and traceability with a consumer centric approach the number of products enables a higher degree of well-informed decisions, at the same time fostering a culture of conscious purchasing favouring brands and business models leaner towards this trend.

Also, another alternative would be to calculate the SCVI, each of these factors could be assigned a weight based on its importance to supply chain visibility and aggregated into a composite index score. Regular monitoring and tracking of the SCVI over time would provide insights into the effectiveness of IoT-based supply chain monitoring initiatives and identify areas for improvement.

Conclusion

The adaptation to new digital technologies and processes in food packaging is reshaping the industry by enhancing consumer engagement and improving efficiency monitoring and traceability. Smart packaging technologies like QR codes, NFC tags, and augmented reality are enriching the consumer experience, while IoT and blockchain are revolutionizing supply chain management. As these technologies continue to evolve, they offer significant potential for improving transparency, safety, and efficiency in the food packaging industry. Businesses that embrace these innovations are likely to gain a competitive edge and build stronger relationships with their consumers.

6.2 Consumer centric approaches

In the field of food packaging, adopting consumer-centric approaches is increasingly crucial. Customers are becoming more conscious about prioritizing satisfaction, engagement, awareness, training, and transparency, ensuring that packaging not only preserves food but also meets their preferences.

Decisions and Processes

Consumer-centric decision-making in food packaging involves incorporating consumer feedback and preferences into the design, materials and functionality of packaging. There is a long-standing tradition for companies about using diverse methods, such as customer surveys, focus groups, and social media feedback, to understand consumer needs and expectations [56]. This consumer input is invaluable for developing packaging that aligns with market demand. For instance, the growing emphasis on sustainability has led many companies to adopt eco-friendly packaging options. According to Smith et al. (2021), 74% of consumers are willing to pay a premium for sustainable packaging, underscoring the significance of environmentally conscious decision-making [56]

The integration of advanced technology in packaging processes also allows for greater customization and responsiveness to consumer demands. Smart packaging, which includes features like freshness indicators, temperature control, and QR codes for additional product information, is a direct response to consumer desire for more information and better food safety [46]. These innovations not only enhance the consumer experience but also build trust and loyalty by ensuring the product's quality and safety throughout its lifecycle.

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Prioritizing Customer Satisfaction and Engagement

Customer satisfaction in food packaging is achieved by ensuring that packaging is functional, safe, and aesthetically pleasing. High-quality materials that preserve the freshness and integrity of the product play a crucial role. [57] reports that packaging that is easy to open, resealable, and portable significantly enhances consumer satisfaction, indicating the importance of convenience in packaging design [46]. Additionally, attractive and informative packaging can influence purchasing decisions and reinforce brand loyalty, as visually appealing designs catch the consumer's eye and convey important product information effectively.

Engagement with consumers is equally crucial. Companies are increasingly leveraging digital platforms to interact with consumers and gather real-time feedback. For instance, social media campaigns, online reviews, and direct consumer interactions provide valuable insights into consumer preferences and areas for improvement [46]. Engaging consumers in this manner not only helps companies tailor their products to meet consumer demands, but also fosters a sense of community and brand loyalty. Through active engagement, companies can demonstrate that they value consumer opinions and are committed to continuous improvement based on consumer feedback.

Awareness, Training, and Transparency

Raising consumer awareness about the importance and benefits of different packaging options is another key aspect of consumer-centric approaches. Educational campaigns can inform consumers about the environmental impact of various packaging materials, recycling practices, and how to make more sustainable choices [46]. Such initiatives can enhance consumer knowledge and encourage more responsible purchasing behaviours. By educating consumers about the life cycle of packaging materials and their environmental impact, companies can foster a more informed and environmentally conscious consumer base.

Training consumers, particularly in understanding and utilizing new packaging technologies, is also essential. For instance, educating consumers on how to use smart packaging features, such as QR codes that provide detailed product information or freshness indicators that ensure food safety, can significantly enhance their experience and satisfaction [58]. Providing clear instructions and demonstrations on how to maximize the benefits of smart packaging can help consumers feel more confident and satisfied with their purchases.

Transparency in packaging, including clear labelling of ingredients, nutritional information, and sourcing, is critical to building consumer trust. Also [58] found that transparency in food packaging leads to higher consumer trust and satisfaction, as consumers appreciate knowing exactly what they are buying and consuming. Companies that are open about their processes, sourcing, and ingredients are more likely to gain consumer loyalty and trust. Transparent practices not only fulfil regulatory requirements but also align with the growing consumer demand for honesty and integrity in the food industry.

Case Studies and Best Practices

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Examining case studies and best practices provides practical insights into how consumer-centric approaches can be successfully implemented in food packaging. For instance, a well-known food company redesigned its packaging to be more environmentally friendly by using biodegradable materials and reducing plastic use. This initiative was in direct response to consumer feedback about environmental concerns [59]. The company also launched an educational campaign to inform consumers about the benefits of the new packaging and how to dispose of it properly, leading to increased consumer satisfaction and brand loyalty [59].

Another example is a company that incorporated smart packaging technology to enhance consumer engagement. By adding QR codes to their packaging, consumers could access detailed product information, including sourcing, nutritional content, and recipe ideas [59]. This transparency not only built trust but also provided added value to consumers, making the product more appealing.

Future Trends and Innovations

Looking forward, the future of consumer-centric approaches in food packaging is likely to be shaped by ongoing innovations and emerging trends. Advances in digital technologies will continue to play a significant role, with developments in smart packaging, augmented reality, and blockchain for supply chain transparency expected to enhance consumer engagement and trust. Furthermore, the increasing emphasis on sustainability will drive the adoption of more eco-friendly materials and processes in packaging [60].

Collaborative efforts between companies, governments, and consumers will be essential in advancing these trends. Joint initiatives and partnerships can foster innovation and lead to more comprehensive solutions that address both consumer needs and environmental concerns [60]. By staying attuned to consumer preferences and leveraging technological advancements, companies can continue to evolve and improve their packaging strategies, ensuring they remain competitive and relevant in the market.

KPI proposal

Based on the literature reviewed on this novel approach, a good metric to measure the extent to which a food packaging product is consumer centric is the Consumer Satisfaction Index (CSI). This metric can be derived from a combination of several key indicators that reflect consumer-centric approaches in packaging:

- Consumer Feedback Score: Gathered from surveys, focus groups, and online reviews, this score reflects direct consumer opinions and satisfaction levels regarding the packaging [56] Questions can cover aspects such as ease of use, convenience, safety, and overall satisfaction.
- Net Promoter Score (NPS): Measures the likelihood of consumers to recommend the product based on their experience with the packaging [59]. A high NPS indicates that consumers find the packaging valuable and are likely to promote it to others.
- Engagement Rate: The frequency and quality of consumer interactions with packaging features, such as scanning QR codes for information, using freshness indicators, or participating in packaging-related campaigns on social media [56].

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- Complaint Rate: Tracks the number of packaging-related complaints received by the company. A lower complaint rate indicates higher consumer satisfaction and fewer issues with the packaging [58].
- Sustainability Perception Score: Assesses consumer perceptions regarding the environmental friendliness of the packaging. This can be measured through surveys or feedback that specifically ask about the packaging's sustainability attributes [56].
- Transparency and Information Accessibility: Evaluates how easily consumers can access information about the product, including ingredients, nutritional facts, and sourcing details [58]. This can be measured by the percentage of consumers who report satisfaction with the transparency of the information provided.
- Usability Testing Results: Involves direct observation and testing with consumers to assess how easily they can use the packaging, including opening, closing, and storing the product [59].

By compiling and analysing these indicators, the Consumer Satisfaction Index (CSI) provides a comprehensive measure of how well a food packaging product aligns with consumer-centric principles. This metric not only reflects consumer satisfaction but also highlights areas for improvement to further enhance the consumer experience [56].

Conclusion

Consumer-centric approaches in food packaging are vital for meeting the evolving demands of a more conscious consumer base. By incorporating consumer feedback, prioritizing customer satisfaction and engagement, and promoting awareness, training, and transparency, companies can enhance their brand loyalty and trust. These strategies not only improve the consumer experience but also contribute to more sustainable and responsible business practices and value chain.

6.3 Agile methodology

Agile methodology is grounded in the principles outlined in the Agile Manifesto, emphasizing individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, and responding to change over following a plan [61]. These principles foster a flexible and collaborative environment, enabling teams to deliver value incrementally and adapt to feedback swiftly.

