ICAERUS

D4.4 Onsite Learning & Value-added Services

Version A

WP4: Capacity Building & Value- added Services

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0.4	First full draft of Value-Added Services: Working Group design, OCT clustering, workshop planning, and digital tool concepts	16/04/2025	Mackenzie Baert (RFF), George Papapostolou (RFF),
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Executive Summary

Deliverable D4.4 Onsite Learning & Value-added Services documents the development and implementation progress of two core ICAERUS activities: on-site learning workshops (Task 4.3) and value-added services for Open Call beneficiaries (Task 4.4). This report reflects activities carried out up to the end of Year 3 (1st year of demo events), including the first cycle of demonstration-based workshops and value-added services delivered to date, and outlines the implementation plan for the second round of demonstration events and learning activities in Year 4 (2nd year of demo events).

On-site Learning

The first phase of on-site learning was implemented in conjunction with the ICAERUS demonstration events, each hosted by a Use Case partner and aligned with their respective technical domain: crop monitoring, drone spraying, livestock monitoring, forestry and biodiversity monitoring, and rural logistics. These hands-on technical workshops enhanced participants' operational capacity by exposing them to real-life UAV deployment strategies, equipment handling, and safety protocols.

Building on this foundation, the second round of on-site learning (planned for Year 4) will integrate more strategic content by linking in-class workshops with the online ICAERUS learning modules developed in Tasks 4.1 and 4.2. A structured methodology was applied to define the thematic focus of this next phase, resulting in the selection of four internationally validated tools designed to support the development of sustainable business models: the market concentration calculator, Grant's six forces analysis, SWOT analysis, and the Triple Layered Business Model Canvas (TLBMC). These tools were chosen for their ability to address key phases in the strategy process—analysis, decision-making, and implementation—and will be uniformly presented across on-site learning events, value-added services, and the ICAERUS Platform to ensure coherence and replicability.

Value-Added Services

Task 4.4 delivers targeted support services to beneficiaries of the ICAERUS Open Call Trials (OCTs), which have been implemented under two types of Open Calls (PUSH and PULL), each launched twice and collectively funding 20 sub-projects with a total of over €1M in Financial Support to Third Parties (FSTP). The Value-Added Services are designed to strengthen OCT capacity for commercialisation, innovation design, and strategic sustainability through three complementary pillars:

1. **Working Groups**: Themed groups bring together OCTs, ICAERUS Use Case leaders, and pilots from sister projects SPADE and CHAMELEON. Five domain-specific groups were formed to facilitate peer exchange and sectoral dialogue: crop monitoring, resource conservation, livestock & wildlife management, forestry & biodiversity, and rural logistics & cross-cutting technologies. The first meetings are scheduled for May 2025 and will initiate collaboration, peer learning, and planning of thematic content.
2. **Workshops**: A structured workshop series has been developed to support OCTs in:
    - Conducting **market analysis**, including segmentation and competitive landscape assessment;
    - Developing **Triple Layered Business Model Canvases**, tailored to each domain;
    - Understanding **intellectual property rights** and asset management for commercialisation. These workshops are grounded in real-world Use Case examples and designed to be practical and immediately applicable.
3. **Digital Tools**: A suite of online tools has been designed and prototyped to provide long-term, open-access support to ICAERUS stakeholders. These include:
    - A **market concentration calculator** based on CR and HHI indices;
    - A **business model wizard** guiding users through the TLBMC framework;
    - An **IP checklist** and downloadable templates for SWOT and six-forces analyses. These tools are integrated into the ICAERUS Platform and will remain accessible beyond the project's duration.

The activities conducted during Year 3 have established a solid foundation for hands-on learning and strategic support for ICAERUS stakeholders. The on-site learning workshops successfully transferred technical knowledge at demonstration events, while the value-added services provided targeted guidance to OCTs and fostered cross-project exchange. In Year 4, ICAERUS will expand these efforts by focusing on business development and sustainability planning, offering stakeholders a structured path to turn UAV-based innovations into market-ready, socially responsible, and environmentally sound services.

By aligning technical implementation with strategic modelling and stakeholder engagement, ICAERUS ensures that its educational activities and tools are not only impactful in the short term but also support the long-term transformation of drone-enabled services in agriculture, forestry, and rural logistics across Europe.

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1. Introduction

1.1 Aim of the deliverable

This deliverable provides an update on the implementation of Task 4.3 On-site Learning and Task 4.4 Value-Added Services during Year 3 of the ICAERUS project and outlines the planned activities for the second round of demonstration events in Year 4.

Task 4.3 focuses on the coordination of on-site learning activities delivered during ICAERUS Use Case demonstration events (Task 3.4). These learning activities are designed to complement the online learning modules developed in Task 4.2 and provide participants with practical, face-to-face capacity building opportunities. During Year 3, the first round of on-site learning workshops focused on technical UAV applications. The next round, planned for Year 4, will introduce strategic tools to support business model development for drone-based services. The methodology for these learning activities is detailed in Chapter 2.

Task 4.4 aims to provide Value-Added Services to the ICAERUS Open Call Trials (OCTs), including access to sector-specific working groups, training workshops, and digital tools. These services offer targeted guidance on both technical and business development topics, including market analysis, sustainable business modelling, and IP management. The design of these services builds on the ICAERUS Use Cases and is closely aligned with Task 5.6 on business and governance models. While primarily targeting OCT beneficiaries, the services also engage pilots from the sister projects SPADE and CHAMELEON and are made available more broadly via the ICAERUS platform.

The implementation of Tasks 4.3 and 4.4 is led collaboratively by RFF, the AUA, and the OU, in close cooperation with Use Case leaders and other partners.

1.2 Structure of this deliverable

This deliverable is organised into six chapters. Following this introductory section, **Chapter 2** presents the methodology for on-site learning and reports on the outcomes of the first round of on-site workshops held during Year 3. It also outlines the planning for the second round of workshops scheduled for Year 4. **Chapter 3** introduces the four strategic tools—Market Concentration Calculator, Six Forces Analysis, SWOT Analysis, and the Triple Layered Business Model Canvas—providing examples and detailing their role in supporting both on-site learning and Value-Added Services. **Chapter 4** describes the design, implementation, and current status of the Value-Added Services, including working groups, training workshops, and digital tools for the ICAERUS Open Call Trials. **Chapter 5** focuses on the dissemination of materials via the ICAERUS Platform, presenting the development of interactive tools and access to recorded workshops and demonstration resources. Finally, **Chapter 6** summarises the progress made and outlines the next steps for completing the on-site learning activities and Value-Added Services in the final project phase.

2. On-site learning

2.1 Methodology for On-site Learning

Task 4.3 of the ICAERUS project is focused on developing and coordinating on-site learning activities conducted during the demonstration events of the ICAERUS Use Cases (linked to Task 3.4). These activities are delivered through face-to-face workshops, organised by each Use Case partner based on their domain expertise and demonstration focus.

To develop the on-site learning initiatives, a **workshop** was conducted at the 4th Project Management Board Meeting in Milton Keynes, UK, on 27/06/2024, involving all project partners in the discussion of the learning outcomes of the on-site learning activities and the selection of contents and activities. Participants were involved in discussion across four tables and flipcharts were developed. Each group then shared the outcomes of the others, and the session concluded with an open floor discussion.

Eight flipcharts were developed and collected. An example of a SWOT analysis developed by a group is reported in Figure 2.1.

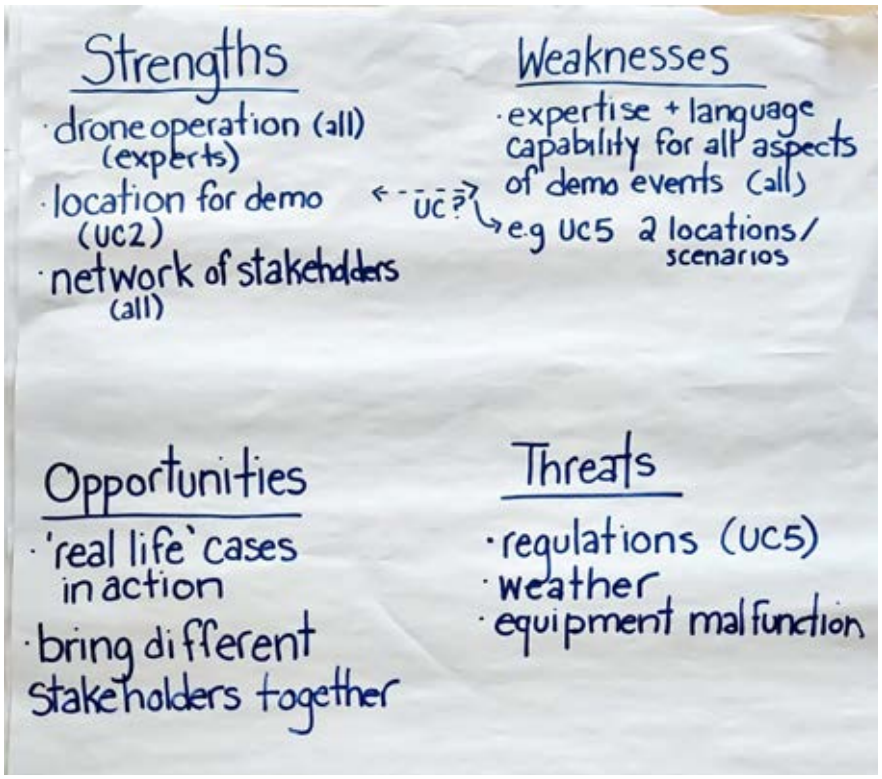


Figure 2.1: Flipchart with a SWOT analysis on the on-site learning activities

The notes of the discussion were analysed along with the eight flipcharts. The outcomes of the discussions were suggested considering the following aspects:

- On-site events are attended by multiple diverse stakeholders with different background, but with, typically, some technical knowledge;
- Language barriers require to adapt materials to the local language;
- Time constraints limit the on-site event to maximum 1.5 – 2 hours;
- It is important to link on-site events with the online course;
- The on-site event should cover both technical and business-related aspects:
    - The technical aspects should demonstrate the feasibility of the use of drones, its basic operations, the sensors used for data collection, and how data is analysed;
    - The business-related training should focus on showing the value-added by the use of drones;

- "Real cases" add value to the on-site events.

Participants reflect on how to divide the training on technical and business contents. A possible solution was offered by a group during the workshop as shown in Figure 2.2. they suggested the first round of on-site learning workshops to be planned around technical competence, whereas the second round should be focused on business-related skills.

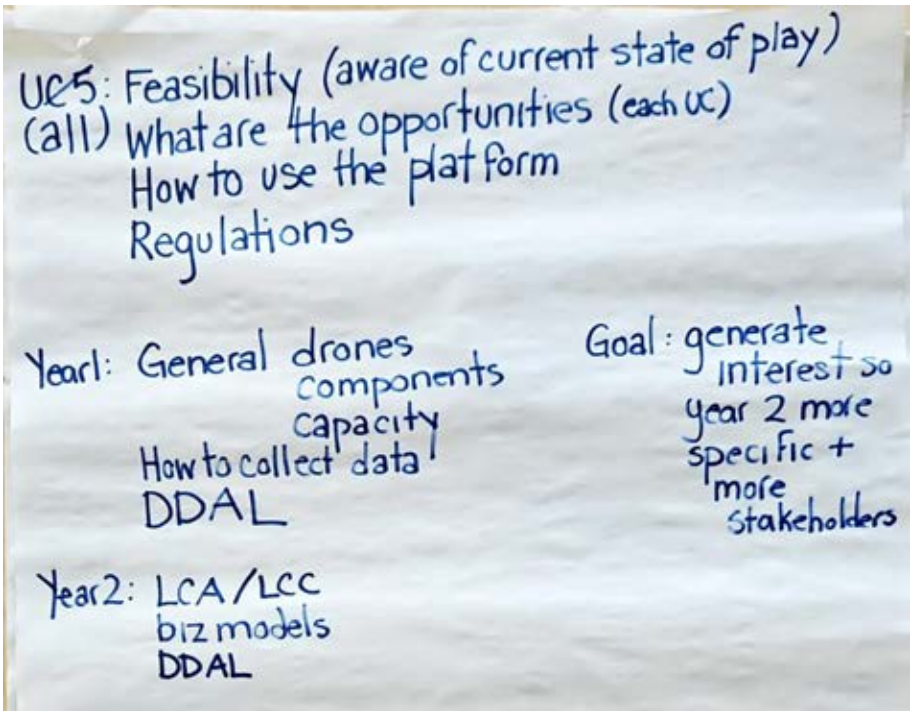


Figure 2.2: Flipchart showing the reflection on the division between technical and business-related skills

Year 1 On-site Learning Activities

During the first year of ICAERUS demonstration events, each of the five Use Case partners hosted a dedicated technical workshop, providing hands-on training and in-depth knowledge aligned with their specific Use Case and technical expertise.

The figure below illustrates the five on-site technical workshops delivered across the Use Cases:

- **Use Case 1: Crop Monitoring** – Practical demonstration of drone-based crop monitoring using the DJI Mavic 3M.
- **Use Case 2: Drone Spraying** – Technical preparation, safe deployment, and operational execution of spraying drones.
- **Use Case 3: Livestock Monitoring** – Practical applications, challenges, and opportunities for drone-based monitoring in pasture systems.
- **Use Case 4: Forestry and Biodiversity Monitoring** – Safe deployment and operational execution of drone operations in forest environments.
- **Use Case 5: Rural Logistics** – Principles and evolving landscape of Drones as a Service, including the European regulatory framework for UAV operations.

These workshops contributed to building both technical and operational capacity among participants, showcasing real-life UAV deployment strategies in agriculture, livestock, forestry, and rural logistics contexts.

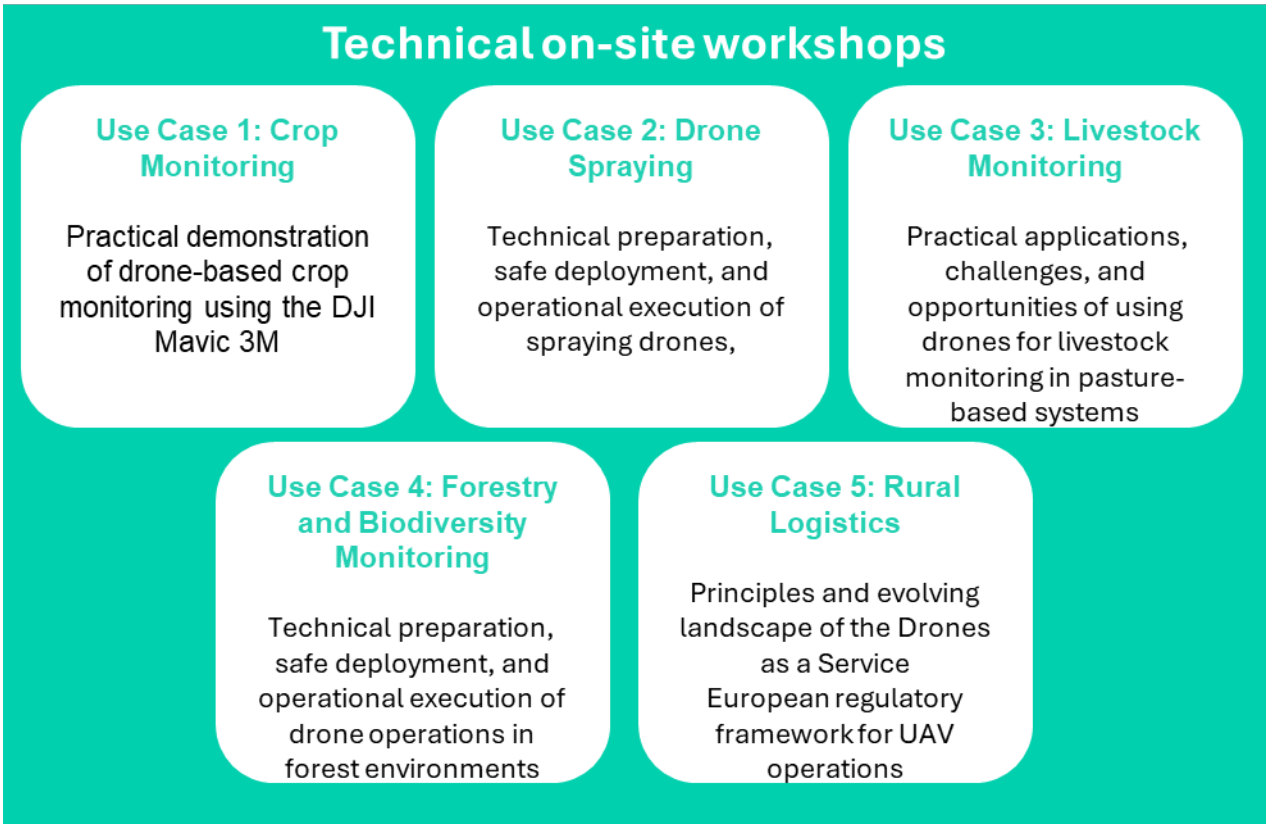


Figure 2.3: Contents of the first round of on-site learning workshops

Year 2 activities and planning

In the second year of ICAERUS demonstration events, on-site learning will be further developed to complement the online learning modules focused on developing business ideas and innovation pathways for drone-based services. This hybrid approach will strengthen the capacity-building dimension of the project, especially for stakeholders involved in the Open Call Trials.

An initial planning phase was conducted in September 2024 before the first demonstration event in Greece. The first series of demonstration events for the five use cases was concentrated on developing technological knowledge specific to each use case. These are reported in Chapter 2. Figure 2.4 below illustrates the process followed.

Subsequently, a second phase was designed to complement the online teaching material developed in Task 4.1. This phase involved a series of meetings, which resulted in the identification of the requirement to identify four tools essential for transforming a meaningful business idea into a well-structured business model canvas. Figure 2.4 shows the process followed. The decision to limit the number of strategy tools to four was not to overload the stakeholders with excessive information. A consensus was reached to identify strategy tools that would support the strategic development of business ideas linked to ICAERUS technologies.

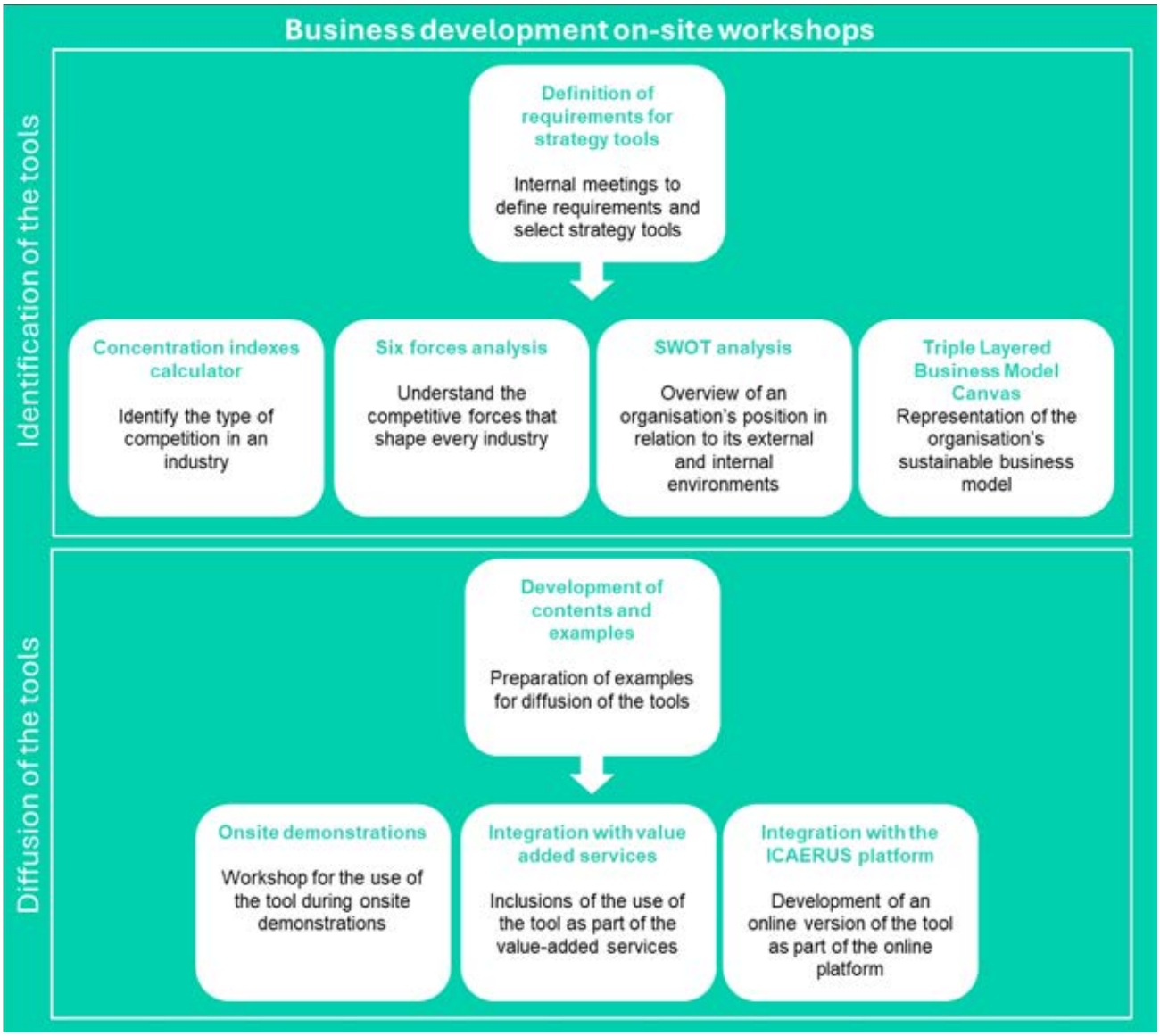


Figure 2.4: Methodology followed to identify and develop capacity on the strategy tools

The working group consulted with other project partners and based the selection of tools on the following criteria:

- Avoidance of overlap with tools already presented in the ICAERUS online course (e.g., the sustainability business model canvas);
- International validity both in literature and in practice;
- Capability to support the development and presentation of a business idea to stakeholders;
- Ability to support competitive analysis and business modelling as the main areas of business development;
- A balanced level of complexity to require training, but without necessitating a prior managerial background.

After two internal meetings, a set of four tools were identified: a market concentration calculator, Grant's six forces analysis, SWOT analysis, and the triple-layered business model canvas, which are presented in Chapter 3.

The team also evaluated the importance of maintaining consistency across the project by developing a presentation of the tools that is consistent across three points of contact with external stakeholders: the on-site learning events, the value-added services, and the ICAERUS platform. The choice was based on the consideration that the stakeholders for the three points of contact are different: on-site demonstrations usually engage local stakeholders in the use case development, whereas value-added services are

dedicated to participants at the open calls, and the ICAERUS platform addresses a broader international audience. This approach ensures a high level of consistency in the development of valid content and promotes good integration among both the contributions of project partners and external stakeholders. For instance, the application of a tool to an open call participant serves as a good example of the tool's use for participants at demonstration events. This will facilitate the development of a repository of examples based on the application of the tools to real cases within the project.
Chapter 3 presents the four tools. Paragraph 6.1 shows the next steps to deliver the second round of on-site learning workshops.

2.2 First round of on-site learning workshops

This chapter presents the contents and outcomes of the five on-site learning workshops.

2.2.1 Use Case 1: Crop Monitoring

As part of the UC1 demonstration event, the on-site learning workshop provided a practical demonstration of drone-based crop monitoring using the DJI Mavic 3M. The session, led by Esther Vera, introduced the drone's structure and sensors while detailing its functionality for agricultural data collection.

Participants were guided through the assembly and setup process, including pre-flight checks and activation of the remote controller. The workshop encompassed two flight modes:

- Manual flight mode: Participants learned to adjust drone configurations, including maximum altitude, home point setup, camera settings for photo/video capture, gimbal and zoom control, and joystick functions. They also understood real-time feedback from the remote controller display, such as camera view, altitude, orientation, and speed.
- Automated flight mode: Participants learned to define mission parameters, such as flight path per points or area coverage, adjusting parameters for image overlap or flight altitude. A programmed flight was executed, capturing images every two seconds, which are essential for generating high-quality orthomosaics for plant health analysis.

In addition to the Mavic 3M, the DJI Agras T50 spraying drone was presented and compared in terms of size, capabilities, and use cases, offering participants insight into the broader range of drone applications within ICAERUS.

The session was highly valued by participants, who appreciated the hands-on exposure to real-world workflows, from equipment setup to image capture, and the opportunity to connect technical procedures with agricultural applications.

2.2.2 Use Case 2: Drone Spraying

The On-site Learning Workshop that took place during the demonstration event was jointly facilitated by the Agricultural University of Athens (AUA) and the Hellenic Crop Protection Association (HCPA). The workshop was structured around the technical preparation, safe deployment, and operational execution of spraying drones, with dedicated sessions delivered by both organising partners.

The first session, led by AUA, focused on the technical setup of UAV spraying systems. It included an overview of drone calibration procedures, optimal application parameters, and the environmental conditions required for safe operation. Participants were guided through pre-flight preparations, route configuration, and equipment calibration, with emphasis on risk mitigation strategies for spray drift and treatment efficacy under different field conditions. Although a live drone flight was not possible due to strong winds, a static demonstration provided a comprehensive explanation of the equipment and configurations used during efficacy trials.

The second session, led by HCPA, addressed operator safety and the proper execution of UAV spraying procedures in line with legal and environmental standards. The session included practical guidance on the preparation and handling of spray mixtures, personal protective equipment (PPE) use, and operator responsibilities before, during, and after spraying. Attendees also reviewed documentation practices, such as pre-flight checklists, spray logs, and calibration records, and discussed regulatory compliance under Greek and EU frameworks. Despite the weather constraints, the workshop was highly valued by participants, who appreciated the practical insights into drone setup and safety protocols. The sessions were praised for bridging the gap between theoretical knowledge and field-level application, offering a solid foundation for the safe and effective use of UAVs in crop protection.

2.2.3 Use Case 3: Livestock Monitoring

The workshop focused on the practical applications, challenges, and opportunities associated with the utilisation of drones for livestock monitoring in pasture-based systems. Combining technical presentations, real-life testimonials, and live demonstrations, the workshop aimed to equip participants with both theoretical knowledge and field-level experience.

The first session provided insights from ongoing trials that integrate drone imagery into research protocols and daily management tasks. Attendees were introduced to various tools employed for data visualisation and interpretation. The workshop also addressed user feedback, highlighting key challenges such as cost, weather dependency, and technical training needs, while discussing future development pathways.
The second session explored the deployment of drones for tracking and observing sheep in extensive grazing environments. IDELE presented the principles underlying drone flight planning, image acquisition strategies, and data interpretation to support herd management decisions. Special emphasis was placed on flight safety, animal welfare considerations, and regulatory constraints. Participants observed live drone flights, which captured real-time footage of grazing flocks, serving as the basis for later discussions on animal behaviour analysis, headcounts, and monitoring pasture usage.
Overall, the workshop received positive feedback from participants, who appreciated the balance between practical demonstrations and scientific grounding. It effectively illustrated how drones can complement traditional observation methods and contribute to more precise and responsive livestock management systems.

2.2.4 Use Case 4: Forestry and Biodiversity Monitoring

The workshop held during the demonstration event was facilitated by the BetaVia team (formerly known as ART21) and led by Linas Didziulevicius. The workshop concentrated on drone operations within forest environments, encompassing technical preparation, safe deployment, and operational execution. It highlighted the technical setup required for drone operations, including the installation of a Gimbal T7 system for stabilised camera positioning, as well as the maintenance and management of obstacle sensors. Additionally, the workshop addressed optimal flight parameters and identified the environmental conditions necessary for safe operation. Participants were guided through pre-flight preparations, route configuration, and equipment calibration, with a particular focus on risk mitigation strategies within densely forested areas. Discussions also covered the optimal flight height for enhanced data collection and adherence to governmental regulations. On-site demonstrations involved drones fitted with hyperspectral and thermal cameras; however, live flights were not conducted due to the densely populated urban setting of the demo event. Instead, a video presentation provided step-by-step operational procedures, accompanied by detailed explanations of each phase. The workshop delivered a thorough exposition of the equipment and configurations employed during efficacy trials. Attendees also reviewed guidelines concerning drone operation and regulatory compliance within the EU framework. In summary, participants highly valued the workshop for its practical insights into drone setup and safety protocols, effectively bridging theoretical knowledge with real-world applications in forest management.

2.2.5 Use Case 5: Rural Logistics

The workshop comprised two distinct sessions. The conceptual session introduced participants to the fundamental principles and evolving landscape of the Drones as a Service (DaaS) model. Under the guidance of Dimitris Ramnalis (GS), the session examined how UAVs are increasingly integrated into a service-oriented ecosystem across diverse sectors, including logistics, civil protection, public health, environmental monitoring, and infrastructure maintenance. The facilitator underscored the strategic value of deploying drones as modular, scalable assets that can enhance public service delivery, particularly in remote or underserved areas. Key discussion points encompassed the role of interoperability, ethical deployment, public acceptance, and enabling infrastructure for expanding the use of drones beyond pilot projects. The session also highlighted how the DaaS approach fosters cross-sector collaboration and policy innovation to unlock the full societal value of UAV-enabled services.
The applied session, conducted by Vasilis Polychronos (GS), focused on educating participants about the current European regulatory framework for UAV operations, with particular emphasis on Standard Operational Procedures (SOPs) required for legal and safe deployment. Vasilis Polychronos elucidated the structure and requirements of EU drone regulation, including operator registration, airspace classification, BVLOS provisions, and risk assessment protocols. Drawing from the UC5 demonstration experience, he provided practical instances of how regulatory requirements were implemented on-site,

encompassing topics such as flight authorisations, safety protocols, and risk mitigation. The session also reviewed documentation procedures such as pre-flight checklists and compliance reporting. By bridging regulatory theory with real-world implementation, the session enhanced participants' comprehension of how to align UAV missions with European legal and operational standards.

3. The Four Tools

According to Paroutis et al. (2015) strategy tools can be defined as “concepts, models and methods employed by managers during strategy making”. Typically, different strategy tools are employed in different phases of the strategy process, which is divided in three phases: analysis, decision making and implementation (Johnson et al., 2017, p. 12; Lynch, 2015, p. 16). We identified four tools which are connected to different phases of the strategy process so to better serve the needs of the stakeholders: their links are portrayed in Figure 3.1. The calculation of the Concentration Index and the Six-Forces analysis are typical competitive analysis tools that enable the evaluation of the strategic positioning within an industry. The SWOT analysis support the consideration of which strategies can leverage on the strengths of a company and reduce its weaknesses in the context of the threats and opportunities of a competitive environment. Finally, the Triple Layered Business Model Canvas can be both connected to the decision making and to the Implementation phases as it a design tool that inform on how to design a good business model and how to make sure the different aspects are well orchestrated in its development.

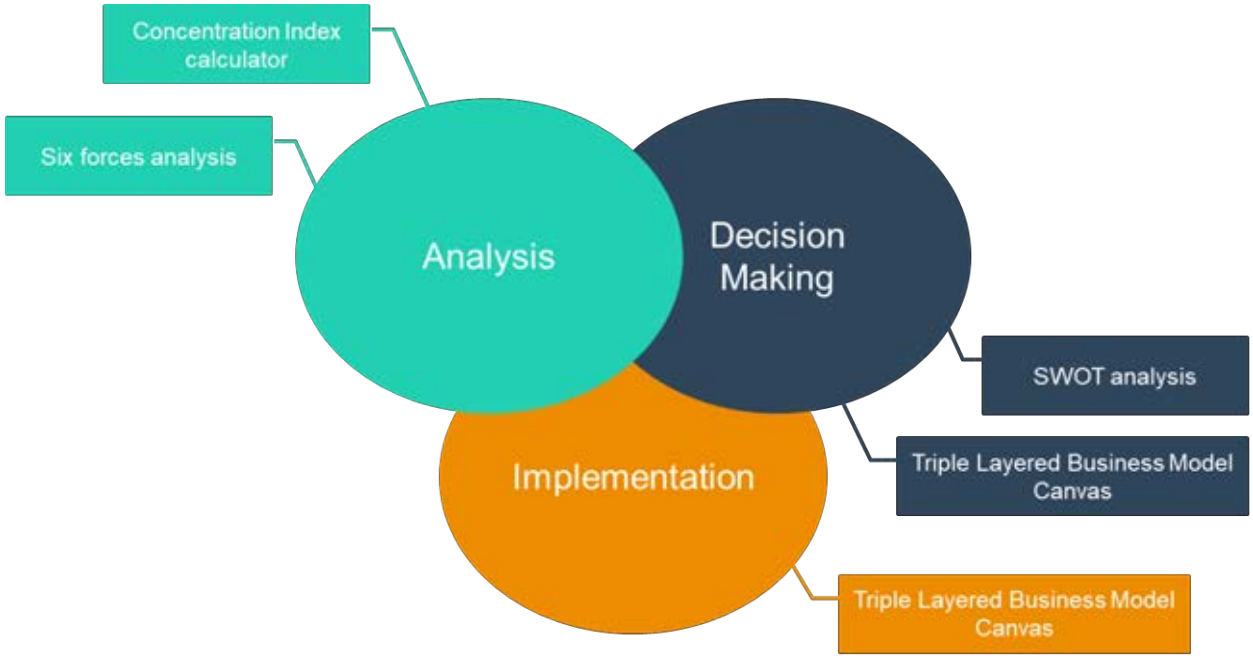


Figure 3.1: Link between the selected strategy tools and phases of the strategy process

Finally, a recent research reported that a sample of 46 managers confirmed that both the Six Forces analysis and the SWOT analysis are able to “divide areas up to provide a clear picture” (Wright et al., 2013).

3.1 Concentration Index Calculator

3.1.1 Purpose of the tool

It is possible to argue that the more competitors there are in an industry, the tougher the competition will be. This is not always true, however, because it depends on the competitors’ control of their market shares. **Market share** represents the proportion of total sales a company achieves within a particular industry over a specified period, typically one year. It indicates a company's relative size within that industry. Analysing market shares can provide valuable insights into the competitive dynamics that companies within the industry encounter.

To evaluate competition in an industry, two indexes can be calculated: the n-firm concentration ratio and the Herfindahl index. These indexes will also be used later to categorise industry types. Before starting the analysis, it is important to distinguish the revenue generated from the specific industry that is the focus of the analysis, especially if a company operates in more than one industry.

Concentration is not just an important aspect for understanding the behaviour of competitors in an industry but also for understanding how regulators might react upon a merger of two companies or an acquisition. The level of concentration of an industry is used by regulators to allocate industries among three broad categories (non-concentrated, moderately concentrated and highly concentrated), which indicate the need to act proactively in case of mergers and acquisitions which lead to increasing the levels of concentration above a threshold level and to potentially monopolistic industries. This is because, as it will be explained below, monopolies can lead to higher prices and lower product variety which both lower consumer welfare.

3.1.2 Data required

To calculate market shares, usually revenues from companies during a specific time (usually one year) are to be collected. Data can be collected from specialist data bases such as Osiris, searching for companies operating in the same industry or market.

Revenues may not always be a good measure for evaluating market shares. Think about the case of online search engines. A possible way to measure their market shares would be to count how many people open their web pages.

When calculating market shares it becomes then fundamental to identify the competitors: if the competition is global, international, national, regional or local. This depends on the industry and market. For instance, drone producers compete globally, whereas drone-based services are mostly local or regional.

3.1.2.1 Data of the global drone producers

As an example, Table 3.1 shows the markets shares of drone produces across the world (Statista, 2024).

Table 3.1: Market shares of drone producers in 2024

Company Name	Market share (%)
DJI	76
Autel	6
Other	4
Yuneec	4
Parrot	4
CARRERA	3
Holy Stone	3

3.1.3 Method

The n-firm concentration ratio is the sum of the number of largest market shares in an industry. For instance, concentration ratio 4 (CR4) is the sum of the largest four market shares in that industry, while CR6 is the sum of the largest six market shares in that industry. Industries are more concentrated and therefore CR4 or CR6 will have higher values when fewer firms account for the larger share of the market. The higher the concentration ratio, the more concentrated the industry, because a smaller number of firms control a larger share of the market.

An alternative to the n-firm concentration ratio is the Herfindahl index, also known as the Herfindahl–Hirschman Index, which is given by the following formula:

$$H = \sum_{i=1}^{N} x_i^2$$

x_i is the market share of the firm in the industry (i);
N is the number of firms in the industry.

A dedicated template has been developed for calculating the concentration ratio and Herfindahl–Hirschman Index.

3.1.4 Interpretation of results

According to the Antitrust Division of the US Department of Justice, a market with an H index lower than 0.1 is considered competitive, whereas if the H index is between 0.1 and 0.18, the market is considered moderately concentrated, and it is considered highly concentrated when the H index is higher than 0.18 (*Antitrust Division | Herfindahl-Hirschman Index*, 2015).
Table 3.2 below enables an interpretation of results emerging from the calculation of the Herfindahl–Hirschman Index, following the well-known interpretation of Besanko et al. (2013).

Table 3.2: Industry types and concentration indexes

H index	Number of firms	Type of industry	Intensity of competition	Entry barriers a nd exit barriers	Potential for product differentiation	Information flow
Typically, less than 0.2	Many firms	Perfect competition	Strong	No barriers	Scarce: commodity market	Good
Between 0.2 and 0.6	Few firms	Oligopoly	Strong or weak, based on rivalry among companies	Considera ble	Possible	Scarce
Between 0.2 and 0.6	2 firms	Duopoly	Strong or weak, based on rivalry between the two players	Considera ble	Possible	Scarce
More than 0.6	1 firm	Monopoly	Weak (but possible threat of entrants)	High	Possible	Scarce

Adapted from Besanko (2013) and Grant (2016)

The industry concentration can be used to define different industry types which range from a monopoly (in which only one firm operates within the industry) to perfect competition (an industry with many firms with equal market shares offering an undifferentiated product; Johnson et al., 2017, p. 76).

A **monopoly** is a condition where a single company operates with weak or no competition in its industry. Besanko et al. (2013, p. 176) consider that the cumulative market shares of the remaining companies in such an industry would be less than 40% and that competitors are unable to overtake the monopolist's shares by increasing their productive capacity or the demand for their products/services.
Operating without relevant competitors, a monopolist can optimise its profit, setting prices at a level that maximises the value capture from customers. The optimal position for a monopolist may result in less customer choice and higher prices than would be viable in a competitive industry. By contrast, customers will have less choice, pay higher prices and see their customer surplus reduced. In this situation some customers will decide not to buy the product because its price would be too high. This situation may have serious effects on industries that use the monopolist's products or services; think about the effect of concentration in steel production, for example. For these reasons, antitrust agencies try to combat the rise of monopolists, or to open existing monopolies to competitors.

In an **oligopoly**, a few firms compete in an industry that presents significant barriers to other companies wanting to join. There is potential for a variety of products to be available, and information availability will be imperfect, so customers would not be able to evaluate and compare products or services as would be the case, if there were perfect competition.

Firms in oligopolistic industries monitor each other's activities very closely – if one makes a move such as a price increase, the others will follow suit immediately. Their activities are therefore 'interdependent'.

A **duopoly** is a special case of oligopoly, with just two firms controlling the market, who can decide to collude in fixing the quantities of products or setting the prices. In this situation, the colluding companies will benefit from higher prices paid by customers, who have scarce opportunity to find the product from other sellers.

Perfect competition is a type of industry in which many firms offer homogeneous products or services to customers and information on prices, products and competitors is readily available. Other firms can easily enter the industry as there are no complex entry requirements. However, a company is unlikely to make more profits than the minimum required to survive. In this type of industry excess capacity may lead to a price war because if competitors try to gain market share by lowering their prices, then rivals can match or undercut that price to gain revenue by selling higher quantities.
If prices continue to fall, the unit price may come close to matching the average unit cost of the product/service, making it unprofitable to remain in the industry.
Perfect competition is a theoretical ideal, which assumes everyone knows everything and no one has the power to change anything. While this ideal does not occur in practice, competitive industries may tend towards perfect competition.
It is possible to argue that the more competitors there are in an industry, the tougher the competition will be. This is not always true, however, because it depends on the competitors' control of their market shares.

3.1.4.1 Findings and discussion of the drone market producers market shares

The screenshot reported in Figure 3.2 shows the outcomes of the analysis done with the tool developed to calculate the concentration indexes.

Company Number	Company Name	Market share	Squares			
1	DJI	76	0.5776		CR4	90%
2	Autel	6	0.0036		CR5	94%
3	Other	4	0.0016			
4	Yuneec	4	0.0016		H index	0.5878
5	Parrot	4	0.0016		HHI (agencies' version)	5878
6	CARRERA	3	0.0009		Numbers-equivalent companies	1.7
7	Holy Stone	3	0.0009			

Figure 3.2: Example of the use of the Concentration Index Calculator

The seven companies producing drones are listed on the left. They are ordered according to their market shares from the largest to the smallest: this is important to calculate the Concentration Ratio properly.
The CR4 shows that the first four players own most of the market. This is also confirmed by the H index which is almost .6 denoting a monopolistic market, which is quite evident considering the DJI market share (76%).

3.2 Six Forces Analysis

The Porter Five Forces model, developed by Michael Porter and first published in the Harvard Business Review in 1979, is a strategic analysis tool used to understand the competitive forces that shape every industry. The model identifies five key forces that determine the intensity of competition and the potential profitability within a market. The Six Forces model expands upon Porter's Five Forces framework by incorporating Grant's sixth force: the bargaining power of complements. This model examines the influence these forces exert on industry profitability and strategic positioning.
Figure 3.3 represents the six forces.