Key practices of agile methodology include iterative development, where projects are broken down into small, manageable units called sprints (usually lasting from two to four weeks), and continuous integration and testing, ensuring that each iteration results in a potentially shippable product [62]. Daily stand-up meetings, sprint planning, review sessions, and retrospectives are integral to maintaining transparency, accountability, and continuous improvement within teams [63].

Benefits of Agile Methodology

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Agile methodology offers numerous benefits that make it an attractive choice for modern businesses. One of the primary advantages is its ability to enhance responsiveness and adaptability. By prioritizing customer feedback and iterative development, agile teams can quickly adjust their strategies and deliver solutions that better meet client needs [64]. This responsiveness is particularly crucial in fast-paced industries where customer preferences and market conditions change rapidly.

Additionally, agile methodology promotes greater collaboration and communication among team members. The emphasis on daily stand-ups and regular feedback loops ensures that potential issues are identified and addressed promptly, reducing the risk of project delays and cost overruns [65]. Furthermore, the incremental nature of agile development allows for early detection and mitigation of risks, leading to higher-quality outcomes and increased customer satisfaction [66]

Challenges of Implementing Agile Methodology

Despite its benefits, implementing agile methodology presents some challenges. One common obstacle is the cultural shift required within organizations. Agile practices demand a high degree of collaboration, transparency, and flexibility, which can be difficult to achieve in traditional, hierarchical structures [67]. Organizations must foster an environment that encourages experimentation and tolerates failure to fully realize the potential of agile methodology.

Another challenge is the need for skilled and experienced practitioners. Effective agile implementation requires team members who are well-versed in agile principles and practices, as well as the ability to adapt these to the specific context of their projects [68]. Continuous training and professional development are essential to maintain the proficiency of agile teams and ensure the methodology is applied effectively.

Agile in food packaging

The European food packaging value chain is a complex and dynamic ecosystem, continuously influenced by shifting consumer demands, regulatory changes, and technological advancements. To maintain competitiveness and sustainability, companies within this sector are increasingly adopting agile methodologies, which emphasize flexibility, collaboration, and rapid adaptation to change. This text explores how agile practices can enhance the efficiency, responsiveness, and innovation of the European food packaging value chain.

Adaptation to Regulatory Changes

One of the significant drivers for agility in the European food packaging sector is the need to comply with stringent and frequently updated regulatory standards. The European Union's regulations on packaging and waste management are designed to promote sustainability and reduce environmental impact [69]. Agile methodologies enable companies to quickly adapt their processes and products to meet new regulatory requirements. For instance, through iterative development and continuous feedback loops, packaging firms can swiftly incorporate eco-friendly materials and practices, ensuring compliance without significant delays [70].

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Enhancing Consumer Engagement

Consumer preferences in Europe are rapidly evolving, with increasing demand for sustainable, convenient, and innovative packaging solutions. Agile methodologies prioritize customer feedback and iterative development, allowing companies to align their products closely with consumer needs [71]. For example, by implementing agile practices, a packaging company can develop prototypes, gather consumer feedback, and make necessary adjustments in a short time frame. This approach not only improves customer satisfaction but also fosters brand loyalty and market differentiation [72].

Improving Supply Chain Responsiveness

The food packaging value chain involves multiple stakeholders, including suppliers, manufacturers, and retailers. An agile approach facilitates better coordination and communication among these players, leading to a more responsive and resilient supply chain [73]. Agile practices such as daily stand-up meetings, cross-functional teams, and real-time data sharing can significantly enhance the supply chain's ability to respond to disruptions and changing market conditions. For instance, during the COVID-19 pandemic, agile methodologies helped many packaging companies swiftly pivot their operations to meet the surge in demand for packaged food and safety supplies [74].

Driving Innovation through Collaboration

Agile methodologies encourage a culture of collaboration and continuous improvement, which is crucial for innovation in the food packaging sector. By fostering an environment where team members can experiment, learn, and iterate, companies can develop cutting-edge packaging solutions that meet the highest standards of functionality and sustainability [75]. Collaborative agile frameworks such as Scrum and Kanban are particularly effective in facilitating innovation. These frameworks provide structured processes for teams to brainstorm, test new ideas, and rapidly bring successful innovations to market [76].

Case Study: Agile Implementation in European Food Packaging

A notable example of agile implementation in the European food packaging sector is the case of a leading packaging company that adopted Scrum to enhance its product development process. The company established cross-functional teams that included members from design, engineering, marketing, and customer service. Through iterative sprints and regular reviews, the teams were able to develop new packaging solutions that not only met regulatory standards but also exceeded customer expectations in terms of sustainability and convenience [77]

The adoption of agile methodologies also led to significant improvements in the company's supply chain management. By using Kanban boards and real-time analytics, the company optimized its inventory levels, reduced waste, and improved delivery times. This agile transformation resulted in a more efficient, responsive, and customer-centric organization, capable of thriving in the competitive European market [78] .

KPI proposal for measuring adoption of Agile methodologies

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To effectively measure the level of responsiveness or adaptability of a product to an agile methodology, it is essential to develop a comprehensive metric that encompasses various dimensions of agility. One such metric is the Agile Responsiveness Index (ARI), which evaluates responsiveness through KPIs in three primary areas: iteration speed, customer feedback integration, and team collaboration. The ARI can be calculated by assigning weighted scores to each KPI, thereby providing a quantifiable measure of a product's adaptability within an agile framework, according to [71] and [46].

- Iteration speed is a critical component of the ARI, reflecting the frequency and efficiency with which a team can deliver functional increments of the product. This is measured by cycle time (the duration of each iteration or sprint) and release frequency (the number of releases within a given period). Shorter cycle times and higher release frequencies indicate a higher level of responsiveness, as they demonstrate the team's ability to rapidly develop, test, and deploy product features [80]. Additionally, metrics such as lead time (the time from the initial concept to market release) and deployment time (the time taken to deploy updates or new features) are crucial in assessing iteration speed [76].
- Customer feedback integration is another vital aspect of the ARI, focusing on how effectively the team incorporates user input into the product development process. This can be evaluated through metrics such as feedback turnaround time (the time taken to gather and implement customer feedback) and satisfaction scores (customer ratings and reviews post-implementation). A higher ARI score in this area signifies that the product is continuously evolving based on real-world user experiences, thus enhancing its market relevance and customer satisfaction [72].
- Finally, team collaboration metrics, such as the frequency of cross-functional meetings, communication effectiveness, and the number of collaborative tools used, provide insight into how well the team works together to achieve agile objectives. Effective collaboration is a cornerstone of agile practices, driving innovation and responsiveness in product development [81].

Conclusion

The adoption of agile methodologies offers significant benefits for the European food packaging value chain, including enhanced regulatory compliance, improved consumer engagement, responsive supply chain management, and accelerated innovation. By embracing agile practices, companies in this sector can better navigate the complexities of the market, respond swiftly to changes, and deliver superior value to their customers. As the industry continues to evolve, agile methodologies will play a crucial role in driving sustainable growth and competitiveness.

6.4 Data-driven decision-making

Data-driven decision-making offers numerous advantages in food packaging. Primarily, it allows companies to respond swiftly to market changes and consumer demands being able to modulate over existing data records. By analyzing these large datasets, companies can identify trends and make informed decisions regarding packaging designs and materials. For instance, data analytics can reveal consumer preferences for eco-friendly packaging, prompting companies to adopt sustainable materials [82].

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Moreover, data-driven approaches enable companies to improve operational efficiency. By monitoring production processes in real-time, firms can identify inefficiencies and implement corrective measures promptly. This results in reduced waste, lower costs, and enhanced product quality [83]. Additionally, data analytics can help ensure compliance with food safety regulations by providing insights into the integrity and safety of packaging materials [84].

Methodologies in Data Analytics for Food Packaging

Various methodologies are employed in data analytics for food packaging. Descriptive analytics involves summarizing historical data to understand past performance and identify patterns. For example, analyzing sales data can help companies determine which packaging designs are most popular among consumers [85].

Predictive analytics goes a step further by using statistical models and machine learning algorithms to forecast future trends. In the context of food packaging, predictive analytics can help anticipate changes in consumer preferences, enabling companies to proactively adjust their packaging strategies [86]. Predictive models can also optimize supply chain management by forecasting demand and adjusting production schedules accordingly [87].