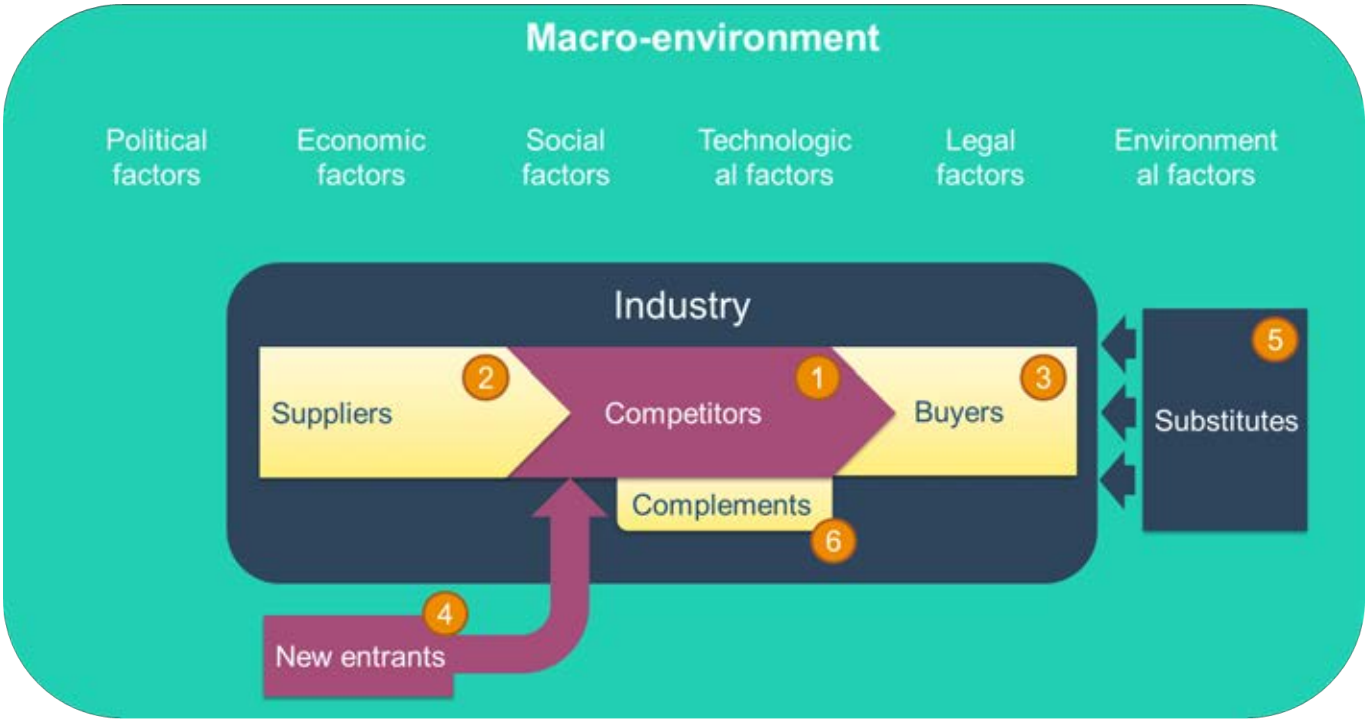


Figure 3.3: A representation of the six forces

3.2.1 Purpose of the tool

The primary elements of the model include suppliers, buyers, substitutes, new entrants, and industry rivalry, each representing a distinct competitive pressure. Grant's contribution—the power of complements—emphasises products or services that enhance the value of others.
It is vital to consider how businesses can leverage or counter these pressures to attain a competitive edge.

3.2.1.1 Force 1: Rivalry among existing firms

The factors influencing this force are:

- **Competitive industry type**: monopoly and oligopoly reduce rivalry.
- **Equal distribution of market shares**: a uniform distribution of market shares makes rivalry stronger, while the presence of competitors with larger market shares makes it difficult to challenge their position (Johnson et al., 2011, p. 59). An increase in the number of firms in an industry reduces the possibilities of collusion and increases the chances that a firm starts selling at lower prices (Grant, 2010, p. 74). Despite the idea that the exit of a competitor reduces price competition, and the entrance of a competitor could increase it, only a small effect of concentration on profitability has been proved (Schmalensee, 1989; Salinger, 1990).
- **Low or negative industry growth rate**. In some phases of the lifecycle of an industry, the rivalry is low because the industry is expanding. This happens in the development and growth phases of an industry lifecycle, whereas in the mature phase growth rate decreases, giving rise to stronger rivalry. This continues in the declining phase where the size of the industry reduces.
- **High fixed costs required to operate**. If the specific industry requires a high level of fixed costs, then firms will be incentivised to cover those costs by selling at discounted prices.
- **High exit barriers**. Exit barriers are all the factors that prevent a company from exiting an industry. If they are present, it would be more difficult to leave the industry, so competitors would rather engage in price wars.
- **The product is a commodity**. If it is not possible to differentiate the product, for instance, agricultural products such as corn, cocoa or soy, competition would be much tougher.
- **There is a high strategic stake in the industry**. If the industry has a particular strategic importance for competitors, not just for performances but because it is central for their reputation, then the rivalry will be higher, because competitors invest in developing new products/services.

3.2.1.2 Force 2: Bargaining power of suppliers

The factors influencing this force are:

- **Suppliers are concentrated**. The same impact of concentration of competitors applies to suppliers; however, in this case, competitive markets on the supply side are preferable to oligopolies or, even worse, monopolies. In non-competitive industries the prices of products or services are higher.
- **The switching costs are high**. If it is easy to change a supplier, then its bargaining power is limited. Some suppliers are so important that it is very hard to switch.
- **Information asymmetries**. These occur when there is a difference in the amount and quality of information held by the different parties to a transaction. There is a powerful source of advantage when one party, in this case the suppliers, has access to more (and potentially better) information than another, in this case the competitors in the industry. Therefore, the better informed the competitors of the industry are about the products they are buying and the suppliers they are buying from, the better their relative bargaining.
- **Suppliers pose a competition threat**. In some cases, a supplier can decide to enter the competition in the industry it is serving (the industry is the one which buys from the supplier).
- **Suppliers offer a highly differentiated product or service difficult to find on the market**. It is the condition of some specialised engineering services or of some legal services focused on specific domains, expertise and countries.
- **The cost of the product or service offered by a category of suppliers accounts for a considerable percentage of the cost of the product or service offered by the firm**.

3.2.1.3 Force 3: Bargaining power of buyers

The factors influencing this force are:

- **Buyers are concentrated**. The bargaining power of buyers is reduced when there are many. Remember that here buyers are not necessarily clients of the company under consideration. When buyers in an industry are few, it means they control large parts of the market shares. This means that they can negotiate prices from a strong position, while the presence of a high number of buyers makes them less important in terms of relative market shares. In this case buyers may lose strength in negotiating prices, becoming price-takers.
- **Switching costs of buyers are low**. Buyers can easily change from one competitor to another. This becomes especially true as a dominant design diffuses in an industry: this causes the diffusion of products or services that are quite like each other and results that are interchangeable to buyers.
- **Information asymmetries**. Buyers have difficulties in evaluating and comparing the products and services offered by the competitors in the industry. This could be due to the complexity of the product or its specialistic nature (e.g. an advanced medical treatment or a specific legal consult). One effect of the internet has been to improve buyers' access to information on product and service features and prices, enhancing information transparency and enabling **disintermediation**.
- **Buyers pose a competition threat**
- **Buyers consider the product a commodity and are more price-sensitive**. If the product or service offered by competitors is less differentiated and like a commodity
- **Buyers are price-sensitive because the product or service represents a large proportion of their costs**.

3.2.1.4 Force 4: Threat of new entrants

Industries are impacted by the threat of new entrants based on the presence of entry barriers. High barriers may prevent new entrants from joining an industry, even if it appears attractive. The types of entry barriers are depicted in Figure 3.4.

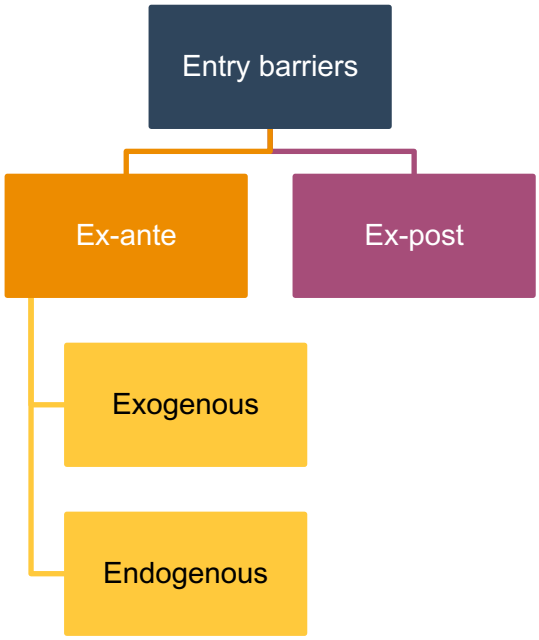


Figure 3.4: Types of entry barriers

- **Exogenous barriers**:
  - **Investments in fixed assets** (e.g. plants, equipment). This barrier is not strong if competitors in the industry have not reached large scale production. In this case a new entrant would not need a big investment and the industry would probably be in the development or growth stage. It is important to note that to enter an industry which has already reached a large scale, a new entrant would have two choices: a) make a large investment with the risk of not using all the capacity (e.g. not selling all the flight tickets on its new large aircraft); (b) enter with a smaller investment, resulting in higher unit costs.
  - **Barriers posed by governments** such as licences, taxes or authorisations. This is particularly true in some regulated industries, such as banking and telecommunications.
  - **Legal barriers**. Copyrights and patents may constitute a barrier to enter an industry.
- **Endogenous barriers**
  - **Investments in research and development** to improve the product/service, to reinforce loyalty of buyers. Adding new features will accustom buyers to expect them and raise the barriers for a new entrant because customers will already have sophisticated demands.
  - **Investments in marketing to create a large base of loyal customers**. This barrier is very important when buyers have low switching costs. It is also important when there are considerable network effects, which are the positive effects on the value of goods or services given by the increased numbers of people or participants using them: a large base of customers will not be likely to move to the new entrant because they benefit from the network effect.
  - **Experience developed by incumbents**. If competitors have produced many units of a product or delivered the same service many times, they would have learned how to optimise the process of production or the routines needed to produce the product or deliver the service. This would mean that their unit costs would be lower.
  - **Control of supply and/or distribution channels**. Incumbents can reduce the threat of new entrants acquiring the control of suppliers of the industry or of some distribution channels to prohibit the new entrant to have access to buyers.
  - **Further investments to reach a larger scale**. Incumbents could have invested in enlarging the scale of their operations (e.g. plant) to make the industry less attractive.

- **Further investments in developing experience**. Incumbents could have increased their experience by producing more products to benefit from the knowledge developed and to streamline their production processes.

- **Ex-post barriers:**
  - **Ex-post barriers are related to competitors' reputation for behaving aggressively with new entrants**. Ex-post barriers are threats and not actual barriers. Incumbents can look accommodating, because the industry is growing and they are not interested in the new player. Nevertheless, if the industry is mature or in decline, the incumbent could behave more aggressively to defend their market shares and initiate retaliation practices. These actions could include:
  - **Introducing predatory pricing**: initiating a price-war, incumbents would lower their prices to a level below the costs sustained by new entrants. This can be done by further investments in expanding the scale.
  - **Tightening control on supply or distribution channels**.
  - **Initiating litigation**: incumbents could react aggressively to new entrants by initiating a legal dispute on patent or copyright infringement. This behaviour forces the new entrant to invest energies in defending from allegations and freeze financial resources in case of loss.

3.2.1.5 Force 5: Threat of substitutes

Substitutes limit the potential of an industry by placing a ceiling on the prices that can be charged. To define substitutes, it is important to be clear about the difference between 'industries' and 'markets'. A market groups together firms whose products are close substitutes from the buyer's perspective: the consumer feels that they can switch from one to the other easily. In contrast, an industry refers to product groups that are close substitutes from the producer's viewpoint.

So, for close substitute products, if the price of product A increases then it is reasonable to expect that customers will turn to the product they consider a substitute (product B), increasing its demand.

The **propensity of customers to substitute** a product/service with another determines the threat of substitutes. For example, consider the various ways to capture aerial footage - drones are often favoured over helicopter rentals due to their affordability and ease of use. Although both methods provide aerial photography, customers perceive drones as a better substitute due to their lower costs and convenience.

The **degree of substitutes' threat** is high when the ratio price/performance in the view of the customer is perceived as better for the substitute product.

3.2.1.6 Force 6: Bargaining power of complements

Complements are the sixth force missing in the five-forces model proposed by Porter (1980).

Product A can be considered the complement of a product B if an increase in sales in product A generates an increase of sales in product B (Giarratana, 2013, p. 19) – they help each other's sales. In other words, customers consider that the value of product B is higher when offered with product A (Brandenburger and Nalebuff, 1995).

The organisation that sells a complement is called the complementor.

The complementors acquire bargaining power when:

- They create a monopoly by making their complement the only product required, with control on its supply. For instance, consider drones equipped with specific software for aerial mapping. If this software is unique and proprietary, drone manufacturers who control its supply can gain significant bargaining power. The customers are then dependent on both the drone and the specific software, creating a monopoly where the complementors dictate terms.
- They make the product a commodity, easily substitutable among competitors. For example, consider drones equipped with cameras for aerial photography. Various manufacturers produce drones, and the user may prioritize the drone's camera functionality over the drone itself. Thus, if one drone offers better image quality or additional features at a similar price point, it becomes more desirable, and the user may substitute their current drone with the new option.

3.2.2 Data required

Being a qualitative analysis, the six-forces analysis benefits from multiple data sources. A combination of the following sources can widen the input. The quality of each source should be assessed in terms of currency and reliability.

1. **Industry Reports and Publications**:
    - **Market research reports**: These provide detailed insights into industry trends, competitive landscape, and market dynamics.
    - **Trade journals**: Industry-specific publications often contain valuable information on market conditions and competitive strategies.
2. **Government Databases**:
    - **Economic and industry statistics**: Government agencies often publish data on industry performance, growth rates, and market size.
    - **Regulatory information**: Details on regulations and policies affecting the industry.
3. **Company Financial Reports**:
    - **Annual reports**: These provide information on a company's financial health, competitive strategies, and market position.
    - **SEC filings**: Documents like 10-K and 10-Q reports offer detailed financial and operational data.
4. **Market Intelligence Platforms**:
    - **Subscription-based services**: Platforms like IBISWorld, Statista, and MarketLine offer comprehensive industry analysis and data.
    - **Business databases**: Tools like Bloomberg and Thomson Reuters provide real-time market data and analysis.
5. **Academic Research**:
    - **Scholarly articles**: Research papers and case studies can offer in-depth analysis and theoretical insights into industry dynamics.
    - **University publications**: Many universities publish research on industry trends and competitive strategies.
6. **Interviews and Surveys**:
    - **Expert interviews**: Speaking with industry experts can provide qualitative insights and firsthand perspectives.
    - **Customer surveys**: Gathering data directly from customers can help understand buyer power and preferences.
7. **Competitive Intelligence**:
    - **Competitor websites and press releases**: Monitoring competitors' activities and announcements can provide insights into their strategies and market moves.
    - **Social media and news outlets**: Tracking industry news and social media trends can offer real-time information on market conditions.

3.2.3 Method

The model facilitates the assessment of the attractiveness of an industry. The following steps should be undertaken:

Step 1. Define the industry

An industry can be defined as a group of companies offering products or services that are close substitutes for each other – that is, products or services that satisfy the same basic customer needs.
(Hill et al., 2014, p. 44; emphasis in original)

To define an industry, consider answering these two questions derived from Porter (2008, p. 91):

- Scope of products or services: which products or services are provided?
- Scope of the industry: is the competition local, national, regional (international or continental) or global?

Step 2. Identify the forces operating in the industry (determine who the buyers and suppliers are, etc.), and ascertain their strength and the underlying reasons for that (i.e. explain why the force is strong, medium, or weak). To do this, the next six subparagraphs present the checklists that enable to evaluate if a force is strong medium or week.
Step 3. Evaluate how the six forces influence the level of profitability of the industry.
Step 4. Assess the general attractiveness of the industry to incumbents and potential entrants.
Step 5. Evaluate possible changes in the six forces and how they might be influenced by competitors, new entrants, or the analysed company.

A PowerPoint template was developed to showcase the analysis, as reported in the screenshot in Figure 3.5.

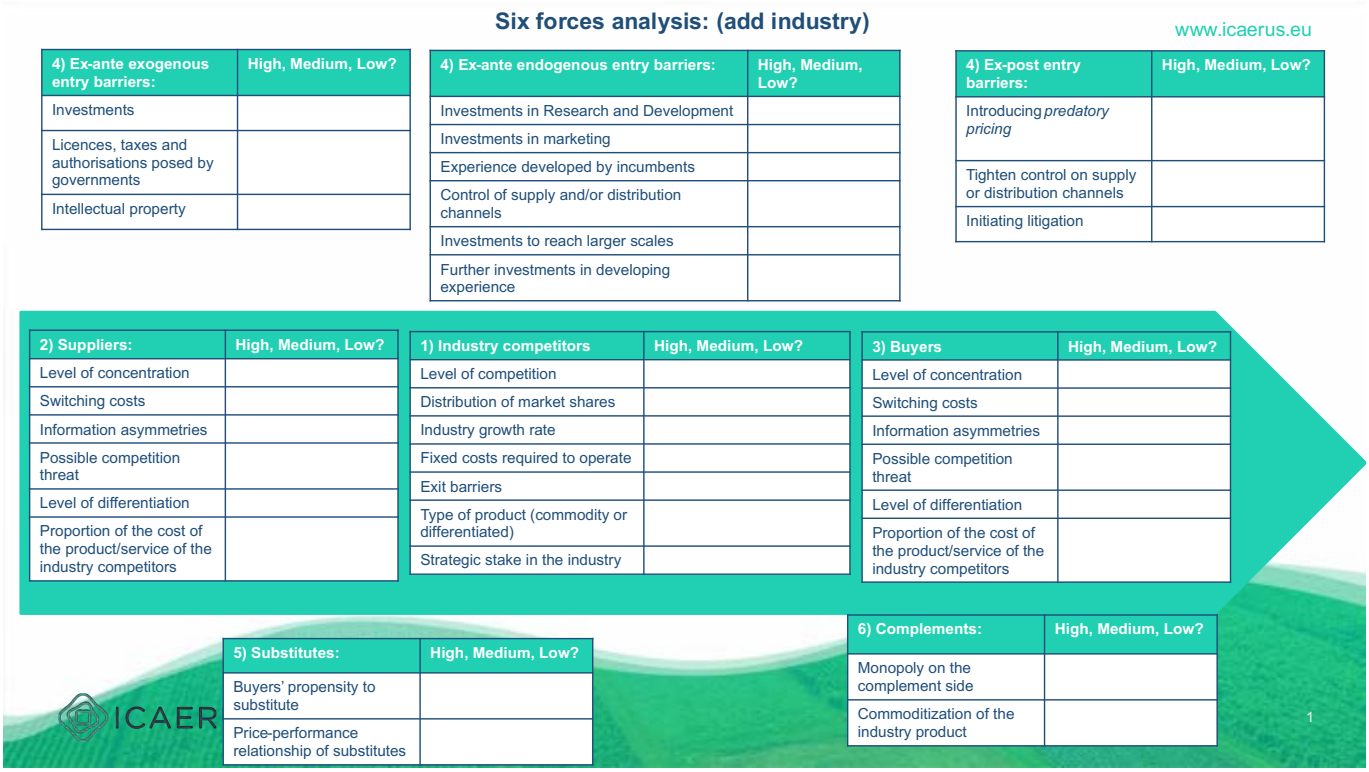


Figure 3.5: Template of the six-forces analysis

3.2.4 Interpretation of results

The results from a six-forces analysis refer to the attractiveness of an industry for an existing competitor and for a potential entrant. A simple example has been developed for the industry of crop disease detection of plants in the Italian market (see Figure 3.6).

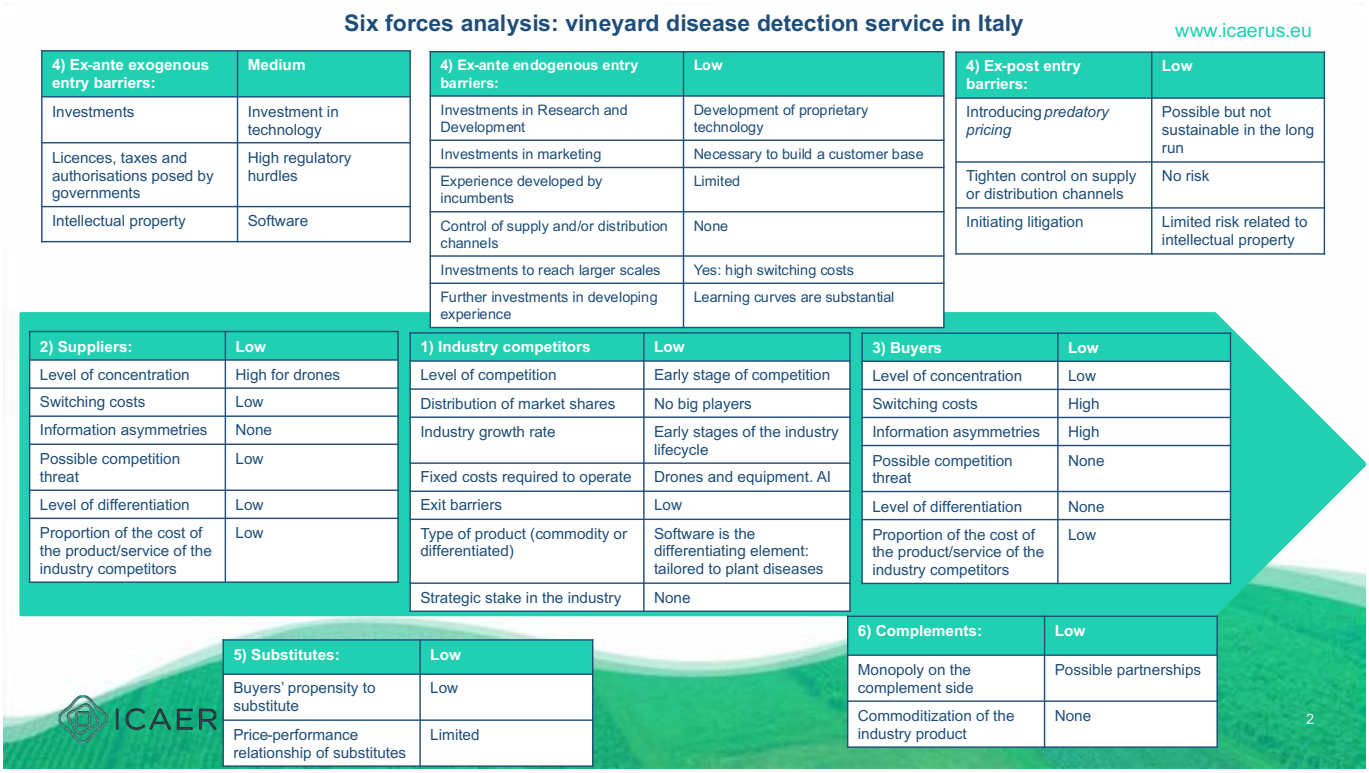


Figure 3.6: Example of application of the template for the six-forces analysis

The application of the template serves to elicit a reflection on each of the points listed in the tables, as shown in the example below.

Industry Rivalry

The competitive landscape for plant disease detection services in Italy includes various players offering advanced diagnostic tools and services. The industry is growing due to increasing demand for precision agriculture and sustainable farming practices. Companies differentiate themselves through technological advancements and specialized applications tailored to specific plant diseases, making the market competitive but with room for innovation and specialization.

Bargaining Power of Suppliers

The industry relies on a limited number of suppliers for specialized components like diagnostic kits and laboratory equipment. This concentration can increase supplier power, as they offer unique and technologically advanced products critical for the performance and differentiation of plant disease detection services. Low switching costs relate to the drone equipment.

Bargaining Power of Buyers

The market for plant disease detection services includes various sectors such as agriculture, horticulture, and forestry. Buyers are sensitive to price, especially in sectors like agriculture where cost efficiency is crucial. The availability of alternatives like traditional scouting methods and visual inspections can influence buyer power, although advanced diagnostic services offer significant advantages in accuracy and precision.

Threat of New Entrants

High regulatory hurdles and substantial capital requirements pose significant barriers to entry for new players in the plant disease detection service industry. Obtaining permits for diagnostic services and compliance with safety regulations can be time-consuming and costly. Established companies have built

strong reputations and customer loyalty, making it challenging for new entrants to gain market share and compete effectively.

Threat of Substitutes

Traditional methods such as manual scouting and visual inspections can serve as substitutes for plant disease detection services. While advanced diagnostic services offer advantages in terms of accuracy, speed, and precision, substitutes may still be preferred for certain applications due to established reliability. Switching to advanced diagnostic services from traditional methods involves costs related to training, equipment, and integration, which can affect adoption rates.

Complementors

Collaborations with research institutes can enhance diagnostic capabilities and credibility. Partnerships with companies like, which offer molecular diagnostics and pest detection, provide complementary services that can broaden the scope and effectiveness of plant disease detection. Working with agricultural universities can facilitate access to cutting-edge research and development in plant pathology, further strengthening the service offerings.

3.3 SWOT Analysis

3.3.1 Purpose of the tool

SWOT stands for strengths, weaknesses, opportunities, and threats. An analysis of these elements provides an organisation with an overview of its position in relation to its external and internal environments. The strengths and weaknesses of a business arise from its internal environment, encompassing resources and their utilisation, structure, culture, and the various business functions. Conversely, the opportunities and threats stem from the external environment. The decision on which strengths to build upon and which weaknesses to minimise is influenced by the impact of opportunities and threats from the external environment. Once the external influences on a business are identified, they can be judged as either threats or opportunities and subsequently dealt with or capitalised upon, as appropriate.

3.3.1.1 Strengths

A strength is a competence, a valuable resource, or any positive attribute that an organisation utilises to exploit opportunities or counter threats arising from the external environment. Strengths may include resources such as a well-motivated and skilled workforce with a low turnover rate or an attribute such as a strongly established brand image or reputation. Strengths, as well as weaknesses, are intrinsic to an organisation, meaning they are not universally shared by all businesses within an industry. For some organisations, a particular feature can be a strength, while for others, it might be a weakness. For instance, a well-established and loyal customer base can be a strength in a stable market but a weakness if those customers are reluctant to try new products, thereby inhibiting innovation.

3.3.1.2 Weaknesses

A weakness is the absence of a competence, resource, or attribute that an organisation requires to exploit opportunities, counter threats, or outperform its competitors. Reliance on outdated products or processes can be a weakness if the market demands product innovation or new processes are necessary for more efficient production of goods or services. Examples of weaknesses include a lack of skilled employees, insufficient knowledge of customer preferences, financial resource deficits, cash-flow problems, and obsolete machinery. Certain factors, such as a lack of funds, are typically considered weaknesses in any organisation, be it a business, public sector, or voluntary organisation. However, some aspects can be weaknesses in certain contexts but strengths in others. For example, a long-standing, experienced workforce can be a weakness if it implies resistance to learning new skills and change; conversely, it can

be a strength if their experience is essential for producing complex goods or dealing with long-standing customers.

3.3.1.3 Opportunities

Opportunities are prospects in the external environment that an organisation might utilise to gain advantages. Opportunities can arise from any aspect of the external environment. For example, the advent and rapid proliferation of mobile telephony have created opportunities not only for businesses involved in manufacturing and selling mobile phones and providing mobile telephony services but also for numerous other organisations that can leverage this new technology to communicate with their customers and other stakeholders.

For instance, educational institutions now utilise mobile phones to communicate with students and deliver learning materials via platforms like OpenLearn, Coursera and edX. Another example is the recent advancements and investments in the space industry, which have provided opportunities for numerous global companies to establish partnerships with space agencies and attract new markets, such as satellite communications and space tourism. In the drone industry, firms such as DJI have capitalised on technological advancements to dominate the market with innovative consumer and professional drones, thereby exploiting the growing demand for aerial photography and videography.

3.3.1.4 Threats

Threats have the potential to adversely affect an organisation's performance. These often originate from competitors or other factors beyond the organisation's control. Competitors might lower the prices of similar products or services or introduce new, technologically advanced products or enhanced customer service. Threats may also arise from various external environmental factors, such as legislative changes, taxation modifications, technological advancements that an organisation struggles to adopt, natural resource shortages, and adverse weather events due to environmental issues. Threats from the external environment can pose a direct risk to the wellbeing or survival of an organisation, but they may also hinder its ability to capitalise on opportunities. For example, if a business plans to develop a new product based on emerging technology but a competitor introduces it first, the opportunity becomes less attractive. In the context of drone companies, regulatory changes might threaten operations by imposing stricter controls and limitations on drone usage, impacting DJI and other firms' ability to expand their market reach.

3.3.2 Data required

To conduct a SWOT analysis effectively, accurate and comprehensive data must be gathered from both internal and external sources.

Externally, data should be collected on market trends, competitor analysis, regulatory changes, technological advancements, and broader economic conditions. Staying informed about political, social, and environmental factors that could impact the business is also essential. This external data helps identify potential opportunities and threats that the organisation could leverage or need to mitigate.

Key internal data includes information on the organisation's resources, capabilities, and current performance metrics. This encompasses financial statements, workforce skills assessments, inventory levels, production capabilities, and operational efficiency records. Additionally, customer feedback, sales data, and market share reports are crucial in understanding the organisation's strengths and weaknesses.

3.3.3 Application method

The most basic SWOT analysis will examine how threats and opportunities can be addressed while enabling the organisation to leverage its strengths and weaknesses to achieve its objectives. This can be achieved through lists of strengths, weaknesses, opportunities, and threats. Such lists should be concise and specific, highlighting key and significant issues. A fundamental SWOT analysis includes an assessment of the organisation's current situation and its aspirations for the future, with the timeframe varying from a few months to several years, depending on the organisation's business and current status.

A more sophisticated approach to conducting a SWOT analysis involves considering strengths, weaknesses, opportunities, and threats concerning key business functions. These functions include

marketing, operations, human resources, accounting, finance, and occasionally information management. For instance, drone companies like DJI may identify strengths in their advanced engineering capabilities, weaknesses in regulatory compliance, opportunities in expanding into new geographical markets, and threats from competitors and regulatory changes.

3.3.4 Interpretation of results

An example of a generic SWOT analysis is reported in Figure 3.7, referring to a hypothetical company providing vineyard disease detection in Southern Europe named VineFly.

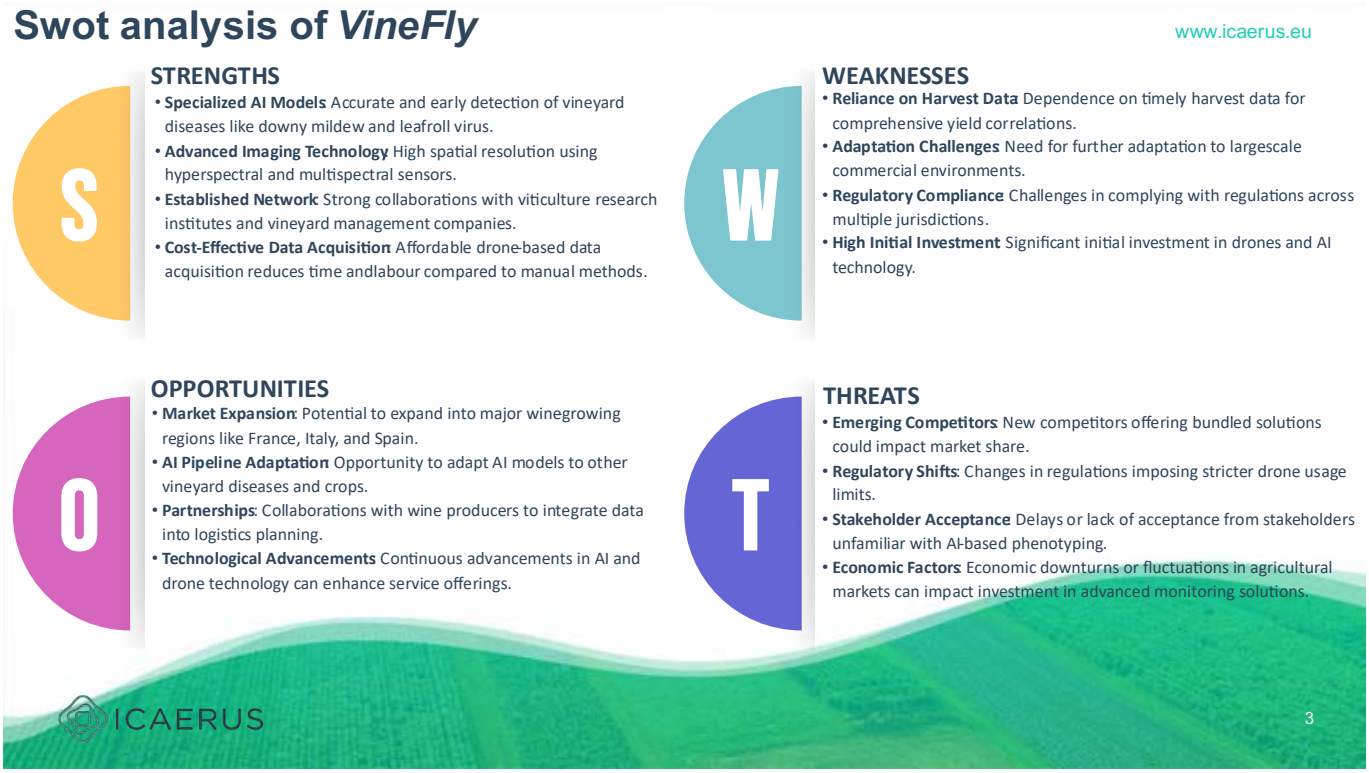


Figure 3.7: Example of SWOT analysis using the template designed for ICAERUS project

3.4 Triple Layered Business Model Canvas

The Triple Layered Business Model Canvas (TLBMC) is a Business Model Tool for depicting sustainable business models. Its innovation lies in the fact that it adds two (2) additional layers (after the *economic layer)*: an environmental layer and a social layer. Interaction patterns emerge within each layer of the Tool but also emerge between the layers. The result is that, when all layers are considered together, the TLBMC is far more efficient in depicting how a Business Model may generate different values across the three dimensions – *economic, social & environmental.* The TLBMC was introduced by Joyce and Paquin (2016) with the purpose of coming up with a business model tool that, when represented visually, would immediately convey an all-rounded and holistic interpretation of a Business Model.

3.4.1 The Layers

"As a tool, the TLBMC bridges business model innovation and sustainable business model development to support individuals and organizations in creatively and holistically seeking competitive sustainability-oriented change as a way to address the challenges facing us today" (Joyce & Paquin, 2016)

3.4.1.1 The economic layer

The TLBMC builds upon the original Business Model Canvas (Osterwalder et al., 2010), considering the nine (9), interconnected components of the Canvas: Value Proposition, Customer Relationship, Channels, Key Resources, Key Activities, Partners, Costs and Revenues. The BMC was explored, amongst other BMTs, in ***D5.7 Inclusive Business & Governance Models Report (A)*** and the BMC's ability to explore the intricacies of a Business Model have been established. It was decided that the triple layer business model will be used for the Use Cases and the Open Call Trials, and as such business model exploration will not be pursued here.

The Business Model Canvas is a Business Model Tool, i.e. it is a visual chart with elements describing a company's or product's value proposition, customers, infrastructure including its partnerships, and financial aspects. It has been widely adopted in practice for designing business models (Osterwalder et al., 2010). However, it follows an organization-centric approach that renders the model from the perspective of a single company, as opposed to a network-centric view (Turber et al., 2015). It focuses on the processes controlled by the focal company and pays less attention to the customers' active role in value co-creation. A particular characteristic of the Business Model Canvas is that Osterwalder and Pigneur, who invented it, insisted that the Business Model Canvas should always be a one-page document. The main reason for this is that the Business Model Canvas, being a Tool, should bear a single, robust message: how to implement the strategy of the Business Model. Another reason is that Osterwalder advised the use of graphical icons in business modelling as much as possible (Prabhu et al., 2013) for the message to be pithy and succinct, as shown in Figure 3.8.

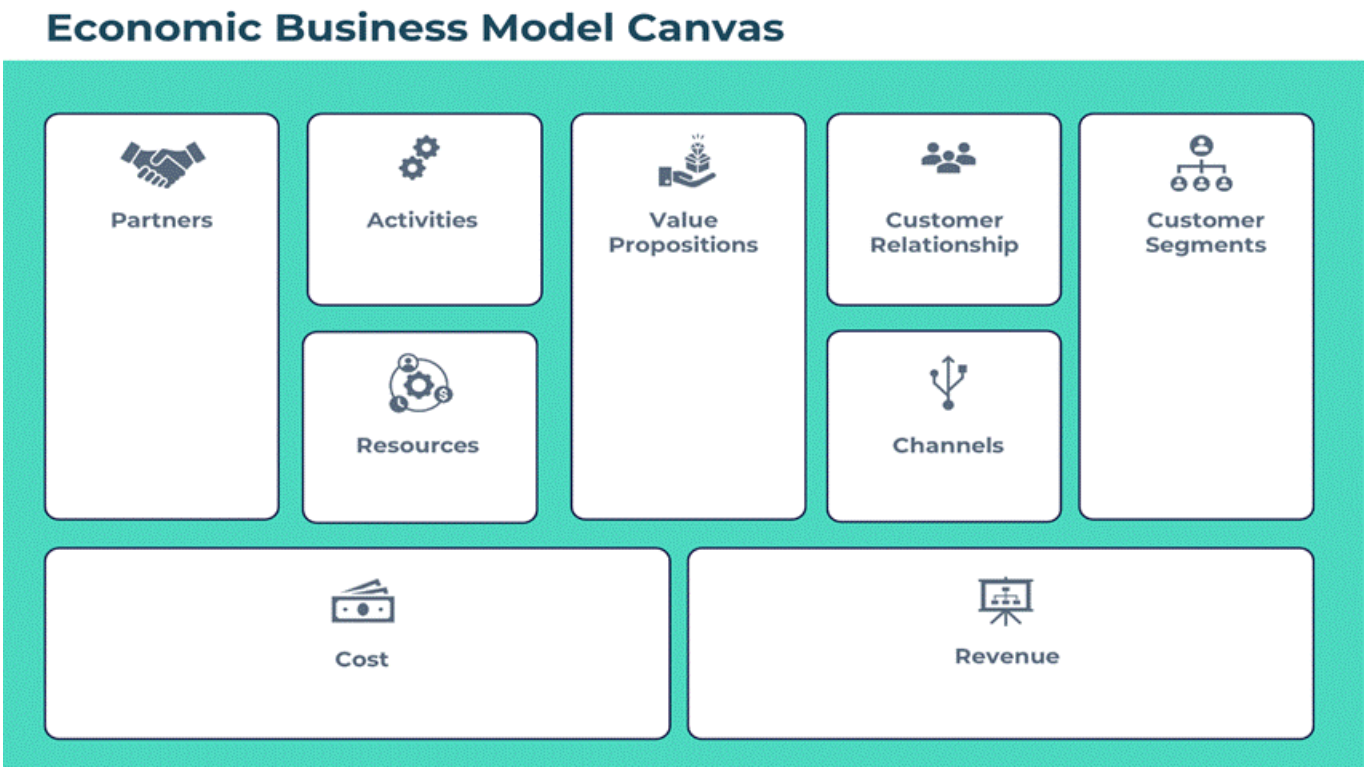


Figure 3.8: The Triple Layered Business Model Canvas: The Economic Layer

The Business Model Canvas, understandably, incorporates the nine (9) building blocks: value proposition, partner networks, customer segment, customer relationship, channel, key resources, activities, revenue streams, and cost structure (Osterwalder et al., 2010). A brief explanation of each block, which is generic and can be found easily through numerous online sources, is presented below:

1. **Key activities:** The most important activities in executing a company's (or, in the case of the Project, a use case's) value proposition.

2. **Key resources:** The resources that are necessary to create value for the customer. They are considered assets to a company (or, in the case of the ICAERUS, the Partnership) that are needed to sustain and support the business. These resources could be human, financial, physical and intellectual.
3. **Key networks:** To optimise operations and reduce risks of a business model, organisations usually cultivate buyer-supplier relationships so they can focus on their core activity. In the case of ICAERUS such networks are expected to emerge from the networks of each participating partner, but also from networking activities undertaken by the implementation effort itself.
4. **Value propositions:** Services a business (or, in the case of the Project, an economic actor in general) offers to meet the needs of its customers. The value proposition provides value through various elements such as newness, performance, customization, "getting the job done", design, brand/status, price, cost reduction, risk reduction, accessibility, and convenience/usability. The Project's use case results should be at the core of the value proposition.
5. **Customer segments:** To build an effective business model, any economic actor offering a service must identify which customers it tries to serve. ICAERUS' use cases will provide a point of direction for this building block, but it is also the main task of the Business Model to determine potential customer segments for its use cases.
6. **Channels:** ICAERUS can deliver its value proposition to its targeted customers through different channels. Effective channels will distribute the value proposition in ways that are fast, efficient and cost-effective. In the case of ICAERUS, the value proposition can reach potential clients through channels developed during the project's lifetime (store front), partner channels (major distributors), or a combination of both.
7. **Customer relationships:** To ensure the survival and success of any business endeavour, responsible Project Partners will have to specify the type of relationship they want to create with their identified customer segments. In the case of the Project, that element should address two critical steps of a customer's relationship: How the emergent business opportunity will get customers and how it will keep customers purchasing or using its services.
8. **Cost structure:** This describes the most important monetary consequences while operating under different business models. The cost structure can be cost-driven and value-driven. Given that costs are absorbed in the case of the Project through its funding, the cost structure is expected to be value driven.
9. **Revenue streams:** The way the potential business opportunity is expected to generate income from each customer segment. This building block is expected to be further elaborated upon further in the analysis.