Prescriptive analytics offers actionable recommendations based on data insights. By simulating different scenarios, companies can determine the optimal course of action for packaging design and material selection. This approach is particularly useful for balancing cost, sustainability, and consumer satisfaction [88].

Case Studies

Several case studies illustrate the successful application of data-driven decision-making in food packaging. One notable example is a leading global food manufacturer that utilized data analytics to reduce packaging waste. By analyzing production data, the company identified inefficiencies in its packaging process and implemented changes that resulted in a 15% reduction in material usage and a 10% decrease in production costs [89].

Another example involves a company that used predictive analytics to enhance its packaging sustainability. By analyzing consumer feedback and market trends, the company identified a growing demand for biodegradable packaging. This insight led to the development and successful launch of a new line of eco-friendly packaging, which significantly boosted consumer satisfaction and brand loyalty [90].

Furthermore, a case study of a food packaging company that adopted prescriptive analytics demonstrated significant improvements in supply chain efficiency. By simulating various production and distribution scenarios, the company optimized its logistics, resulting in a 20% reduction in delivery times and a 5% increase in overall profitability [91].

KPIs Proposal for Measuring Data-Driven Decision-Making

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To effectively measure the impact of data-driven decision-making in food packaging, several KPIs can be proposed focusing on packaging performance, including efficiency, sustainability, and consumer satisfaction:

- Material Usage Reduction: Measure the percentage reduction in packaging material usage over time. This KPI helps assess the effectiveness of data-driven initiatives in minimizing waste and promoting sustainability [82]
- Production Cost Savings: Track the cost savings achieved through optimized packaging processes. This KPI highlights the financial benefits of data analytics in reducing operational costs [83].
- Cycle Time: Monitor the time taken from the initiation of a packaging process to its completion. Shorter cycle times indicate increased efficiency and responsiveness to market demands [87].
- Consumer Satisfaction Scores: Use surveys and feedback mechanisms to gauge consumer satisfaction with packaging. Higher scores reflect successful alignment with consumer preferences and improved user experience [90].
- Compliance Rate: Measure the percentage of packaging that meets regulatory and safety standards. High compliance rates indicate effective use of data analytics to ensure safety and adherence to regulations [84].
- Sales Performance: Analyze sales data to assess the impact of packaging changes on product sales. Increased sales can indicate successful packaging strategies that resonate with consumers [85].
- Return on Investment (ROI): Calculate the ROI of data-driven packaging initiatives by comparing the financial gains to the investments made in data analytics tools and processes [86].

Conclusion

Data-driven decision-making is transforming the food packaging industry by enabling descriptive, predictive, and prescriptive analytics, firms can optimize packaging designs, materials, and processes, ensuring compliance with regulations and alignment with consumer preferences. As illustrated by case studies, the application of data analytics in food packaging leads to significant operational improvements and competitive advantages.

6.5 Strategic partnerships

Collaborations enable businesses to pool resources, expertise, and market access, fostering innovation and driving growth. This text provides an overview of their benefits, a case study illustrating successful implementation, and a proposal for KPIs to evaluate their effectiveness.

The Concept and Benefits of Strategic Partnerships

Strategic partnerships are alliances between organizations that aim to achieve mutually beneficial goals. These partnerships can take various forms, including joint ventures, alliances, and consortia. The primary benefits of strategic partnerships include access to new markets, enhanced innovation, shared resources, and risk mitigation [92]. By combining the strengths of

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each partner, businesses can create synergies that lead to competitive advantages and increased profitability.

For instance, strategic partnerships can provide access to new technologies, expertise, and customer bases, which might be challenging to achieve independently [93]. Furthermore, these collaborations can enhance brand reputation and market positioning by associating with established partners [94]. Effective partnerships also enable companies to share risks and costs associated with research and development, marketing, and international expansion [95].

Case Study: Starbucks and Nestlé Alliance

A notable example of a successful strategic partnership is the alliance between Starbucks and Nestlé. In 2018, Nestlé acquired the rights to market, sell, and distribute Starbucks products globally outside of Starbucks stores. This $7.15 billion deal allowed Starbucks to leverage Nestlé's extensive distribution network and expertise in consumer-packaged goods, while Nestlé benefited from Starbucks' strong brand recognition and premium product offerings [96].

The partnership enabled Starbucks to expand its global reach, particularly in regions where it had limited presence, such as Europe, Asia, and Latin America. On the other hand, Nestlé strengthened its coffee portfolio and gained a significant market share in the premium coffee segment [97]. The collaboration also led to the development of new products, including Starbucks-branded coffee capsules for Nestlé's Nespresso and Dolce Gusto systems, further driving revenue growth for both companies [98].

KPI Metric Proposal for Evaluating Strategic Partnerships

To assess the effectiveness of strategic partnerships, it is essential to establish a set of KPIs that could align with partnership's objectives and provide insights into its performance and impact. The following KPIs are proposed for evaluating strategic partnerships:

- Revenue Growth: Measure the increase in revenue directly attributable to the partnership. This includes sales from joint products, market expansion, and new customer acquisitions [92].
- Market Share: Track changes in market share within the target segments. An effective partnership should lead to an increased market presence and competitive positioning [93].
- Product Development: Assess the number and success of new products developed through the partnership. This includes tracking product launch timelines, market reception, and sales performance [94].
- Cost Savings: Evaluate cost savings achieved through shared resources, joint marketing efforts, and economies of scale. This can be measured by comparing costs before and after the partnership [95].
- Customer Satisfaction: Monitor customer feedback and satisfaction levels related to products and services resulting from the partnership. This can be measured through surveys, Net Promoter Scores (NPS), and customer reviews [98].

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- Innovation and R&D: Track the impact of the partnership on innovation activities, including the number of patents filed, research projects initiated, and technological advancements achieved [97].
- Brand Equity: Measure changes in brand perception and equity resulting from the partnership. This can be assessed through brand valuation studies and consumer sentiment analysis [94].

Conclusion

Strategic partnerships are a powerful tool for businesses aiming to leverage complementary strengths and expand their market reach. The Starbucks and Nestlé alliance exemplifies how such collaborations can drive significant growth and innovation.

6.6 Lean Startup

The Lean Startup methodology, popularized by Eric Ries in 2011, emphasizes the rapid development and testing of products or services to quickly validate market assumptions and iterate based on feedback [42]. This approach is particularly relevant in the food packaging value chain in the European Union, where innovation and sustainability are key drivers. Given the dynamic nature of consumer preferences and regulatory environments, lean startup principles can help companies in this sector remain competitive and responsive. This paper explores the application of lean startup methodology in the food packaging value chain in the EU and proposes a metric for measuring the level of lean startup maturity of a product or company.

Application of Lean Startup in Food Packaging

The food packaging value chain in the EU is undergoing significant transformations due to increased demand for sustainable packaging solutions and the need for compliance with stringent environmental regulations [99]. Lean Startup principles, which focus on building minimum viable products and utilizing customer feedback for iterative development, are particularly suited to address these challenges.

Developing Minimum Viable Products (MVPs): The lean startup methodology encourages the creation of MVPs – basic versions of a product with just enough features to satisfy early adopters and provide feedback for future development [100]. In the context of food packaging, an MVP might be a new biodegradable packaging material that meets basic functional requirements. Companies can quickly test these MVPs with a small group of consumers or businesses to gather feedback on performance, usability, and environmental impact.

Iterative Development and Feedback Loops: Iterative development is a cornerstone of the Lean Startup approach. Companies in the food packaging sector can use this principle to refine their products based on real-world feedback. For instance, after launching an MVP, a company might discover that the packaging material needs to be more durable to withstand transportation. This feedback would be used to make necessary improvements, ensuring the final product is both functional and sustainable [101].

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Pivoting Based on Data: Lean Startup methodology also emphasizes the importance of pivoting – making fundamental changes to the product or business model based on validated learning. For example, a company might start with a focus on biodegradable packaging but pivot to reusable packaging solutions if market feedback indicates a stronger demand for such products. This flexibility allows companies to adapt quickly to changing market conditions and consumer preferences [102].

KPI Proposal for Measuring Lean Startup Maturity

To evaluate the extent to which a company or product in the food packaging value chain adheres to Lean Startup principles, a comprehensive metric is proposed using the previous literature. This metric assesses five key dimensions: Speed of Development, Customer Engagement, Iteration Frequency, Data-Driven Decision-Making, and Adaptability. The key dimensions to test adherence to lean startup principle are summarized below:

- Speed of Development: Measure the time taken from concept to MVP launch. Evaluate the average development time for iterations.
- Customer Engagement: Assess the frequency and depth of customer feedback collection. Evaluate the methods used for engaging customers (surveys, focus groups, beta testing).
- Iteration Frequency: Count the number of iterations made in a given period. Measure the scope and impact of each iteration on the product.
- Data-Driven Decision-Making: Assess the extent to which data influences product decisions. Evaluate the tools and methodologies used for data collection and analysis.
- Adaptability: Measure the frequency and nature of pivots based on validated learning. Evaluate the responsiveness to market changes and regulatory updates.

Conclusion

The Lean Startup methodology offers a valuable framework for innovation in the food packaging value chain in the EU. By focusing on rapid development, iterative feedback, and data-driven decisions, companies can create more sustainable and market-responsive packaging solutions. The proposed metric provides a structured way to assess and enhance Lean Startup maturity, helping companies to continuously improve their processes and products in a competitive and regulatory-driven environment.

6.7 Collaborative spaces

This approach is believed to enhance creativity, innovation, and productivity by facilitating the exchange of ideas and resources. In the context of the food packaging value chain in the European Union, collaborative spaces have the potential to address some of the industry's most pressing challenges, such as sustainability, efficiency, and consumer engagement [70].

Collaborative Spaces and the Food Packaging Value Chain

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The food packaging value chain in the EU encompasses a wide range of activities, from raw material sourcing and packaging design to manufacturing, distribution, and recycling. Each stage of this value chain presents unique challenges and opportunities for innovation. Collaborative spaces can play a pivotal role in this value chain by providing a platform for stakeholders from different sectors to collaborate on innovative solutions.

Enhancing Sustainability: One of the primary challenges in the food packaging industry is developing sustainable packaging solutions that minimize environmental impact. Collaborative spaces can bring together packaging designers, material scientists, and environmental experts to work on eco-friendly packaging materials and designs. For example, the collaboration between Tetra Pak and the Ellen MacArthur Foundation in a co-working environment led to the development of fully recyclable packaging solutions, which have significantly reduced the environmental footprint of food packaging [103].

Improving Efficiency: The efficiency of the food packaging value chain can be greatly enhanced through collaborative innovation. By bringing together logistics experts, technologists, and manufacturers, collaborative spaces can facilitate the development of advanced packaging technologies that improve supply chain efficiency. For instance, the collaboration between several European packaging companies in a shared innovation hub led to the creation of smart packaging solutions equipped with sensors to monitor the freshness and quality of food products, thereby reducing waste and improving efficiency[104].

Fostering Consumer Engagement: Consumer preferences and behaviours are constantly evolving, and the food packaging industry must adapt to these changes to remain competitive. Collaborative spaces can serve as a testing ground for new packaging concepts and consumer engagement strategies. By involving marketing professionals, consumer behaviour experts, and designers, these spaces can help create packaging that not only protects food but also enhances the consumer experience. A notable example is the collaborative project between Nestlé and a European design think tank, which resulted in interactive packaging that provides consumers with product information and recipes via QR codes [105].

Measuring Collaboration in the Food Packaging Industry: A KPI proposal

To assess the effectiveness of collaborative spaces in the food packaging value chain, it is essential to develop metrics that measure the level of collaboration among companies and products. The proposed metrics include:

- Collaboration Index (CI): This metric evaluates the extent of collaborative activities within a company or between companies. It considers factors such as the number of collaborative projects, diversity of stakeholders involved, and the frequency of collaboration. A higher CI indicates a greater level of collaboration.
- Innovation Output (IO): This metric measures the tangible outcomes of collaborative efforts, such as the number of patents filed, new products developed, and improvements in packaging technology. The IO provides insight into the productivity and effectiveness of collaboration.

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- Sustainability Impact: This metric assesses the environmental benefits resulting from collaborative initiatives. It includes measures such as reduction in packaging waste, use of recyclable materials, and overall carbon footprint reduction. It helps gauge the contribution of collaborative efforts towards sustainability goals.
- Consumer Engagement Score: This metric evaluates the effectiveness of collaborative packaging solutions in enhancing consumer engagement. It considers factors such as consumer feedback, engagement levels through interactive packaging, and improvements in consumer satisfaction. It provides a comprehensive view of how collaborative efforts are perceived by consumers.

Conclusion

According to literature reviewed, collaborative spaces have the potential to transform the food packaging value chain in the EU by fostering a culture of collaboration that drives creativity, innovation, and productivity. By bringing together diverse stakeholders in a shared environment, these spaces can address key challenges in sustainability, efficiency, and consumer engagement. The proposed metrics for measuring collaboration provide a structured approach to evaluating the impact of these initiatives. As the food packaging industry continues to evolve, embracing collaborative spaces can lead to significant advancements and a more sustainable future.

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7 Exploitation strategies

The MAGNO consortium, adopting an impact-driven methodology to ensure the sustainability and applicability of the project outcomes, prepared all this side information to enrich the decision-making process. However, this process starts in parallel to outline exploitation pathway for implementation of results during and beyond the project. In line with this objective, MAGNO adopts a tailored approach to exploitation.

The MAGNO consortium includes partners from different contexts and dimensions such as universities, research institutions, tech centres, engineering companies, biopolymers producers, and packaging manufacturers. To address these diverse aspects, the overall exploitation strategy requires a high degree of adaptability while maintaining a structured methodology.

Moreover, as anticipated in section 3, the main results include technologies, products, advancement in knowledge, and expertise related to the food packaging value chain, particularly in the prevention and management of waste from packaging. The development of these results must take into consideration the strict international and national regulations and standards that exist in the food industry.

To capture all these aspects, the exploitation perspective must provide a high degree of flexibility while requiring a structured methodology. Also, a more detailed identification and update of the project's KERs will be carried out within D7.2 – First exploitation iteration at M24, representing a fundamental step towards the definition and execution of the exploitation strategy.

The comprehensive exploitation strategy aims to optimize the commercial and non-commercial exploitation of the developed technologies and products, by the consortium partners or third parties. At the same time, it seeks to facilitate non-commercial exploitation by leveraging the acquired expertise, initiating new research, and fostering innovation activities through the expanded knowledge base.

The preliminary delineation of the primary exploitation pathways for MAGNO is presented in the following paragraphs, building on the following pillars:

- TRL upscaling towards commercialisation or adaptation.
- Commercial exploitation.
- Direct commercialisation.
- Provision of technology, consulting, and training services.
- Training or consumer awareness and behavioural change to consumers.
- Licensing.
- Policy recommendations and standardisation.
- Research and academic exploitation.
- TRL upscaling towards commercialization or adaptation continued exploitation.

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These results deserve to be considered independently for exploitation pathways, considering not only their different potential applications but also partners' business and research strategies. These exploitation pathways will be articulated during the course of the project development.

Traditionally, before developing the go-to-market strategy, for each of them, it's necessary to further upscale the TRL level reached at the end of the project to 9, so that the result is ready for commercialisation. In particular:

- Upscaling TRL from 7 to 9 means validating the technology's performance, functionality, scalability, and manufacturability, while ensuring regulatory compliance and addressing any remaining challenges.
- Upscaling from TRL 8 to 9 focuses on refining the technology, completing remaining development steps, conducting full-scale demonstrations, obtaining necessary approvals, securing partnerships, and funding, and preparing for widespread implementation.

These processes are essential for demonstrating the readiness of the technology for real-world applications and compliance with standards and regulations. Once ready for commercialization, MAGNO technologies, products and services will be integrated into industrial and SME partners' portfolios for direct or indirect commercialisation, according to the exploitation and protection measures presented in the Grant Agreement (GA).

Finally, while the MAGNO project is focused on proposing new business models to switch from lineal to circular sustainable ones, MAGNO could cover a wide range of applications and its applicability potential is promising. Also, with a view on one of its main results, the Ecosystem Digital Twin, its modulable behaviour could be used for other value chains or adapted to different sectors. Therefore, R&D activities after the project's end could be focused on adapting the results for other uses or other industries.

Commercial exploitation

Once ready, several MAGNO results have the potential for commercial exploitation, including avenues such as technology licensing, product commercialisation, or the provision of new and improved services. In the following paragraphs, an initial assessment of the commercial exploitation pathways is presented, according to the preliminary IPR management strategy.