In conclusion, the Business Model Canvas is a Business Model Tool which has met with wide acceptance from the business community and beyond. Its plasticity has rendered it immensely popular amongst other Business Model Tools and its robustness has solidified its reputation as a valid tool for Business Model implementation.

TLBMC makes use of the BMC because it accepts that Osterwalder & Pigneur's Tool allowed for some sustainability elements to be considered during the development of a business model, however the Canvas was found to be more profit-centric, with the environmental or social aspects giving way to a "profit-first" approach. To elaborate further, if a Business Model wanted to emphasize the social or environmental aspect of developing a (sustainable) business model the BMC was deemed a limited tool for the task and a new Tool would need to be employed (e.g. the Sustainable Business Model Canvas). The TLBMC, however, aspires to achieve more than that and give the user the freedom to explore a sustainable or sustainable-oriented business model in a more creative way, than other available BMTs. Osterwalder and Pigneur's BMC is utilised, of course, and its functionality is maximized by employing the model solely on

the economic aspect of the value proposition. This liberates the BMC from having to depict environmental and social benefits of the business model, since these are taken care of by the other two (2) layers.
To make everything work together, the TLBMC allows the business model to be depicted using ***a triple bottom line (TBL)***, where each canvas layer is dedicated to single dimension and together they provide the means to integrate pattern interactions across layers. The TBL approach allows for business model actors to consider *formally* (i.e. by a standardized method) their economic, environmental and social impact (Savitz & Weber, 2014).

3.4.1.2 The environmental layer

The environmental layer of the TLBMC builds the Business Model (Figure 3.9) uses a life cycle approach of environmental impact and it is based on Life Cycle Assessment (LCA) for measuring a service's environmental impact overall. By utilizing LCA approach with business innovation a service's innovation can be explored with environmental characteristics in mind, in contrast to more traditional business innovations.

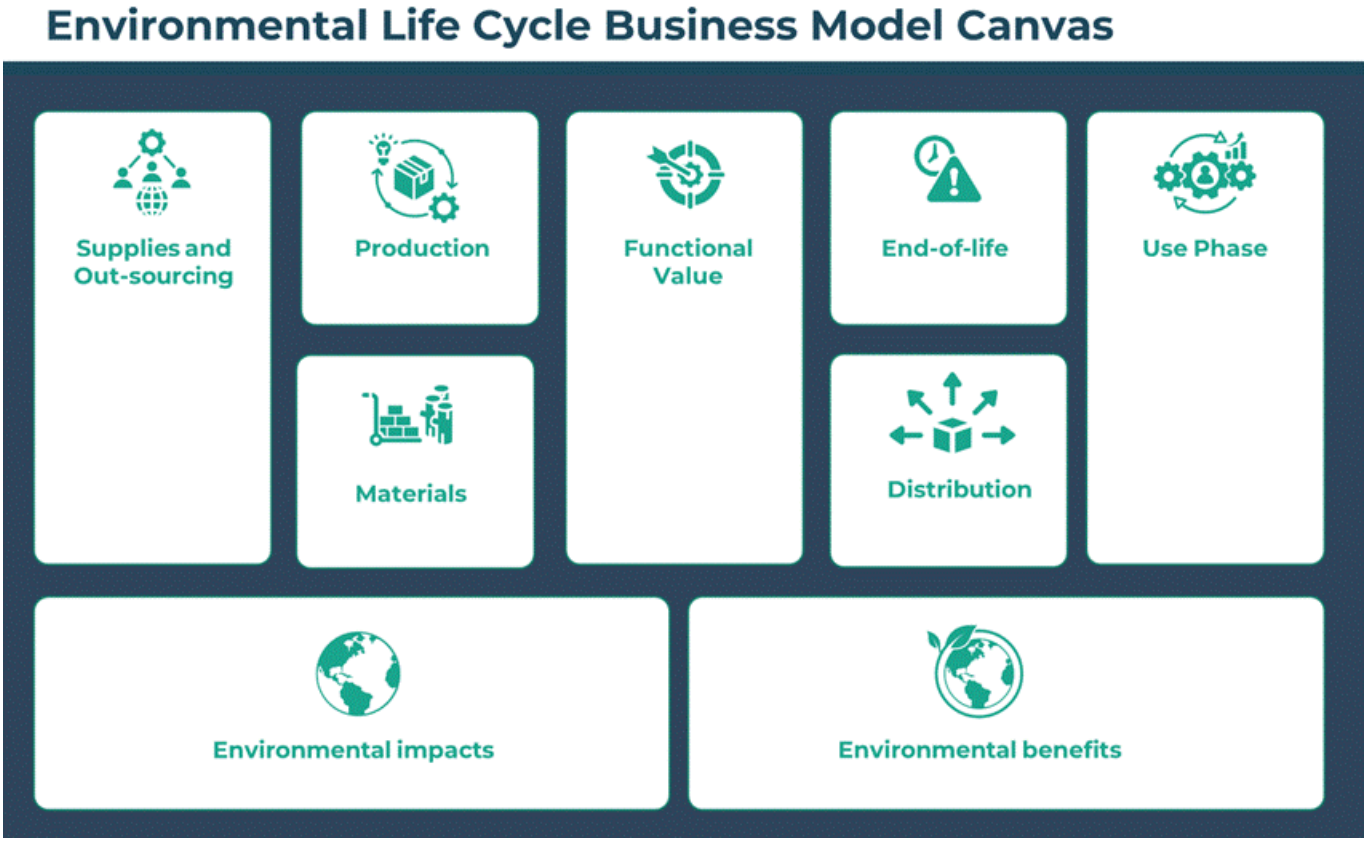


Figure 3.9: The Triple Layered Business Model Canvas: The Environmental Layer

The logic behind the Canvas remains much the same: just as BMC is depicting how potential earnings outweigh costs the environmental layer of the TLBMC attempts to ascertain how the business model can incur more environmental benefits than impacts. Employing the LCA approach referenced above the nine (9) components of the environmental layer of the TLBMC are briefly explained below:

1. **Functional Value:** The functional value models a service's functional unit in LCA (given that our interest is focused on ICAERUS' use cases, other considerations of the functional value are of no interest).
2. **Materials:** Materials are, of course, the environmental counterpart of BMC's *Key Resources* element. As it can be impractical, or simply unfeasible, to introduce all key resources into the economic layer so it can be equal impractical to include all physical material in this element. However, the intend is to include those key materials that bare the most environmental impact.

3. **Production:** The production element of the environmental layer of the TLBMC is the environmental counterpart of the *Key Activities* of the economic layer. In the case of ICAERUS' use cases such data will be made available through the experimentation process and would scrutinize how each use case promotes the environmental footprint of the service generation process. Again, the issue here is not to populate the element with extraneous data but to distil the information and depict those Production activities with the most environmental impact.
4. **Supplies and outsourcing:** The environmental counterpart to the economic layer's "Partners", Supplies and Outsourcing, it includes all Production and Material activities that may be necessary to produce the functional value, but are not integral for the implementation of the use case, in the case of ICAERUS.
5. **Distribution:** Following the BMC element-by-element, distribution involves the environmental counterpart of the *Channels component.* In case of ICAERUS' use cases this could potentially involve logistics regarding the assembling of drones etc.
6. **Use phase:** *Use phase* deals with the environmental impact of the Business Model's functional value; the element may include maintenance and other similar considerations.
7. **End-of-life:** *End-of-life* deals with repurposing or reusing *Material* or *Production elements.* In the case of ICAERUS use case's things to consider could be drone batteries, other addons etc. Admittedly, the line between *Production* and *End-of-life* can become blurry, it should be looked upon as the business model attempt to consider environmental impact of its innovations beyond the scope of service development.
8. **Environmental Impacts:** The *Environmental Impacts* element incorporates all ecological costs associated with the Business Model. While in BMC this element is usually reserved for financial costs, in the environmental layer it may be related with CO_2 emissions, resource depletion or misuse etc. ICAERUS' use cases are already producing raw data on the issue, for example the Crop Spraying use case calculates dispersion patterns in accordance to viscosity etc.
9. **Environmental Benefits:** The *Environmental Benefits* elements is, of course, the environmental counterpart to *Revenue,* extending the concept of value creation beyond the strictly financial. In essence, this element provides the opportunity for the Business Model developer to reduce negative or increase positive impact by exploring potential environmental innovations.

As mentioned, the environmental layer is meant to provide a comprehensive outlook on the environmental innovation of a business model, to explore more in-depth environmental concerns and provide the opportunity, through vertical pattern interactions, to align sustainability efforts across the whole business model.

3.4.1.3 The Social Layer

The social layer of the TLBMC is meant to present the opportunity for a dedicated depiction of how Business Model elements interact with all potential stakeholders of the value proposition (Figure 3.10). As was explored in 2.1.2 & in 4.1.2, when a business model addresses sustainability concerns or when the business model of choice becomes the sustainable business model then there is an increased need to identify how all stakeholder groups interact with all elements of the BMC. The Social Layer of the TLBMC brings into focus these key social impacts that come out of the relationships with the stakeholder groups. At the same time the social layer acts as a ***thorough and exhaustive tool to develop and design ICAERUS UCs governance models.***

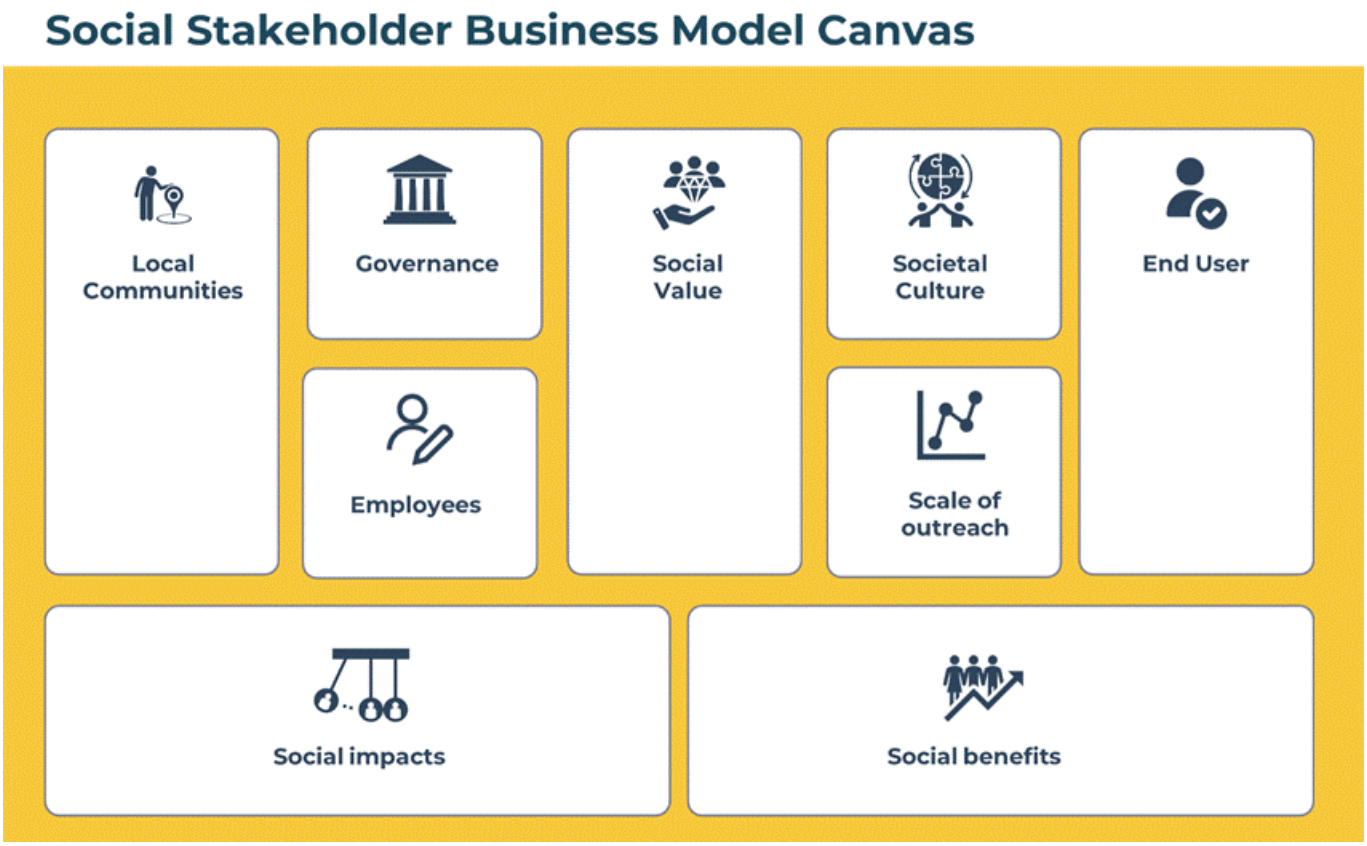


Figure 3.10: The Triple Layered Business Model Canvas: The Social Layer

As with the environmental layer the social layer retains the nine (9) element outlook of the economic layer, ensuring that there is robust information horizontally within the canvas but also foreshadowing about the vertical interactions that can be derived from the multilayer examination. A brief explanation of the elements of the social layer is elaborated below:

1. **Social Value:** Social value lies at the heart of the social layer and is dedicated to depicting how the Business Model mission can create benefit for its stakeholders and society in general.
2. **Employee:** The employee element is reserved for employees as organizational stakeholders of the business model. In case of ICAERUS' use cases this could involve researchers and other staff involved in project implementation.
3. **Governance:** The governance element depicts the organizational structure and decision-making policy of an organization. In the case of ICAERUS the governance element could be dedicated to explaining how each use case's business model should be governed, under the service-dominant mindset.
4. **Communities:** *Communities* is the social counterpart of *Partners.* The social layer of the TLBMC attempts to bring the two concepts together, exploring social relationships that emerge between suppliers and local communities where they are involved. On the social layer, ensuring identification and, consequently, interaction with these *Communities* can generate mutually beneficial relationships.
5. **Societal Culture:** Societal Culture considers the overall potential impact of an organization on society overall. This may seem far-fetched in the case of ICAERUS, but the project overall will incur a substantial societal impact overall and, as such, an examination of the impact incurred by each use case may provide unique insights.
6. **Scale of outreach:** *Scale of outreach* is meant to explore the strength of the relationships that the project builds with its stakeholders. Given that ICAERUS is employing a robust communication and

dissemination strategy and given that the whole effort is quantified through the Dissemination and Communication KPIs, the element is expected to be populated with substantial data.

7. **End-users:** The social counterpart to the *End Phase (environmental layer) and the Customer Segments* elements, this element depicts how the value proposition attends to needs of the end-user.
8. **Social Impacts:** As with their economic and environmental counterparts, *Social Impacts* assesses the social cost of sustainable or sustainable-oriented business model. It extents the financial costs of the economic layer and the environmental impacts of the environmental layer.
9. **Social Benefits:** *Social Benefits* are those positive aspects of the value creation process, carried out by the business model implementor. This element is dedicated to depicting the overall social benefit of an organization's actions. In the case of ICAERUS the element would depict the social benefit incurred by the successful implementation of the use case.

3.4.2 Vertical and Horizontal Coherence of the Triple Layered Business Model Canvas

As mentioned in the beginning of the chapter, the innovation of the TLBMC lies in its proposition that it can depict a holistic overview of any given Business Model, considering environmental and social concerns. This, by definition, makes it a tool that was developed out the necessity to better examine sustainable or sustainable-oriented business models and this is the main reason why it seeks to explore the environmental and societal aspect with such alacrity.

As such, Figure 3.11 below exemplifies the *Vertical Coherence* and the *Horizontal Coherence* that emerges from the application of the tool.

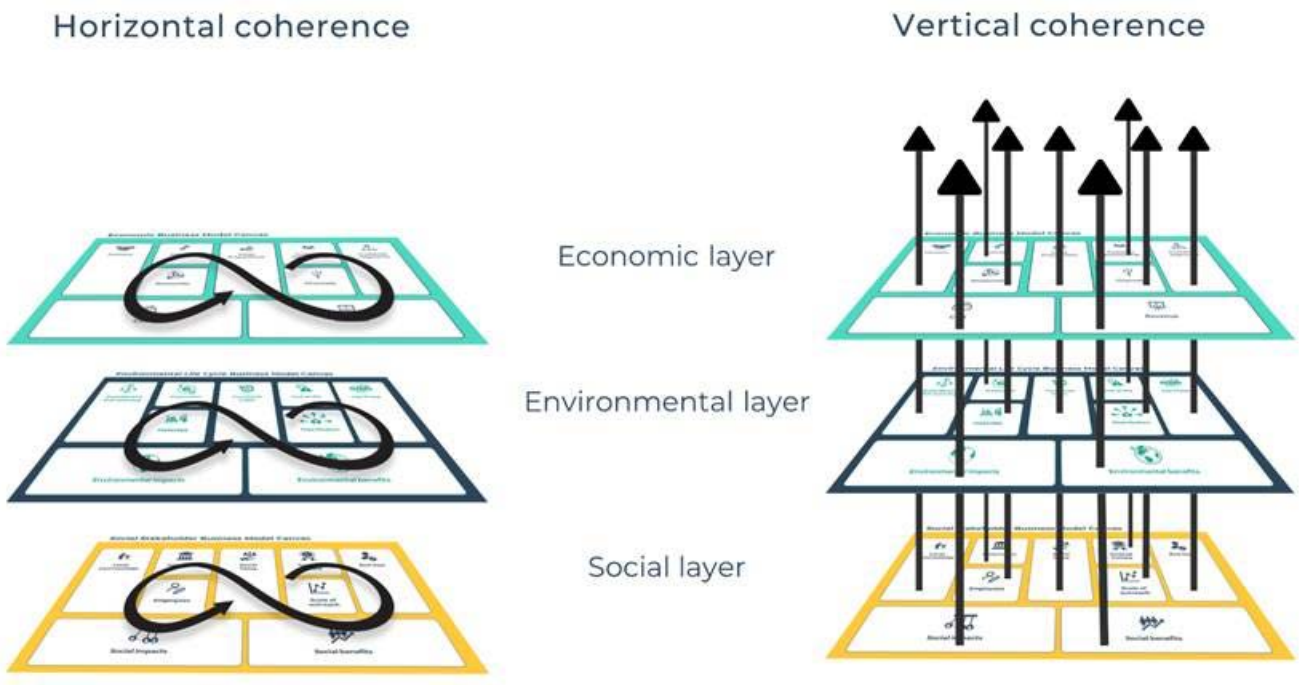


Figure 3.11: The Triple Layered Business Model Canvas: Horizontal and Vertical Coherence

- **Horizontal Coherence:** The *Horizontal Coherence* of the TLBMC enables the in-depth examination of a Sustainable or Sustainable-oriented Business Model, it encourages the business model developer to address sustainability in a far more elaborate method while it presents succinctly the different type of value creation within the Business Model. In the case of ICAERUS' use case such an approach would at first, explore in depth, through the market analysis, a *financially viable* business model but also set the foundations, from the design stage of the BM, to

take into consideration the environmental and social aspect of each use case. The opportunity to "discuss" each use case's economic, environmental and social benefits and pit them against the possible financial costs and potential environmental & social impact is unique in the tool's approach. More than that, the Tool instigates, through its environmental and social layers, the exploration of the potential impact of ICAERUS' on both the environment and its stakeholders.

- **Vertical Coherence:** Vertical Coherence is, of course, achieved by the alignment of each layer of the TLBMC – a condition which allows interaction patterns to be examined across different types of value. To that end, *Vertical Coherence* is essential for producing a Canvas of a much higher resolution that other tools, given that relationships can be observed from one element to the other. *Vertical Coherence* does not simply "stack" vertically aligned relationships but provide pathways from the vertical to the horizontal, thus always keeping the informational flow going.

3.4.3 Purpose of the tool

The purpose of this tool is to facilitate the transfer of structured knowledge and applied business modelling practices from the ICAERUS Use Cases (UCs) to the Open Call Trial (OCT) Beneficiaries within the context of the Value-Added Services. More specifically, it seeks to translate the rich insights generated during the development and piloting of ICAERUS drone-based services into a format that is both practical and replicable by third-party innovators, entrepreneurs, and practitioners participating in the Open Calls.

The **Triple Layered Business Model Canvas (TLBMC)** has been selected as the Business Model Tool of choice, precisely because of its capacity to encapsulate not only the economic aspects of a business model but also its environmental and social dimensions. This comprehensive, three-tiered approach aligns with ICAERUS's overarching vision of promoting sustainable, inclusive, and scalable UAV-based services in rural, agricultural, and environmental settings.

The core value of the TLBMC within the Value-Added Services framework lies in its **dual function**:

- **Knowledge Codification**: It serves as a means of capturing and documenting the rationale, structure, and evolution of the UCs' business models. This ensures that valuable know-how generated during ICAERUS's implementation phase is preserved and made accessible to OCT participants.
- **Knowledge Transfer**: It functions as a capacity-building and mentoring tool during Value-Added Services workshops. By deconstructing the UC business models into the three TLBMC layers and illustrating them with real data and use case experience, the tool empowers OCT Beneficiaries to adopt a sustainability-oriented approach in developing their own business models.
- **To guide and inspire the OCT Beneficiaries** as they work on their own projects. By sharing the TLBMCs developed with each UC, along with supporting explanations and examples, we provide the OCTs with a practical resource they can adapt and build on for their own purposes.

The detailed methodology is described in Paragraph 4.2.2.

4. Value Added Services

The value-added services are designed to complement the broader capacity building efforts of the ICAERUS academy by providing practical, hands-on knowledge exchange to the open call beneficiaries. Three (**3**) types of complimentary services will be offered:

1. **Working group access:** bringing together projects from all the different PUSH and PULL Open Calls, the ICAERUS Use Cases and the pilots of sister project's SPADE and ICAERUS that are focused on addressing similar challenges.
2. **Workshops:** a series of workshops on:
    a. Market Analysis (1 workshop, including all Groups)
    b. Triple Layered Business Model Canvas (a series of workshops, 1 per Group)
    c. Intellectual Property and Asset Management (1 workshop, including all Groups)
3. **Online digital tools**: a set of basic indicators accessible on the platform.
    a. Market concentration calculator
    b. Business model wizard
    c. IP checklist
    d. Templates (e.g., 6-forces analysis and SWOT)

The value-added services target the beneficiaries of the ICAERUS Open Call trials (OCTs), however by expanding the working groups to include sister projects and by including the digital tools on the platform they are accessible to a broader range of interested stakeholders.
The delivery of the value-added services is dependent on two (**2**) factors that have both created challenges.

- **Timing of the OCTs**: since there are four (4) timelines, the open call implementation phases never overlap for example, the PUSH 1 was finished before the PULL 2 started
- **Business model development for the ICAERUS Use Cases**: the business models developed for the project Use Cases are a focal point of the value-added services, however their final versions are not anticipated until the end of the project. This is because the Use Cases need to be mature and producing results to provide the necessary input and work through the business modelling tools. This meant it would not be practical to offer services during the market phase of each OCT, as the first round of sub-projects would have access to less developed information.

To overcome these challenges, it was decided that the value-added services would be offered to the OCTs within the duration of the ICAERUS project even if their specific sub-project was already completed. The additional benefit is that workshops will be organized thematically as opposed to chronologically which will offer more tailored content and initiate more relevant discussions.
The specific timeline of each service is discussed in their respective sections.

4.1 Open Calls

The ICAERUS project has dedicated just over 1M€ to providing Financial Support to Third Parties (FSTP), which is being distributed to 20 Open Call Trials (OCTs) within two (**2**) distinct types of Open Calls (PUSH and PULL), each with two (**2**) launches, as shown in Figure 4.1.

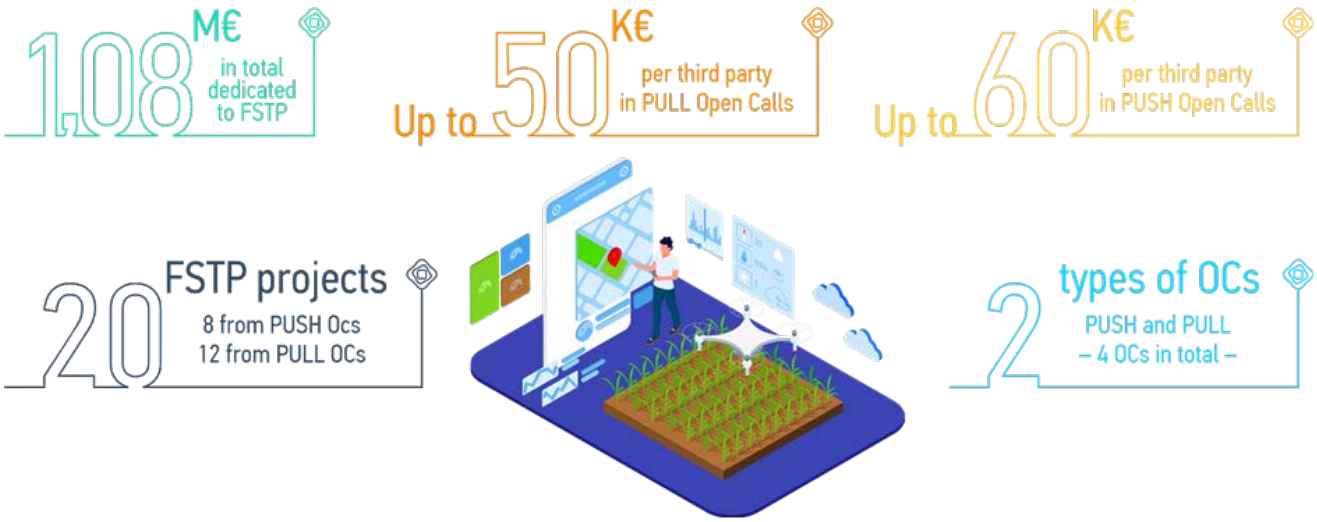


Figure 4.1: An overview in numbers of the ICAERUS Open Call

Each selected sub-project accepted has a twelve (**12**) month implementation period divided into three (**3**) phases: **Design, Development, and Market.**

The outcomes of the Open Call trials including the full description of the selected projects fall within the scope of D5.5 Open Call plan and monitoring report (B update). A summary is provided in Table 4.1, and includes the launch date, implementation period and the selected projects for each call.

Table 4.1: Summary table of the ICAERUS Open Calls

PUSH Open Call for Innovation Development *"Attract stakeholders to deliver and exploit drone-related data sets to assess technical and non-technical hypotheses and/or develop ideas, concepts, and prototypes that can be introduced to the market"*
PUSH 1
Launch: April 2023
Sub-projects: • AGROTWIN by Agrobit srl (Italy) • AIM by Schweitzer Ingenieurgesellschaft mBH (Germany) • SENSOR 2.0 by TAAL s.r.l (Italy) • SHIELD by Obsidian Innovation Institute (Portugal) • SKYFAR by Agricloud (Romania)
PUSH 2
Launch: February 2024
Sub-projects: • DiVine by VelesSense (Serbia) • gprSense by Sensar Consulting (Belgium) • OPTIVERY by Fundación Instituto Tecnológico de Galicia (Spain)

PULL Open Call for Farming, Forestry and Rural Challenges *"Stakeholders can utilise drones and services to address individual commercial needs and/or community related issues"*
PULL 1
Launch: October 2023
Sub-projects: • AI4Leafhopper by InnovPlantProtect (Portugal) • Beetcraft-aid by Pheno-Inspect GmbH (Germany) • DAEPHC by Hmezead exim d.o.o (Slovenia) • FLOX by Flox Robotics (Sweden) • LMDV by Low Altitude Ltd (UK) • OliScan byt Tenute Librandi (Italy)
PULL 2
Launch: July 2024
Sub-projects: • FAMMs by Ordine & Sicurezza Srl (Italy) • Forest Guard by Institute for Security and Strategic Research (Slovenia) • Heidedrones by Grenspark Kalmthoutse Heide (Belgium) • RODENT by Šumski Mir & ICEF (Serbia) • HYGRI by AVT Airborne Sensing Italia srl (Italy) • U-AInSPECT by EUCentre (Italy)

4.2 Value-Added Service 1: Working groups

4.2.1 Objective

The first service offered to the OCTs is membership in sector specific working groups. The objective of these working groups is to bring together OCTs, ICAERUS Use Cases and the pilots from sister projects SPADE and CHAMELEON who are addressing similar challenges.

During the pitch event for each round of Open Calls, participants were asked what they expect to obtain from the ICAERUS project. The most common response was networking and access to experts. Furthermore, during bi-monthly meetings the OCTs have shown great interest in each other's work, asking in depth questions and initiating discussion on their various challenges or contributing their experience and solutions.

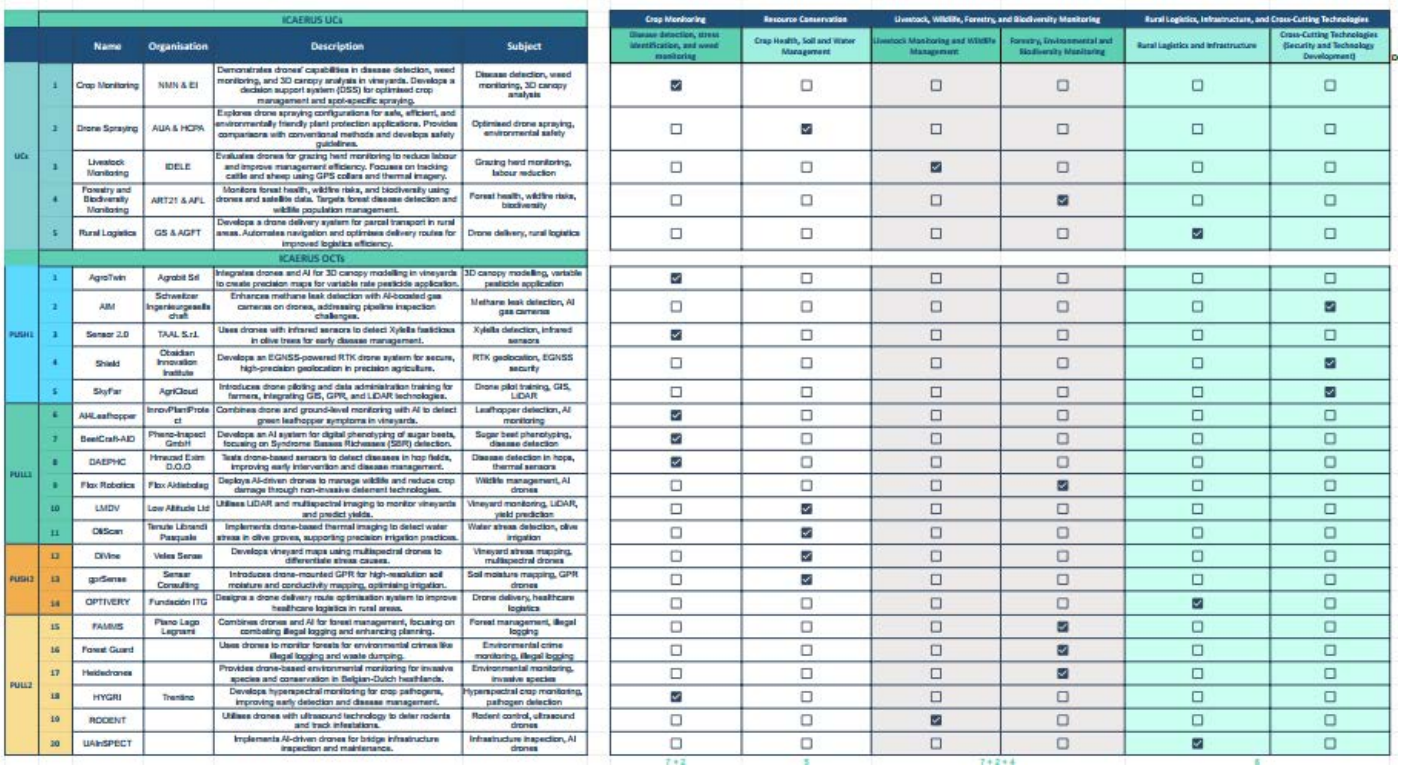
Working groups provide the networking opportunities sought out by the OCTs and offer a space for more in-depth discussion around common issues and solutions. It will also enhance the workshops (service 2) as content can be tailored to the working group area.

4.2.2 Methodology

An excel spreadsheet (Figure 4.2) was used to cluster the ICAERUS Use Cases and OCTs. The first table is organized based upon Use Cases, PUSH 1, PULL 1, PUSH 2 and PULL 2 and provides basic information including the project, organization responsible, country, a brief description and subject area.

The second table breaks down subject areas into four (**4**) broad sectors and in some cases additional sub-focus areas:

- Crop monitoring
  - Disease detection, stress identification, and weed monitoring
- Resource conservation
  - Crop health, soil and water management
- Livestock, wildlife, forestry and biodiversity monitoring
  - Livestock monitoring and wildlife management
  - Forestry, Environmental and Biodiversity Monitoring
- Rural logistics, infrastructure and cross-cutting technologies
  - Rural logistics and infrastructure
  - Cross cutting technologies (security and tech development)



		ICAERUS UCs				Crop Monitoring	Resource Conservation	Livestock, Wildlife, Forestry, and Biodiversity Monitoring		Rural Logistics, Infrastructure, and Cross-Cutting Technologies	
		Name	Organisation	Description	Subject	Disease detection, stress identification, and weed monitoring	Crop Health, Soil and Water Management	Livestock Monitoring and Wildlife Management	Forestry, Environmental and Biodiversity Monitoring	Rural Logistics and Infrastructure	Cross-Cutting Technologies (Security and Technology Development)
UCs	1	Crop Monitoring	NMN & EI	Demonstrates drones' capabilities in disease detection, weed monitoring, and 3D canopy analysis in vineyards. Develops a decision support system (DSS) for optimized crop management and spot-specific spraying.	Disease detection, weed monitoring, 3D canopy analysis	☑	☐	☐	☐	☐	☐
	2	Drone Spraying	AUA & HCPA	Explores drone spraying configurations for safe, efficient, and environmentally friendly plant protection applications. Provides comparisons with conventional methods and develops safety guidelines.	Optimised drone spraying, environmental safety	☐	☑	☐	☐	☐	☐
	3	Livestock Monitoring	IDELE	Evaluates drones for grazing herd monitoring to reduce labour and improve management efficiency. Focuses on tracking cattle and sheep using GPS collars and thermal imagery.	Grazing herd monitoring, labour reduction	☐	☐	☑	☐	☐	☐
	4	Forestry and Biodiversity Monitoring	ART21 & AFL	Monitors forest health, wildfire risks, and biodiversity using drones and satellite data. Targets forest disease detection and wildlife population management.	Forest health, wildfire risks, biodiversity	☐	☐	☐	☑	☐	☐
	5	Rural Logistics	GS & AGFT	Develops a drone delivery system for parcel transport in rural areas. Automates navigation and optimises delivery routes for improved logistics efficiency.	Drone delivery, rural logistics	☐	☐	☐	☐	☑	☐
		ICAERUS OCTs									
PUSH1	1	AgroTwin	Agrobit Sil	Integrates drones and AI for 3D canopy modelling in vineyards to create precision maps for variable rate pesticide application.	3D canopy modelling, variable pesticide application	☑	☐	☐	☐	☐	☐
	2	AIM	Schweitzer Ingenieurgesellschaft	Enhances methane leak detection with AI-boosted gas cameras on drones, addressing pipeline inspection challenges.	Methane leak detection, AI gas cameras	☐	☐	☐	☐	☐	☑
	3	Sensar 2.0	TAAL S.r.l.	Uses drones with infrared sensors to detect Xylella fastidiosa in olive trees for early disease management.	Xylella detection, infrared sensors	☑	☐	☐	☐	☐	☐
	4	Shield	Obsidian Innovation Institute	Develops an EGNSS-powered RTK drone system for secure, high-precision geolocation in precision agriculture.	RTK geolocation, EGNSS security	☐	☐	☐	☐	☐	☑
	5	SkyFlar	AgriCloud	Introduces drone piloting and data administration training for farmers, integrating GIS, GPR, and LiDAR technologies.	Drone pilot training, GIS, LiDAR	☐	☐	☐	☐	☐	☑
PULL1	6	AHLeafhopper	InnovPlantProtect	Combines drone and ground-level monitoring with AI to detect green leafhopper symptoms in vineyards.	Leafhopper detection, AI monitoring	☑	☐	☐	☐	☐	☐
	7	BeetCraft-AID	Phenо-Inspect GmbH	Develops an AI system for digital phenotyping of sugar beets, focusing on Syndrome Basses Richesses (SBR) detection.	Sugar beet phenotyping, disease detection	☑	☐	☐	☐	☐	☐
	8	DAEPHC	Hmezad Exim D.O.O	Tests drone-based sensors to detect diseases in hop fields, improving early intervention and disease management.	Disease detection in hops, thermal sensors	☑	☐	☐	☐	☐	☐
	9	Flox Robotics	Flox Aktiebolag	Deploys AI-driven drones to manage wildlife and reduce crop damage through non-invasive deterrent technologies.	Wildlife management, AI drones	☐	☐	☐	☑	☐	☐
	10	LMDV	Low Altitude Ltd	Utilises LiDAR and multispectral imaging to monitor vineyards and predict yields.	Vineyard monitoring, LiDAR, yield prediction	☐	☑	☐	☐	☐	☐
	11	OliScan	Tenute Librandi Pasquale	Implements drone-based thermal imaging to detect water stress in olive groves, supporting precision irrigation practices.	Water stress detection, olive irrigation	☐	☑	☐	☐	☐	☐
PUSH2	12	OiVine	Veles Sense	Develops vineyard maps using multispectral drones to differentiate stress causes.	Vineyard stress mapping, multispectral drones	☐	☑	☐	☐	☐	☐
	13	gprSense	Sensar Consulting	Introduces drone-mounted GPR for high-resolution soil moisture and conductivity mapping, optimising irrigation.	Soil moisture mapping, GPR drones	☐	☑	☐	☐	☐	☐
	14	OPTIVERY	Fundación ITG	Designs a drone delivery route optimisation system to improve healthcare logistics in rural areas.	Drone delivery, healthcare logistics	☐	☐	☐	☐	☑	☐
PULL2	15	FAMUS	Plano Lago Legnami	Combines drones and AI for forest management, focusing on combating illegal logging and enhancing planning.	Forest management, illegal logging	☐	☐	☐	☑	☐	☐
	16	Forest Guard		Uses drones to monitor forests for environmental crimes like illegal logging and waste dumping.	Environmental crime monitoring, illegal logging	☐	☐	☐	☑	☐	☐
	17	Heidedrones		Provides drone-based environmental monitoring for invasive species and conservation in Belgian-Dutch heathlands.	Environmental monitoring, invasive species	☐	☐	☐	☑	☐	☐
	18	HYGRI	Trentino	Develops hyperspectral monitoring for crop pathogens, improving early detection and disease management.	Hyperspectral crop monitoring, pathogen detection	☑	☐	☐	☐	☐	☐
	19	RODENT		Utilises drones with ultrasound technology to deter rodents and track infestations.	Rodent control, ultrasound drones	☐	☐	☑	☐	☐	☐
	20	UAInSPECT		Implements AI-driven drones for bridge infrastructure inspection and maintenance.	Infrastructure inspection, AI drones	☐	☐	☐	☐	☑	☐
						7+2	5	7+2+4		6	

Figure 4.2: Clustering table for the working group distribution

This approach was used to account for the diversity of the OCTs which would not all fit within the specific categories of the ICAERUS Use Cases. Multiple boxes could be selected for each. The distribution of projects per topic was then examined and an initial categorization was made and evaluated. The objective was to create groups with between 4-7 members to ensure discussion without being too large. The following groups were created:

- Group 1: Crop monitoring (7)
- Group 2: Resource conservation (5)
- Group 3: Livestock, wildlife and forestry, biodiversity monitoring (7)
- Group 4: Rural logistics, infrastructure and cross cutting technologies (6)

To enhance the cooperation efforts of Task 7.5 Coordination with relevant projects it was also decided to consider the pilots from sister projects SPADE and CHAMELEON and to give the option to invite their open call trials. Their projects are broken down in Figure 4.3.

Specific use case			
Working Group	**Activity**	**Description**	**Project**
Specific use case - Livestock	Livestock monitoring and management	Validate the capacity of the CHAMELEON platform for tracking and health assessment of individual animals (Greece).	CHAMELEON
	Livestock pilot	Pilot on the Greek island Lesvos that aims to promote and improve different breeding via grazing & health monitoring (Lesvos, Greece).	SPADE
Specific use case - Crop	Vineyards monitoring	Validate the capacity of the CHAMELEON platform for tracking water status, health of plants, health assessment of vineyards (Austria).	CHAMELEON
	Cropping Pilot	The open-field case study in Spain of potato crops and terraced crops use cases (Spain).	SPADE
Specific use case - Forest	Forest fire defense plan for rural areas	Automate the generation of forest fires defense plans for rural areas, especially in those areas with high risk (Spain).	CHAMELEON
	Forest monitor for potential dangers	Validate the capacity of the CHAMELEON platform for tracking water status, health of plants, health assessment (Austria).	CHAMELEON
	Forestry pilot	A case study in Southern Norway with 3 pilots in forestry inventory, forest harvest, and other forest operations (Southern Norway).	SPADE
	Forestry pilot	A case study in Southern Norway with 3 pilots in forestry inventory, forest harvest, and other forest operations (Southern Norway).	SPADE

Figure 4.3: Distribution of sister project SPADE and CHAMELONE within the ICAERUS working groups

4.2.3 Current status

After integrating the CHAMELEON and SPADE pilots it was determined that the livestock monitoring, and forestry monitoring should be separated. The final five (**5**) working groups and their members is provided in Table 4.2.