While the intellectual property ownership of the results in the MAGNO project will be discussed throughout the project, the following list presents a preliminary range of protection measures that have been envisaged by MAGNO partners.

Direct commercialisation

MAGNO will lead to the development of new technologies and products linked to the food packaging value chain. Direct commercialisation will enable project partners to directly exploit these results in their commercial activities, according to IPR agreements and measures.

Provision of technology, consulting, and training services

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KER8 to KER10 have the potential to be leveraged commercially by their IP owners, through the development of new or improved services to be offered to third external parties.

Through technology, consulting, and training services, project partners can directly capitalize on the expertise and know-how gained during the project to improve or expand their existing commercial offer, enhancing their competitiveness in the bio-based polymers and bioplastics applications fields.

Consumer awareness and behavioural change to consumers

The results of the MAGNO project, particularly in the food packaging value chain and waste management, can be effectively exploited through targeted consumer awareness and behavioural change campaigns. By educating consumers about the environmental impact of packaging waste and promoting sustainable choices, these campaigns can drive significant shifts in consumer behaviour. This approach involves disseminating information about the benefits of eco-friendly packaging and the importance of proper waste disposal through various channels such as social media, community workshops, and in-store promotions. Engaging narratives and visual storytelling can highlight the lifecycle of packaging materials and the potential for recycling and reusing. Incentive-based initiatives, such as rewards for using recyclable packaging or participating in recycling programs, can further motivate consumers to adopt sustainable practices. This section will be led by KVC within Task 6.3. By fostering a deeper understanding of their role in the packaging ecosystem, these campaigns can empower consumers to make informed choices, reducing waste and supporting a more sustainable food packaging value chain.

Licensing

Licensing offers IP owners the opportunity to use their IP in a regulated manner, enabling them to generate revenue over a defined period of time. Licensing involves the IP owner granting permission to one or more entities to use the KER through a mutually agreed contract. In the licensing process, ownership of the IP remains with the licensor.

Policy recommendations and standardisation

To promote the widespread adoption of MAGNO results, including optimised business models and scientific results, it is crucial that the results are compliant with standards and specific regulations within the EU food related legislation amongst others. In this respect, the results of the project can be disseminated to support advocacy strategies among policymakers and other stakeholders at both national and EU levels. The project has the potential to provide valuable support to policymakers and regulators by sharing its findings, lessons learned, and best practices in standardization and policymaking. The aim is to facilitate the uptake of bio-based polymers by highlighting their environmental, economic, and social benefits.

The integration of standardisation initiatives into the MAGNO exploitation strategy is important for translating research and innovation results into market-ready solutions. This aligns seamlessly with EU processes to reduce emissions and improve safety and circularity regulations.

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Research and academic exploitation

MAGNO integrates different Scientific disciplines (STEM), including: food technology; environmental sciences, engineering, materials, as well as toxicology; chemistry and biochemistry; and computer sciences and physics. It also involves Social Science & Humanities (SSH) disciplines, including sociology, economics and business, upon the partners' qualified experts.

The aim of academic, scientific, and research exploitation is to apply the knowledge gained from the project to facilitate ongoing research and knowledge transfer. The knowledge gained may be incorporated into ICT platforms, training courses, technical studies, and methodologies. It may also lead to additional publications (beyond the 11 scientific publications that should be produced during the project duration) and inspire future research in the same or related areas. Importantly, the benefits of these results are not limited to a single university; research centres and R&D departments can also use this knowledge for their future research objectives.

To develop, validate, and replicate the proposed solutions, MAGNO involves universities, research institutions, and theme-related companies. The result of these activities will be a composite body of knowledge that can be used after the end of the project.

Throughout the project, all partners will contribute to advancing the state of the art by disseminating the knowledge derived from the activities within the R&D community. Academic research will address gaps in the current state of the art and formulate innovative business models and production methodologies. Given the different intentions of the partners, such as filing patents or protecting results as industrial secrets, continuous monitoring of the confidentiality of information shared in research and knowledge transfer activities is essential to avoid hindering these exploitation pathways. A comprehensive IPR management strategy must therefore be developed to define what information can be shared and what must remain private.

7.1 Exploitation phases

Having all the aforementioned in mind, to successfully exploit the results of the MAGNO project and positively impact the food packaging value chain, a structured and logical progression of steps will be followed, each of them building on the previous one to ensure a comprehensive and strategic approach. These plan will take place between project M7 that is represents M1 in the following chart and M24 which is M18 in the calendar below:

7.1.1 Multistakeholder and Internal Meetings

MAGNO exploitation plan should begin with the calendar of bilateral meetings, where key stakeholders will be engaged to discuss project goals, gather insights, and establish initial buy-in. These meetings are essential for understanding the needs and expectations of various participants in the food packaging value chain, from manufacturers to regulators. Following these external engagements action, different techniques may be considered as surveys or online forms to collect structured feedback and identify areas of focus for further development. This

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point still need to be further discussed. This data-driven approach helps in pinpointing critical issues and potential opportunities for innovation.

The next step is the **calendar of internal meetings to align on** the acceptance of new Key exploitable results (KERs). These meetings will ensure that all team members and partners are on the same page regarding the project's innovative outcomes and their potential applications. Once there is consensus on KERs, the focus will be on the **assessment of Intellectual Property Rights (IPR)** to protect these innovations and prepare for their secure and strategic exploitation. This alignment phase ensures that the foundational elements are firmly established, paving the way for more detailed planning and execution.

Month 1-3: Initial Phase

- **Workshops:**
  - Month 1: Introduction to New KERs and Initial Acceptance Workshop
  - Month 2: Introduction to IPR and Joint Planning Session
  - Month 3: Conducting an IP Audit (SWOT Analysis Workshop)
- **Bilateral Meetings:**
  - Month 2: Discussion on Acceptance of New KERs
  - Month 3: Initial Assessment of IPR
- **Internal Meetings:**
  - Monthly meetings to align on Acceptance of New KERs and IPR

Month 4-6: Planning and Assessment

- **Workshops:**
  - Month 4: Feasibility and Freedom to Operate Workshop
  - Month 5: Defining Exploitation Objectives Workshop
  - Month 6: Resource Sharing and Securing IP Protection Strategy Workshop
- **Bilateral Meetings:**
  - Monthly meetings focused on Evaluating Feasibility and Freedom to Operate
  - Meetings to define Exploitation Objectives
- **Internal Meetings:**
  - Monthly meetings to review and refine Resource Sharing and IP Protection Strategy

7.1.2 Joint Plan Development

With a solid foundation in place, the process transitions to developing a joint plan, starting with conducting an IP Audit. This step is crucial to inventory and assess all intellectual assets, ensuring to have a clear understanding of the IP landscape. Following the IP audit, a SWOT analysis will be conducted to evaluate the strengths, weaknesses, opportunities, and threats associated with the IP and overall strategic position. This analysis informs the next step: evaluating feasibility

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and Freedom to Operate. Here, it is determined whether the IP can be freely used and commercialized without infringing on others' rights.

Based on these evaluations, next stage consists of defining exploitation objectives, setting clear goals for how the IP and innovations will be leveraged. Resource sharing is the next logical step, facilitating collaboration among partners to efficiently use available resources. Securing IP protection and developing a strategy follows, ensuring that the project's innovations are legally safeguarded and strategically positioned in the market. Subsequently, a market strategy will be developed to guide the commercialization and distribution of MAGNO's results.

C&D+E Implementation activities (Communication and Dissemination + Exploitation) are then planned to promote and exploit the project's outcomes effectively. To measure success, KPIs will be established. Following this, a framework for integration and alignment with individual strategies of partners will be created, ensuring coherence and synergy across all efforts. Risk management is addressed next to identify, assess, and mitigate potential risks associated with the project's exploitation activities. This is complemented by financial projection, which includes a detailed nine-step process to forecast and plan financial performance and sustainability.

Finally, managing and leveraging IP ensures that MAGNO project's intellectual assets are optimally utilized and protected throughout the exploitation phase. Continuous review and adaptation processes will be established to monitor progress and make necessary adjustments, ensuring that the project remains aligned with evolving market conditions and strategic goals.