Table 4.2: The five ICAERUS working groups and their members

Crop Monitoring Disease detection, stress identification, and weed monitoring	• ICAERUS UC1: crop monitoring • AgroTwin • Sensor2.0 • AI4Leafhopper • BeetCraft-AID • DAEPHC • HYGRI • CHAMELEON pilot • SPADE pilot
Resource Conservation Crop health, soil and water management	• ICAERUS UC2: drone spraying • LMDV • OliScan • DiVine • gprSense
Livestock monitoring and wildlife management	• ICAERUS UC3: livestock monitoring • Flox • RODENT • CHAMELEON Livestock pilot • SPADE livestock pilot
Forestry, environmental and biodiversity monitoring	• ICAERUS UC: forestry and biodiversity monitoring • FAMMS

	• ForestGuard • Heidedrones • CHAMELEON Forestry pilot • CHAMLEON Forest fire pilot • SPADE Forestry pilot 1 • SPADE Forestry pilot 2
Rural logistics, infrastructure, and cross-cutting technologies	• ICAERUS UC5: rural logistics • OPTIVERY • UAInspect • SHIELD • SKYFAR • AIM

An invitation was prepared and shared with all partners (Appendix 1), that included the working group distribution and the objectives of creating these groups. Dates were confirmed with the ICAERUS Use Cases Leaders before invitations were sent to the OCTs and sister projects. A presentation template was also shared (Figure 4.4).

Figure 4.4: An indicative slide from the first sector specific working group meetings

The aim of the first working group meeting is to introduce the organizations involved and the work they have been doing. To manage time, only those listed within the group were asked to prepare a presentation. As such, invitees were encouraged to contact RFF and AUA if they felt they were placed in the wrong working group.

1st working group meeting

The first working group meetings are scheduled between May 5- May 9, 2025.

- Crop Monitoring (UC1) - ***Monday, 5 May | 09:00–10:30 CET***
- Resource Conservation (UC2) - ***Monday, 5 May | 11:00–12:30 CET***
- Livestock Monitoring & Wildlife Management (UC3) - ***Tuesday, 6 May | 11:00–12:30 CET***
- Forestry, Environmental & Biodiversity Monitoring (UC4) - ***Wednesday, 7 May | 11:00–12:30 CET***
- Rural Logistics, Infrastructure & Cross-Cutting Technologies (UC5) - ***Friday, 8 May | 09:00–10:30 CET***

Members were requested to prepare a 5-minute presentation of their work and were asked in advance if they had any specific questions or topics for discussion. The agenda is included in Appendix 2.

4.3 Value-Added Service 2: Training Workshops

4.3.1 Objective

The second value-added service offered to the OCTs take the form of a structured workshop series designed to provide targeted, hands-on support in developing sustainable drone-based business ideas. The aim is to help them refine their market strategies, build robust business models, and understand how to manage and protect intellectual assets. These workshops are grounded in the experiences of the ICAERUS Use Cases and structured to ensure that participants gain practical skills that can be directly applied to their own projects.

4.3.2 Methodology

Each workshop is built around a core theme—market analysis, business modelling, and intellectual property management—and is delivered in an interactive format. Sessions include introductory presentations by ICAERUS partners and invited experts, case studies from the Use Cases, collaborative breakout activities, and real-time feedback. The workshops are conducted online to maximise accessibility and will also be recorded and made available on the ICAERUS Platform for future use.

4.3.2.1 Workshop 1: Market analysis

Market Analysis introduces key tools and concepts for evaluating the commercial environment of drone-based services. It includes market segmentation, competitor analysis (using frameworks like the Herfindahl Index and Porter's Five Forces), and techniques for defining user profiles and assessing adoption readiness. Use Case examples are used to illustrate these methods in real-world settings.
More details on the tools are provided in Section 2.

4.3.2.2 Workshop 2: Triple layer business model canvas

Triple Layer Business Model Canvas walks participants through the economic, environmental, and social dimensions of business model design. Participants are introduced to the TLBMC structure and supported in drafting their own models, using templates and examples drawn directly from ICAERUS Use Cases.
The **Triple Layered Business Model Canvas (TLBMC)** has been selected as the Business Model Tool of choice, precisely because of its capacity to encapsulate not only the economic aspects of a business model but also its environmental and social dimensions. This comprehensive, three-tiered approach aligns with ICAERUS's overarching vision of promoting sustainable, inclusive, and scalable UAV-based services in rural, agricultural, and environmental settings.
The application of the Triple Layered Business Model Canvas (TLBMC) within ICAERUS was based on a **structured, hands-on co-creation methodology**. A series of workshops and targeted mentoring sessions were organised by RFF, engaging each Use Case leader in the co-development of their business models. The process focused on supporting participants in mapping their services across all three layers of the TLBMC—economic, environmental, and social—through guided facilitation and iterative feedback. The Miro boards used by each use case are included in Appendix 3.

The approach combined structure with flexibility, ensuring consistency across Use Cases while adapting to their specific contexts. Key methodological elements included:

- **Facilitated workshops** introducing the TLBMC structure and its relevance for sustainable innovation.
- **Tailored templates** for each layer of the canvas, pre-filled with prompts and examples based on project themes.
- **Use of real-world data** gathered from pilot activities, stakeholder consultations, and technical demonstrations.

- **Reflective discussions** with Use Case leaders to identify gaps, challenges, and unique value propositions.
- **Iterative refinement** of each canvas, ensuring coherence between the three layers and alignment with ICAERUS objectives.

This practical, collaborative approach not only ensured that the business models were grounded in real experiences but also laid the groundwork for transferring this methodology to Open Call beneficiaries. The resulting TLBMCs now serve as both reference tools and working examples to support capacity building and innovation design during the Value-Added Services phase.

Summary of Use Case 1 – Crop Monitoring

UC1 focuses on **precision crop monitoring** using drone imagery and AI-based analysis. The economic layer of the canvas identified public partners such as the **Department of Agriculture**, as well as potential customers in **wineries**, **universities**, and **agronomic consultancies**. The revenue model leaned toward **data-as-a-service**, supported by **data hosting providers** and domain-specific analytics.

In the environmental layer, the Use Case explored the impact of **transport fuel usage**, **drone hardware composition**, and the **energy footprint** of flight and data transmission. Socially, the model emphasized engagement with **local communities**, especially in pilot areas where farmers are beginning to adopt precision agriculture. Stakeholder trust and digital literacy emerged as critical success factors. The key takeaways from each layer of the canvas are summarised in Table 4.3.

Table 4.3: The key takeaways from each layer of the canvas from the Crop Monitoring Use Case

Crop Monitoring		
Department of agriculture	Energy footprint of drones	Trust from local communities
Data hosting services	Transport fuel use	University collaboration
Wineries as clients	UAV material inputs	Stakeholder engagement
Economic	Environmental	Societal

Summary of Use Case 2 – Drone Spraying

UC2 developed a **drone-enabled spraying service** aimed at increasing efficiency and reducing chemical overuse. The economic model centered on partnerships with **drone manufacturers**, **agrochemical firms**, and **cloud computing providers**, offering services on a **pay-per-hectare** basis.

Environmental considerations included **eco-friendly components**, **drift reduction**, and **battery recycling**, while socially, the model aimed to protect **farm workers** by minimizing exposure to chemicals. The canvas strongly highlighted the role of **training and upskilling** rural drone operators and embedding **clear governance protocols**. The key takeaways from each layer of the canvas are summarised in Table 4.4.

Table 4.4: The key takeaways from each layer of the canvas from the Drone Spraying Use Case

Drone Spraying		
Pay per hectare model	Battery reuse	Worker safety
Drone and cloud partners	Eco-components	Rural operator training
Agrochemical firms	Drift reduction	Transparent governance
Economic	Environmental	Societal

Summary of Use Case 3 – Livestock Monitoring

UC3 applies drones to **monitor livestock movement and health** in open rural areas. Key partners included **livestock institutes**, **data analysis software firms**, and **local advisors**. The economic model focused on reducing losses and increasing traceability for farmers, with subscription access to monitoring tools.

Environmentally, this Use Case has a light footprint but emphasized **battery life**, **flight range**, and **reuse of components**. On the social side, UC3 stressed **community acceptance**, **respect for rural traditions**, and **engagement with hikers and farmers** to address concerns over privacy and noise. The key takeaways from each layer of the canvas are summarised in Table 4.5.

Table 4.5: The key takeaways from each layer of the canvas from the Livestock Monitoring Use Case

Livestock Monitoring		
Subscription model	Low impact flights	Community acceptance
Livestock institutes	Battery lifecycle	Hiker/farmer relations
Data analytics services	Durable sensors	Data ethics
Economic	Environmental	Societal

Summary of Use Case 4 – Forestry and Biodiversity Monitoring

UC4 employed drones for **environmental and biodiversity assessments** in forestry zones. The economic layer identified customers such as **state forest agencies**, **conservation NGOs**, and **environmental regulators**, while partners included **drone producers** and **software platforms for analysis**.

The environmental layer was rich, addressing **flight energy consumption**, **sensor lifespans**, and **sustainable sourcing of drone parts**. The social model revolved around **forest owners**, **local farmers**, and **hunters**, whose involvement was essential for drone operations in shared landscapes. This UC's TLBMC emphasized building a **trust framework for environmental surveillance**. The key takeaways from each layer of the canvas are summarised in Table 4.6.

Table 4.6: The key takeaways from each layer of the canvas from the Forestry and Biodiversity Use Case

Forestry and Biodiversity Monitoring		
Environmental agencies	Sensor sustainability	Forest owners
Conservation NGOs	Forest-safe UAV parts	Local hunters
Monitoring as a service	LCA considerations	Community monitoring
Economic	Environmental	Societal

Summary of Use Case 5 – Rural Logistics

UC5 tackled the challenge of **drone-enabled rural delivery**, especially for **non-medical items** in **underserved areas**. Partners included **UAV part manufacturers**, **local government**, and **telecom/network providers**. The economic model envisioned **service contracts with public actors** and **last-mile delivery hubs** in remote villages.

Environmental elements focused on **replacing fuel-based transport**, **minimizing emissions**, and **scalable reuse** of drone components. Socially, the UC identified beneficiaries such as **people in need of fast delivery**, **isolated populations**, and **local technicians**, highlighting the potential for **job creation and service equity**. The key takeaways from each layer of the canvas are summarised in Table 4.7.

Table 4.7: The key takeaways from each layer of the canvas from the Rural Logistics Use Case

Forestry and Biodiversity Monitoring		
Delivery hubs	Replace fuel transport	Isolated rural users
Public contracts	Emissions reductions	Local job creation
UAV manufacturing partners	Recyclable parts	Tech accessability
Economic	Environmental	Societal

Detailed example of data collection from Use Case 2

Use Case 2 (UC2), which focuses on the deployment of drones for agricultural spraying, served as a practical example of how the Triple Layered Business Model Canvas (TLBMC) can be built using real-life project data and stakeholder input. The data collection process for this Use Case was conducted through a combination of structured workshops, pilot testing, and collaborative MIRO board activities. These provided insights not only into the service and operational elements of the drone-based model but also into its wider environmental and social implications.

The economic layer was constructed around clear value propositions (**Error! Reference source not found.**), such as **increased precision in spraying**, **reduced chemical waste**, and **cost-effective field coverage**. Key partners included **drone manufacturers**, **agrochemical companies**, and **cloud computing providers** supporting data-driven operations. Revenue streams were envisioned around "drone-as-a-service" models offered to farms lacking internal UAV capacity, with value driven by **efficiency gains and reduced labour requirements**. The MIRO board also identified **battery suppliers** and **certification bodies** as essential contributors to operational and regulatory compliance.

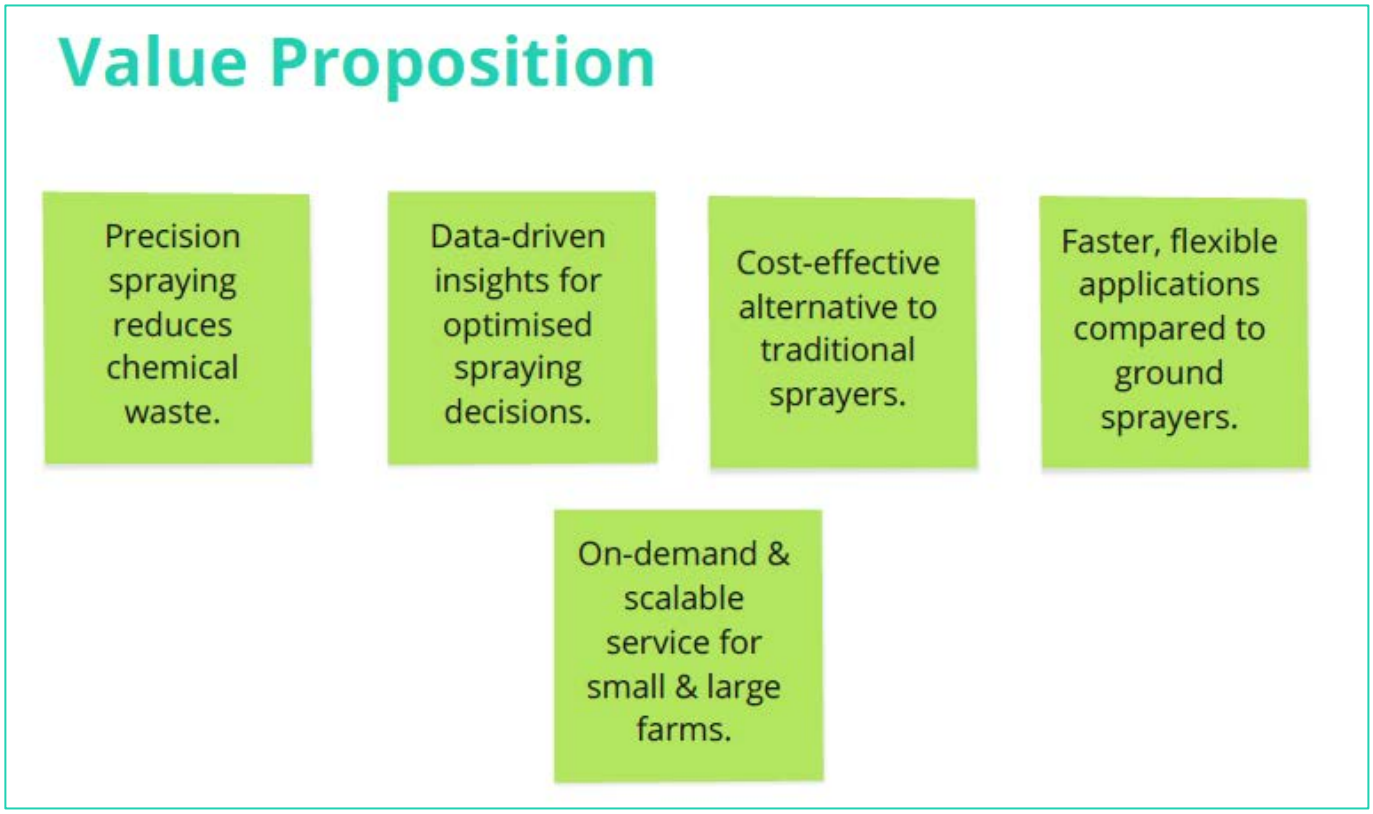


Figure 4.5: Example of value proposition input

In the environmental layer, specific attention was paid to the **supply and use of eco-friendly drone components**, as well as the **management of chemical dispersion and battery waste**. Entries such as "**eco-friendly drone components**" and "**lightweight designs for reduced energy consumption**" were noted, reflecting an awareness of the life-cycle impact of drone hardware. Distribution elements considered

the **logistics of drone deployment in rural areas**, while the **use phase** captured data on **reduced chemical drift and resource savings**, informed by field test observations. The **end-of-life** tile included issues around **battery recycling and hardware reuse**, pointing to circular economy considerations. Examples from the Functional Value box are shown in Figure 4.6.

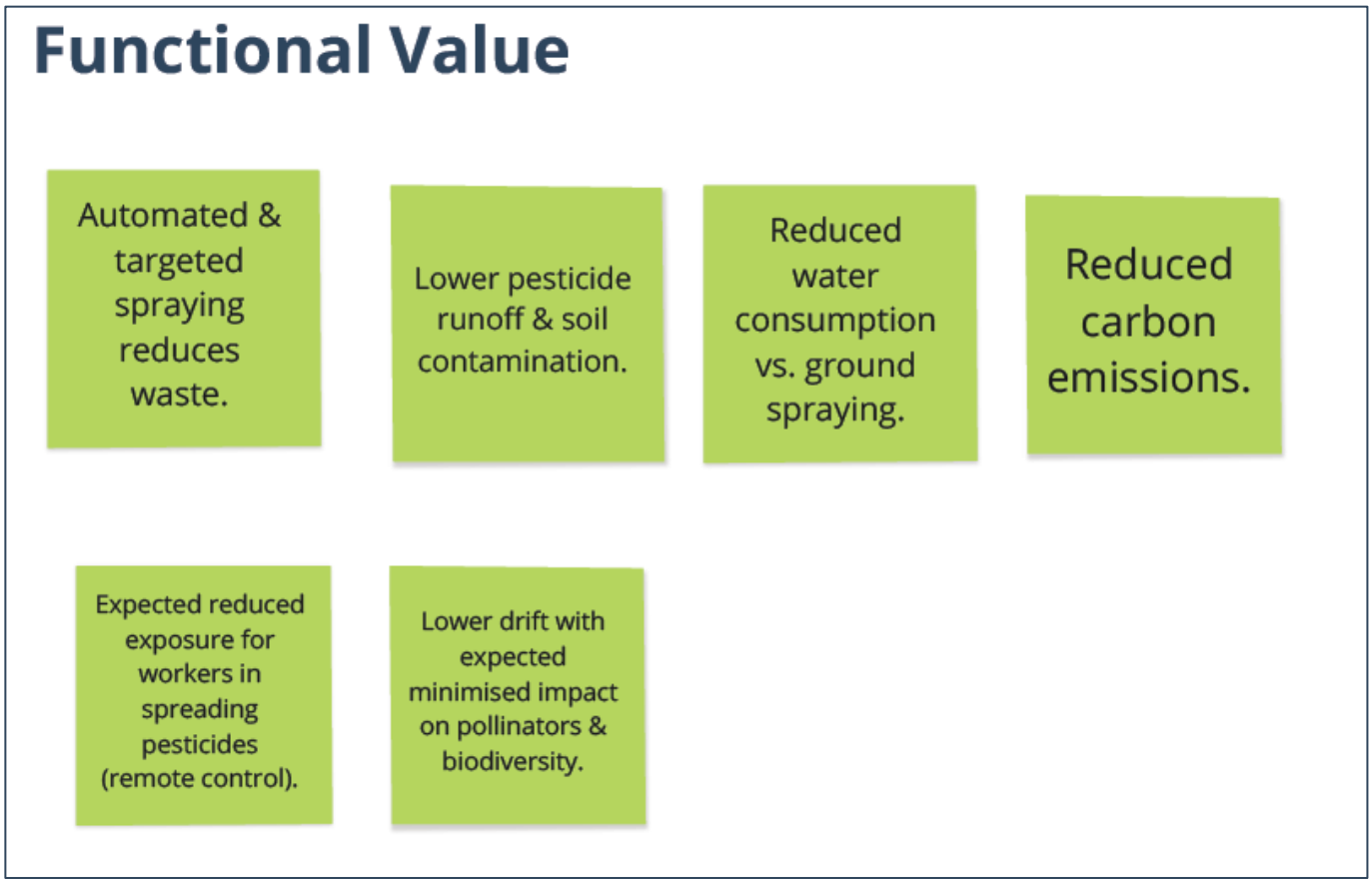


Figure 4.6: Example of functional value input

The social layer was equally rich. Key stakeholders identified on the MIRO board included **farmers and agricultural workers**, **local communities**, and **drone operators**. The "**Local Communities**" tile explored the potential for job creation and improved rural service delivery, while the **social value** component highlighted benefits such as **increased safety by reducing human exposure to chemicals**. The governance component emphasised the need for **clear operating protocols**, particularly given the sensitivity of flying drones over farmland. The board also raised the importance of **training and upskilling** for rural drone operators, a key enabler for long-term adoption. Figure 4.7 shows the input provided for the Social Value category.