Month 4-6: Planning and Assessment

- **Workshops:**
  - Month 4: Feasibility and Freedom to Operate Workshop
  - Month 5: Defining Exploitation Objectives Workshop
  - Month 6: Resource Sharing and Securing IP Protection Strategy Workshop
- **Bilateral Meetings:**
  - Monthly meetings focused on Evaluating Feasibility and Freedom to Operate
  - Meetings to define Exploitation Objectives
- **Internal Meetings:**
  - Monthly meetings to review and refine Resource Sharing and IP Protection Strategy

Month 7-9: Market Strategy and Implementation

- **Workshops:**
  - Month 7: Market Strategy Workshop
  - Month 8: Implementation Activities for C&D+E
  - Month 9: Defining KPIs Workshop
- **Bilateral Meetings:**
  - Monthly meetings to finalize Market Strategy
  - Meetings to discuss C&D+E Implementation
- **Internal Meetings:**

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- Monthly meetings for KPI definition and alignment

7.1.3 Individual Joint Plans with Key exploitable results (KERs)

In parallel with the joint planning, individual joint plans for five different KERs will be developed. This begins with conducting an IP Audit for each KER to evaluate and document their intellectual assets. Each KER will undergo a SWOT analysis to understand its specific strategic context. This will be followed by evaluating feasibility and Freedom to Operate for each KER, ensuring that each innovation can be exploited without legal or operational barriers.

Next comes the definition of exploitation objectives for each KER, tailoring them to the unique strengths and opportunities identified. If necessary, there will be a plan for resource allocation to support the development and commercialization of each KER. Each partner, with support from the project, will develop customized IP management strategies to protect and leverage their specific innovations.

Tailored market strategies will be devised to effectively position and promote each KER in its target market. Implementation of C&D+E activities will follow, ensuring that each KER is effectively communicated and exploited. Setting KPIs for each KER allows us to measure progress and success. Managing and leveraging IP will be a guided process, with each partner executing the strategy with support from the project. Continuous review and adaptation will be crucial to respond to changing conditions and feedback, ensuring that each KER achieves its maximum potential impact in the food packaging value chain.

By following this structured progression of activities, the MAGNO project will strategically exploit its results, fostering innovation and sustainability within the food packaging value chain ecosystem. Since this strategy is a collective and continuous effort based on collaborative decision-making, a series of workshops with KER owners and project representatives will take place in order to advance in the following calendar, moving forward within the framework exposed towards a successful KER implementation through the following phases. The following text showcases the phases logic as well as a concrete calendarization of activities for the following 18th months until next iteration of this deliverable is presented:

Month 10-12: Integration and Risk Management

- **Workshops:**
  - Month 10: Framework for Integration Workshop
  - Month 11: Risk Management Workshop
  - Month 12: Financial Projections and Management Workshop
- **Bilateral Meetings:**
  - Monthly meetings for Integration Framework discussions
  - Risk Management Planning sessions
- **Internal Meetings:**
  - Monthly meetings focused on financial projections and risk management

Month 13-15: Continuous Improvement and Review

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- **Workshops:**
  - Month 13: Continuous Review and Adaptation Workshop
  - Month 14: IP Management and Leveraging Workshop
  - Month 15: Comprehensive Review of Progress Workshop
- **Bilateral Meetings:**
  - Monthly meetings for continuous review and adaptation
  - IP Management strategy discussions
- **Internal Meetings:**
  - Monthly meetings for comprehensive review and ongoing adaptation

Month 16-18: Finalization and Strategy Deployment

- **Workshops:**
  - Month 16: Final Exploitation Plan Workshop
  - Month 17: Deployment Strategy Workshop
  - Month 18: Final Review and Closing Workshop
- **Bilateral Meetings:**
  - Monthly meetings to finalize the Exploitation Plan
  - Deployment strategy discussions
- **Internal Meetings:**
  - Monthly meetings for final review and plan closure

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8 Conclusions

The Preliminary Exploitation outlines the overall strategy of MAGNO. It serves as a guide for partners to align their local communication activities with the project's goals. The document provides visual and content guidelines for exploitation tasks and interaction with the C&D strategy to implement a successful exploitation plan that will be carried out in parallel to the development of MAGNO activities. It explains the processes, targets, tools, methods, and formats that will be used by KVC and all MAGNO partnerships during the implementation of the project.

This document also outlines a series of tools and techniques that will support this activity, starting with the identification of Key exploitable results (KERs) and the identification of the main stakeholder groups. In light of KERs, stakeholders, markets and novel approaches reviewed to support the decision-making process, the construction of the main exploitation pillars, as they are envisaged in the GA, will proceed. These sections were drafted following a cocreation methodology and are also based on Grant Agreement information and will be updated and validated throughout the project duration. This will lead to an effective and smooth exploitation in the post-project phase, ensuring the uptake and sustainability of the results. The current document will be updated in M24 (D7.2) and finalised in M42 (D7.3).

KVC will monitor the effectiveness of the strategy periodically, allowing MAGNO partners to understand and fine-tune its content and review the overall dissemination, exploitation, and communication strategy over time based on the milestones designed in both ways.

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Transforming EU food systems with innovative strategies for sustainable packaging

ANNEX 1

STAKEHOLDER MAPPING ANNEX

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Company name	Main business activities	Value chain step	Relationships within the value chain			Website	Company Size	City	Country	Comments
			Customers	Competitors	Initiatives					
Südpack	Producer of flexible packaging materials for food, technical products and pharmaceutica		Food producers, pharma companies, technical companies	Packaging producers	CEFLEX, Circular Plastics Alliance, Danish Food Cluster, ELIPSO, FPE, ZLV, IKK, IHK, HolyGrail 2.0, OPRL, Packaging Valley, KIDV	www.suedpack.com	Medium - Large	Ochsenhausen	Germany	Locations in Europe, USA
Amcor	Producer of packaging for food, beverage, pharma, home and personal care		Food producers, pharma companies, personal and home care producers	Packaging producers	AEPW, Ellen MacArthur Foundation, Plastics Pacts, Earthwatch Institute	www.amcor.com	Large	Zurich	Switzerland	Global company, from Australia
Constantia Flexibles	Producer of flexible packaging for food, pharma		Food producers, pharma companies	Packaging producers	CEFLEX, Sustainable Packaging Coalition, FPE, alufoil, 4evergreen, "Stop Waste - Save Food"	www.cflex.com	Medium - Large	Vienna	Austria	Globally active
Koehler Paper	Producer of paper		Food producers, pharma companies, cosmetics companies	Paper and packaging producers	Blauer Engel, PEFC, FSC	www.koehlerpaper.com	Medium - Large	Oberkirch	Germany	Family owned, globally active, produces packaging paper among other categories
Mondi	Producer of paper and flexible packaging		Food producers, personal and home care producers, pet food producers	Paper and packaging producers	4evergreen, AWS, CEFLEX, CELAB, CEPI, EWT, Ellen MacArthur Foundation	www.mondigroup.com	Large	Vienna/Weybridge	Austria/UK	Globally active

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Nissha Metallizing Solutions	Producer of metallized paper					www.nisshametallizing.com				Japanese parent company
Seda	Producer of paper cups		Food producers	Paper packaging producers	FSC, PEFC, Sustainable Forest Initiative	www.sedagroup.org		Arzano	Italy	
Multivac	Producer of packaging and labels for food, pharma and consumer goods		Food producers, consumer good producers, pharma companies	Packaging producers	CEFLEX, IK, R-Cycle, Stiftung Allianz für Entwicklung und Klima, BlueCompetence, initiative SaveFood, Circular Plastics Alliance	multivac.com	Large	Wolfertschwenden	Germany	
Gascogne	Producer of flexible and paper packaging		Food producers, pet food producers	Packaging producers	PEFC, FSC	www.groupe-gascogne.com/en/	Mid-Market	Mimizan Cedex	France	
Michelman Packaging Solutions	Producer of flexible and paper packaging, inks and coatings		Food producers	Packaging producers		www.michelman.com	Large	Cincinnati, OH	USA	European HQ: Windhof, Luxembourg
CDM Packaging	Producer of flexible packaging		Food producers	Packaging producers		cdm.pl/en	Medium	Ksawerów	Poland	
PDO						https://pdo.com.pl/?lang=en	Medium	Janocwiec Wielkopolski	Poland	
Groupe Guillin	Producer of food packaging		Food producers	Packaging producers		www.groupeguillin.fr/en	Medium - Large	Ornans	France	
Coopbox	Packaging producer		Food producers	Packaging producers		www.coopbox.com/en/	Medium	Bibbiano	Italy	
Nestlé	Food producer		Retailer	Food producers		www.nestle.com	Large	Vevey	Switzerland	

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Mondelez	Food producer		Retailer	Food producers		www.mondelezinternational.com	Large	Deerfield, IL	USA	European HQ: Glattpark, Switzerland
Procter & Gamble	Consumer goods producer		Retailer	Consumer goods producers	Holy Grail	us.pg.com	Large	Cincinnati, OH	USA	
Unilever	Food producer, personal and home care producer		Retailer	Food producers		www.unilever.com	Large	London	UK	
Kraft Heinz	Food producer		Retailer	Food producers		www.kraftheinzcompany.com	Large	Chicago, IL	USA	
Mars Incorporated	Food producer		Retailer	Food producers	CEFLEX, Ellen MacArthur Foundation, Sustainable Packaging Coalition	www.mars.com	Large	Tacoma, WA	USA	
Frischpack Gruppe	Food processor (cheese)		Retailer	Food producers		www.frischpack-gruppe.de	Medium	Mailling bei Schönau	Germany	
REWE Group	Grocery Store		End consumer	Grocery stores		www.rewe-group.com	Large	Cologne	Germany	Owns: REWE, Nahkauf, Penny, Billa
ALDI Nord	Grocery Store		End consumer	Grocery stores		www.aldi-nord.de	Large	Essen	Germany	For overview over both: www.aldi.de
ALDI Süd	Grocery Store		End consumer	Grocery stores		www.aldi-sued.de	Large	Mühlheim an der Ruhr	Germany	
EDEKA	Grocery Store		End consumer	Grocery stores		www.edeka.de	Large	Hamburg	Germany	Owns: Netto
Schwarz-Gruppe	Grocery Store		End consumer	Grocery stores		gruppe.schwarz	Large	Neckarsulm	Germany	Owns: LIDL, Kaufland

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Lobbe Umweltservice GmbH & Co KG	Recycling operator		Packaging producers	Recycling operators		www.lobbe.de	Medium	Iserlohn-Sümmern	Germany	Also active in other areas of industrial remediation
Remondis	Recycling operator		Packaging producers	Recycling operators		www.remondis.de/en/home	Large	Lünen	Germany	
Alpla	Packaging for a wide array of applications (food, beverage, pharma, cosmetics)	Converter	B2B	Converters	EuPC members	https://www.alpla.com/en	Large	Saint Margrethen	Switzerland	
Ampacet	masterbatches for applications in mono-layer and co-extruded films, as well as in blow molding, injection molding, extrusion, thermoforming	Masterbatcher	B2B	Masterbatcher	EuPC members	https://www.ampacet.com/	Large	Dudelange	Luxembourg	
Barbier Groupe	Wide range of products from palletizing film to garbage bags. Main market segments: industry, agricultural, retail	Converter	B2B	Converters	EuPC members	https://www.barbiergroup.com/en/	Large	Sainte-Sigolène	France	
Bischof & Klein	Packaging and Containers Manufacturing	Converter	B2B	Converters	EuPC members	https://www.bischof-klein.com/en/	Large	Lengerich	Germany	

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COEXPAN	Coexpan is the Grupo Lantero division that specializes in the manufacture of rigid plastic foils and thermoformed products	Converter	B2B	Converters	EuPC members	https://www.coexpan.com/	Large	Alcalá de Henares, Madrid	Spain	
Cofresco	Food packaging	Converter	B2B	Converters	EuPC members	https://www.cofresco.de/index_en.html	SME	Minden	Germany	
Coopbox group SPA	Food packaging	Converter	B2B	Converters	EuPC members	https://www.coopbox.com/en/home/	SME	Bibbiano	Italy	
Crocco	Food contact cling film, technical film, compostable film (…)	Converter	B2B	Converters	EuPC members	https://www.crocco.com/eng/	Small	Tribiano	Italy	
DART Products Europe	Manufacturing foodservice packaging and disposable tableware.	Converter	B2B	Converters	EuPC members	https://www.dartcontainer.com/en-uk/products	Large	Runcorn	UK	
Deceuninck	Manufacturing PVC window systems, doors, and building products.	Converter	B2B	Converters	EuPC members	https://www.deceuninck.com/	Large	Hooglede-Gits	Belgium	
Ergis	Manufacturing plastic films, including PVC films, stretch films, and laminates.	Converter	B2B	Converters	EuPC members	http://www.ergis-eurofilms.com/	Large	Warsaw	Poland	

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Faerch	Manufacturing plastic packaging solutions, particularly trays and containers for the food industry.	Converter	B2B	Converters	EuPC members	https://www.faerch.com/	Large	Holstebro	Denmark	
Flexible Trading Holding - FPS	Manufacturing flexible packaging materials, including films and bags.	Converter	B2B	Converters	EuPC members	https://www.fpsspa.com/	Large	Milan	Large	
Greif	Manufacturing industrial packaging products, such as drums, containers, and packaging accessories.	Converter	B2B	Converters	EuPC members	https://www.greif.com/	Large	Brühl	Germany	
Greiner	Manufacturing plastic packaging, foam products, and technical parts.	Converter	B2B	Converters	EuPC members	https://www.greiner-gpi.com/	Large	Kremsmünster	Austria	
Group Herige	Manufacturing building materials, including PVC and composite profiles for doors, windows, and decking.	Converter	B2B	Converters	EuPC members	https://www.groupeherige.com/	Large	Bressuire	France	
Hipac	Manufacturing packaging solutions, including plastic	Converter	B2B	Converters	EuPC members	https://www.hipac.pl/	Large	Grójec	Poland	

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	bags, films, and pouches.									
IFG Asota	Manufacturing plastic packaging products, including bottles, jars, and closures.	Converter	B2B	Converters	EuPC members	http://www.ifg-asota.de/	Large	Velbert	Germany	
Intraplas	Manufacturing plastic injection-molded components and assemblies for various industries, including automotive, electronics, and consumer goods.	Converter	B2B	Converters	EuPC members	https://intraplas.com/	Large	Helmond	Netherlands	
ITC Packaging	Manufacturing plastic packaging solutions, including containers, bottles, and closures for the food, beverage, and pharmaceutical industries.	Converter	B2B	Converters	EuPC members	https://www.itc-packaging.com/	Large	Valencia	Spain	
Laborplast S.p.A	Manufacturing plastic packaging solutions, including bottles, jars, and closures.	Converter	B2B	Converters	EuPC members	https://www.laborplast.com/	Large	Milan	Italy	

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Lenzig Plastics	Manufacturing plastic films and sheets for various industries, including packaging, agriculture, and construction.	Converter	B2B	Converters	EuPC members	https://www.lenzigplastics.com/	Large	Lenzing	Austria	
Linpac (KP)	Manufacturing plastic packaging solutions, including trays, containers, and films for the food industry.	Converter	B2B	Converters	EuPC members	https://www.linpacpackaging.com/	Large	Featherstone	UK	
Logoplaste	Manufacturing plastic packaging solutions, including bottles and containers, primarily for the food and beverage industry.	Converter	B2B	Converters	EuPC members	https://www.logoplaste.com/	Large	Cascais	Portugal	
MACPAC	Manufacturing plastic packaging solutions, including trays, containers, and films for the food industry.	Converter	B2B	Converters	EuPC members	https://www.macpac.co.uk/	Large	Stockport	UK	

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Manupackaging Deutschland	Manufacturing plastic packaging solutions, including films, bags, and sacks for various industries.	Converter	B2B	Converters	EuPC members	https://www.manupackaging.com/	Large	Gersthofen	Germany	
Matrix Pack	Manufacturing plastic packaging solutions, including bags, pouches, and films for various industries.	Converter	B2B	Converters	EuPC members	http://matrixpack.in/	SME	Athens	Greece	
Muraplast	Manufacturing plastic pipes, fittings, and profiles for various applications, including plumbing, drainage, and construction.	Converter	B2B	Converters	EuPC members	https://www.muraplast.de/	Large	Bad Saulgau	Germany	
Norfolier GreenTec AS	Manufacturing plastic films and packaging solutions for various industries, including agriculture, construction, and food packaging.	Converter	B2B	Converters	EuPC members	https://norfolier.no/	SME	Halden	Norway	

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Papier Mettler	Manufacturing paper and plastic packaging solutions, including bags, sacks, and films for various industries.	Converter	B2B	Converters	EuPC members	https://www.mettler-packaging.com/	Large	Radolfzell	Germany	
Plasbel	Manufacturing plastic sheets and films for various applications, including packaging, printing, and construction.	Converter	B2B	Converters	EuPC members	https://plasbel.com/	SME	Pinto	Spain	
Plastic Omnium	Manufacturing automotive components, particularly plastic exterior body parts, fuel systems, and environmental solutions.	Converter	B2B	Converters	EuPC members	https://www.plasticomnium.com/	Large	Levallois-Perret	France	
Plasticos Romero	Manufacturing plastic packaging solutions, including bags, films, and pouches for various industries.	Converter	B2B	Converters	EuPC members	https://plasticosromero.com/	SME	Valencia	Spain	

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Plastiflex	Manufacturing flexible plastic hoses and ducts for various applications, including vacuum cleaners, swimming pools, and ventilation systems.	Converter	B2B	Converters	EuPC members	https://www.plastiflex.com/	Large	Beringen	Belgium	
Polieco-MPB	Manufacturing plastic pipes, fittings, and drainage systems for infrastructure and construction projects.	Converter	B2B	Converters	EuPC members	https://www.polieco.com/	Large	Carate Brianza	Italy	
Polifilm	Manufacturing plastic films and sheets for various industries, including packaging, construction, and agriculture.	Converter	B2B	Converters	EuPC members	https://www.polifilm.com/	Large	Weißandt-Gölzau	Germany	
Polymer-Chemie	Manufacturing plastic raw materials, including resins, compounds, and additives.	Masterbatcher	B2B	Converters	EuPC members	https://www.polymer-chemie.de/	Large	Bad Salzuflen	Germany	

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Renolit	Manufacturing plastic films, sheets, and laminates for various industries, including construction, automotive, and furniture.	Converter	B2B	Converters	EuPC members	https://www.renolit.com/	Large	Worms	Germany	
RKW SE	Manufacturing plastic films and nonwovens for various industries, including packaging, agriculture, and construction.	Converter	B2B	Converters	EuPC members	https://www.rkw-group.com/	Large	Frankenthal	Germany	
RPC	Manufacturing plastic packaging solutions for various industries, including food and beverage, personal care, healthcare, and automotive.	Converter	B2B	Converters	EuPC members	https://www.rpc-group.com/	Large	Rushden	UK	
Segers&Balcaen	Manufacturing plastic packaging solutions, including bottles, jars, and closures for various industries.	Converter	B2B	Converters	EuPC members	https://segersbalcaen.com/	SME	Hulste	Belgium	

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SIRAP France	Manufacturing plastic packaging solutions, including trays, containers, and films for the food industry.	Converter	B2B	Converters	EuPC members	https://www.sirapgroup.com/	Large	Saint-Étienne	France	
TEKNI-PLEX	Manufacturing plastic and rubber products, including packaging materials, medical devices, and specialty tubing.	Converter	B2B	Converters	EuPC members	https://www.tekni-plex.com/	Large	Brussels	Belgium	
Trioworld	Manufacturing plastic packaging solutions, including stretch films, bags, and sheets for various industries.	Converter	B2B	Converters	EuPC members	https://www.trioworld.com/	Large	Alingsås	Sweden	
Turan Plastik	Manufacturing plastic packaging solutions, including bottles, jars, and closures for the food and beverage industry.	Converter	B2B	Converters	EuPC members	https://www.turanplastik.com.tr/	SME	Istanbul	Turkey	
United Caps	Manufacturing plastic closures and caps for food and beverage packaging applications.	Converter	B2B	Converters	EuPC members	https://www.unitedcaps.com/	Large	Wiltz	Luxemburg	

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Viscofan	Manufacturing casings for meat products, including collagen, cellulose, and plastic casings.	Converter	B2B	Converters	EuPC members	https://www.viscofan.com/	Large	Tajonar	Spain	
Mani	Embalagens para a Restauração, Supermercado e Indústria Alimentar					https://www.mani.pt/pt/		Aldeia de Paio Pires	Portugal	
PETIBOL	Manufacturing EPS and EPP; EPS is widely used in food packaging, such as fish, seafood, fruit and vegetables. The thermal insulation properties of EPS help keep food cool and prevent condensation throughout the distribution chain.					https://www.petibol.pt/en/sectors/		Leça do Balio	Portugal	
Plastrofa	Plastrofa is specialized in the manufacture and commercialization of flexible plastic packaging, in the form of FFS sleeve, film, sheet and bag					https://www.plastrofa.pt/en/who-we-are/index.html		Trofa	Portugal	

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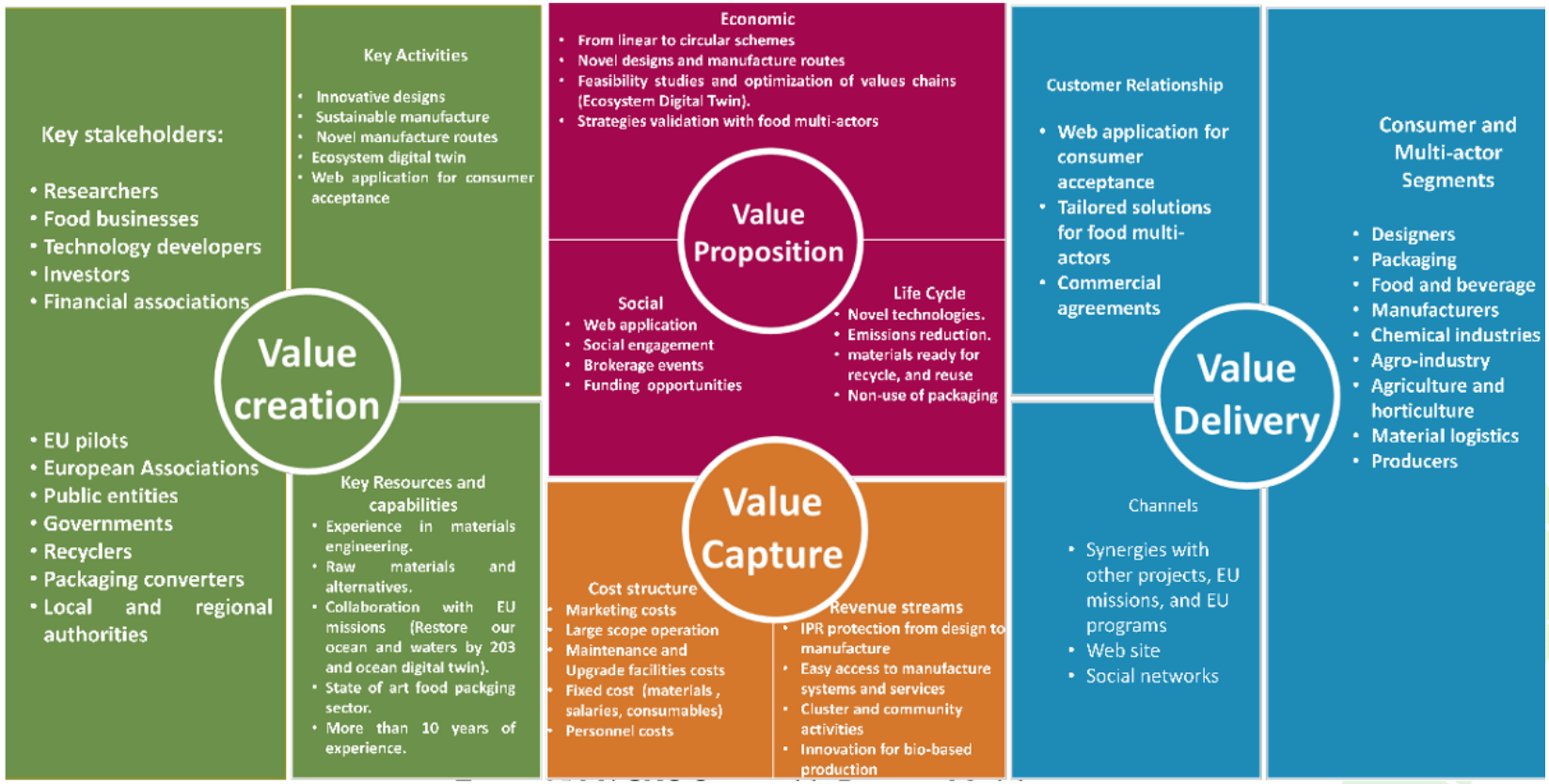
ANNEX 2

PRINCIPLES OF THE BUSINESS PLAN



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