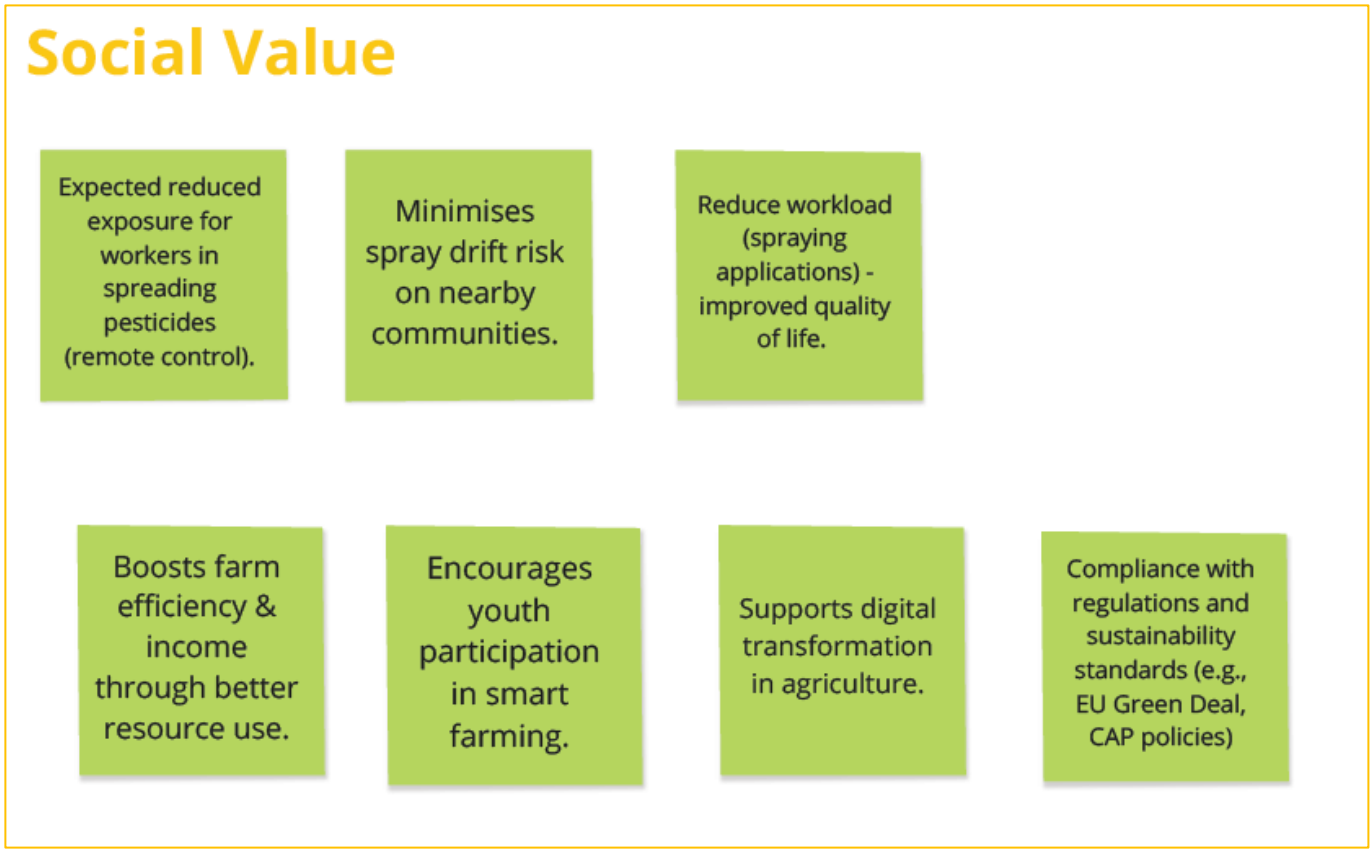


Figure 4.7: Example social value input

This data was not only used to complete the TLBMC but also to demonstrate the **horizontal and vertical coherence** between its layers. For instance, the value proposition of safer and more sustainable spraying was reflected across all dimensions: **economic efficiency**, **environmental performance**, and **social responsibility**. The UC2 canvas is now a reference case within the ICAERUS Value-Added Services and will be shared with OCTs to illustrate how drone-based innovations can be structured around sustainability from the outset.

Example: Building a Sustainable "Drone as a Service" Business Model

One of the clearest patterns that emerged across the ICAERUS Use Cases was the move toward a **"Drone as a Service" (DaaS)** approach. Rather than selling drones as products, teams focused on providing drone-enabled services—such as spraying, monitoring, or data analysis—as **on-demand, packaged offerings** that users could access without needing to own or operate the technology themselves. The Triple Layered Business Model Canvas (TLBMC) was particularly effective in helping teams think through the practicalities and implications of this model. The example shared with the Use Cases is provided in Table 4.8.

Table 4.8: Example of a TLBMC for a "Drone as a service" model

Layer	Element	Example Inputs
Economic	Key Partners	Drone manufacturers, Software providers
	Key Activities	Flight planning, Spraying services
	Key Resources	UAV fleet, Cloud processing platform
	Value Proposition	Affordable access to precision services, Pay-per-use flexibility
	Customer Segments	Farmers, Agri-cooperatives
	Channels	Digital platform, Ag advisors

	Customer Relationships	Training, Ongoing support
	Revenue Streams	Service fees, Subscription models
	Cost Structure	Equipment leasing, Staff costs
Environmental	Supplies & Outsourcing	Eco-certified component suppliers, Open-source software
	Production	Modular assembly, Lifecycle tracking
	Materials	Recyclable plastics, Rechargeable batteries
	Functional Value	Reduced emissions, Less agrochemical use
	Distribution	Local delivery hubs, Drone operators
	Use Phase	Battery recharge cycles, Low-noise operation
	End-of-Life	Component recycling, Refurbishing
	Environmental Impacts	Reduced CO2, Less soil compaction
	Environmental Benefits	Improved biodiversity, Waste minimization
Social	Local Communities	Rural farmer networks, NGOs
	Governance	Fair use policy, Data governance
	Employees	Drone pilots, Local tech teams
	Social Value	Safer spraying, Labor replacement
	Societal Culture	Tech adoption culture, Gender inclusion
	Scale of Outreach	Regional workshops, Field demos
	End-users	Agricultural SMEs, Organic producers
	Social Impacts	New job roles, Reduced exposure
	Social Benefits	Digital inclusion, Better health outcomes

In the **economic layer**, the DaaS approach was built around **service efficiency**, **cost savings**, and **access to advanced technology**. Key partners often included **AI software providers**, **drone manufacturers**, and **regulatory bodies** ensuring compliance. Revenue models were shaped around **subscription fees**, **pay-per-use contracts**, or public-private partnerships—especially where municipalities or cooperatives acted as customers. Several Use Cases also highlighted the role of **local intermediaries or service hubs** to ensure reliable delivery and technical support.

The **environmental layer** raised questions that might otherwise be overlooked in a traditional model. Teams examined the use of **ethically sourced materials**, **recyclable components**, and **low-emission drone operations**. Some canvases, including the DaaS template itself, emphasized **sustainable supply chains** and the impact of logistics and battery waste. The "Use Phase" and "End-of-Life" tiles provided a space to reflect on **resource intensity**, **reuse potential**, and how services could be designed to reduce the environmental footprint across the lifecycle.

In the **social layer**, the DaaS model opened opportunities for **skills development**, **rural job creation**, and **community-level adoption**. Almost all UCs pointed to the importance of involving **local communities**, both as beneficiaries and contributors. Ethical considerations—such as **data privacy**, **informed consent for aerial monitoring**, and **ensuring inclusivity**—were discussed as integral parts of the model. Governance structures were also identified as a key factor, with emphasis on **transparent decision-making** and clear responsibilities among service providers and public authorities.

By working through the canvas with all three layers in mind, the teams were able to craft business models that felt both ambitious and grounded. The DaaS model, as captured through the TLBMC, demonstrates how drone technology can be **delivered as a practical service**, while being **economically viable,**

environmentally responsible, and socially embedded. This model now serves as a reference point for OCTs exploring similar service-based innovations.

Conclusions

The application of the Triple Layered Business Model Canvas (TLBMC) across all five ICAERUS Use Cases demonstrated the tool's capacity to **structure drone-enabled services with sustainability at their core**. Each Use Case used the canvas to critically assess how its solution delivers value—not only in terms of economic feasibility but also in relation to environmental performance and social inclusion. This process led to the development of five distinct, yet thematically interconnected, business models spanning agriculture, rural logistics, biodiversity monitoring, and livestock management.

Several **cross-cutting patterns** emerged from the exercise. Most notably, all Use Cases gravitated toward variations of the **Drone as a Service (DaaS)** model, reflecting a shift from technology ownership to service-based delivery. Economically, this model offers flexible access to advanced capabilities (e.g., spraying, monitoring) through subscriptions or on-demand use. In terms of environmental outcomes, Use Cases focused on energy efficiency, recyclable components, and reduced resource use. The social dimension was equally prominent, with an emphasis on **community engagement**, **training opportunities**, and the **ethical deployment** of drone services.

Beyond informing internal strategy, the real strength of these TLBMCs lies in their ability to **serve as replicable models** for the OC sub-grantees. As part of the ICAERUS Value-Added Services, these canvases will be shared with the **Open Call Trials (OCT)** through a series of thematic workshops and peer exchanges. Each UC's canvas will act as a teaching case, showing how a drone-based solution can be structured, iterated, and scaled responsibly. Templates, sector-specific examples, and guided exercises will be used to help OCT participants build their own TLBMCs, using real project insights as a starting point.

In this way, the outcomes of Task 4.4 contribute not only to the maturity of the ICAERUS Use Cases, but also to the **capacity building and strategic empowerment** of the OC Beneficiaries, supported by the project. By embedding sustainability and co-creation into the core of business design, ICAERUS ensures that its value-added services offer a practical roadmap for meaningful and inclusive drone adoption across Europe's rural landscapes.

4.3.2.3 Workshop 3: Intellectual Property and Asset Management

Intellectual Property Rights (IPR) are the ownership rights for creations of the mind, such as inventions, names, images, or designs and can enable owners to obtain financial benefit from their ideas. Striking the right balance between creator and public interests can foster creativity and innovation. The standard forms of IPR protection include:

- **Patent:** an exclusive right granted for an invention. It allows the owner to decide how and whether the invention can be used by others
- **Trademark**: a sign that distinguishes goods and services of one enterprise from those of another
- **Industrial design:** includes the aesthetic aspect of an object. 2D features can include patterns, lines and colours, whereas 3D features extend to shape and surface
- **Copyright:** is the legal term to describe the rights over literary and artistic work but can also extend to databases, advertisement, maps and technical drawings
- **Trade-secret:** commercially valuable confidential information which may be sold or licensed. This can include technical or nontechnical data, formulas, patterns, methods, lists of customers
- **Confidentiality:** information that is not publicly known and warrants protection
- **Geographical indication:** indicate the specific geographical location of origin or a product and its characteristics that are uniquely attributed to that area.

The full scope of the IPR for the ICAERUS project falls within the framework of D5.2 Plan of Dissemination and Exploitation including Communication Activities (V2); however, IP is considered an integral aspect of the value-added services. As such, the **Intellectual Property and Asset Management** workshop will focus on how to identify and protect Key Exploitable Results. Topics will include:

- IP ownership
- Licensing models
- The role and importance of IP in preparing for commercialisation and investment
- A checklist for IP self-assessment
- Case examples integrated throughout to guide participants through the basics of IP planning.

4.3.3 Current Status

As of April 2025, the agendas have been finalised, and the Task Leader – reframe.food has produced presentation materials. The sessions are now being aligned with the working group calendars to ensure maximum participation.

4.4 Value-Added Service 3: Digital tools

The third value-added service is a suite of digital tools designed to provide continuous access to ICAERUS methodologies and support the strategic development of drone-based services. These tools aim to assist OCTs and other stakeholders in analysing their competitive landscape, modelling their businesses, and planning for sustainability—well beyond the duration of the live workshops.

4.4.1 Objective

The toolkit is being developed as a web-based application hosted on the ICAERUS Platform. It includes several interactive modules, each focused on a core area of strategic planning, including the following:

- **Concentration Index Calculator**, allowing users to assess the competitiveness of their market using Herfindahl-Hirschman and concentration ratio formulas.
- **Six-forces analysis template**, enabling a structured development of a six-forces analysis considering a wide set of aspects related to each competitive force.
- **SWOT analysis template**, to enable a simple and impactful development of a SWOT analysis.
- **Business Model Wizard** guides users step-by-step through the Triple Layer Business Model Canvas, integrating examples from ICAERUS Use Cases to make each concept easier to apply.
- **IP Checklist** helps users identify exploitable assets and take the first steps toward securing intellectual property rights.

The technical details of the toolkit are described in Chapter 5 and D6.3 Platform Development and Updates (B).

4.4.2 Methodology & Current Status

The first version of the Concentration Index Calculator is already functional, and development work is progressing on the other modules. The digital toolkit will remain accessible to ICAERUS stakeholders after the project ends, forming a legacy of open access resources to support the responsible and inclusive growth of drone-enabled services across Europe.

4.4.3 Current Status

The content is prepared and has been shared with the WP6. The mock-ups for the tool have already been designed (*link*) and the tool will be released before the next round of demonstrations. More information provided in Chapter 4.

5. Distribution of Materials on the ICAERUS Platform

In the context of providing training for the uses of drones in business applications, the project will provide Value-Added Services dedicated to providing knowledge and education to stakeholders through online counselling on how to apply the business and governance models generated in the project. These services, delivered specifically to the OCT beneficiaries, will include a digital toolkit with a range of tools, aiming to equip stakeholders with knowledge on how to more efficiently and effectively execute their business plans, as well as gauge competition in their marketplace. In collaboration with WP4 and WP5, a set of tools are currently being designed, aiming to support the users in better understanding their market concentration and industry competition. Two tools are already in their prototype phase, as shown in Paragraphs 5.1 and 5.2.

5.1 Prototype of the Market Concentration Calculator

Upon entry, users are prompted to insert their present market data (see Figure 5.1), including company names and the percentage of the market share they hold.

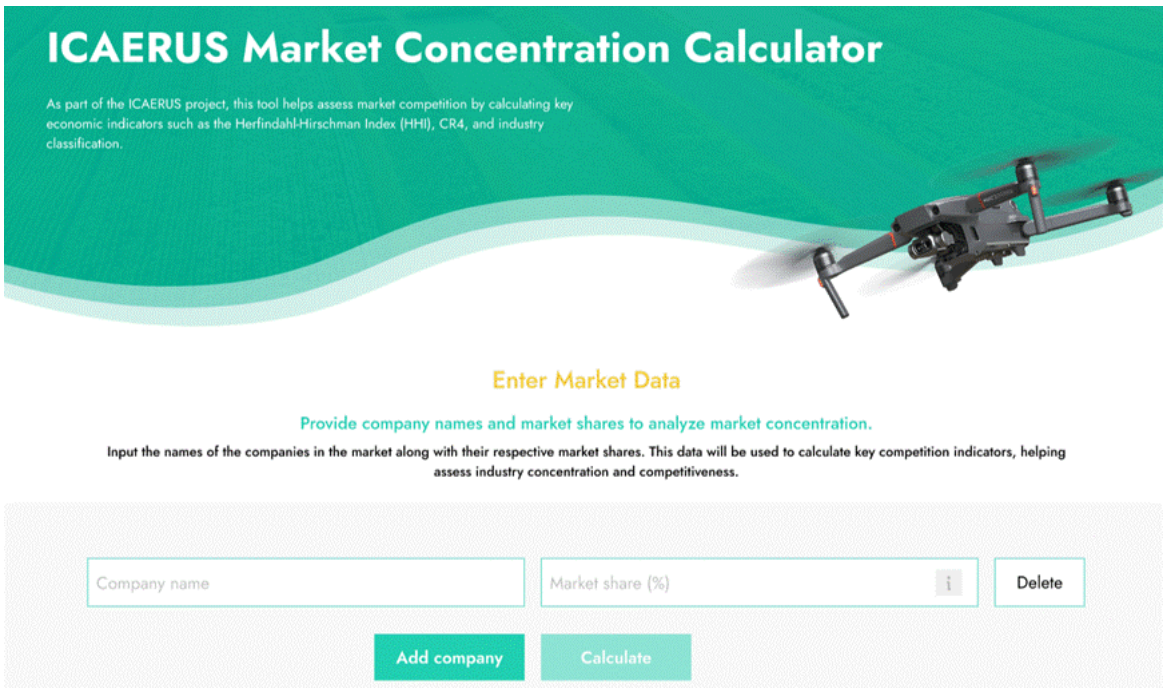


Figure 5.1: Initial interface of the calculator.

Upon inputting their data, users may then proceed to calculate their concentration level and H-index for their specific market data (see Figure 5.2).

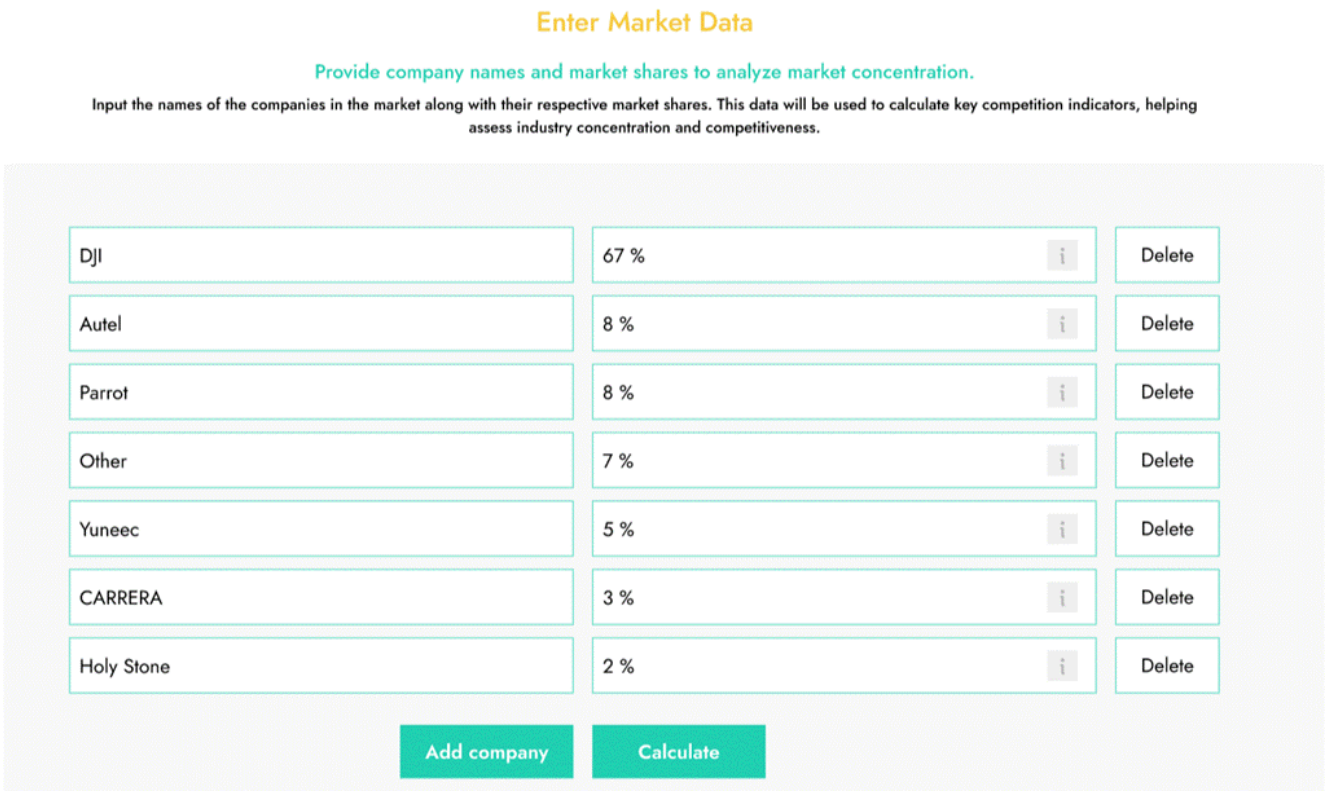


Figure 5.2: The input menu for the provision of market data.

After calculation, users are presented with key indicators, industry classifications, as well as more descriptions detailing what insights they can garner from their specific results (see Figure 5.3). More information on the methodology behind the Value-Added Services Toolkit may be found in Deliverable 4.4 "On-site Learning & Value-added Services Report (A)".

Figure 5.3: Results of the market analysis, showing the concentration of the market and the H-index for the data provided.

5.2 Prototype of the Business Model Wizard

The Business Model Wizard aims to guide users step-by-step through the Triple Layer Business Model Canvas (see Figure 5.4), integrating examples from the ICAERUS Use Cases to make each concept easier to apply.

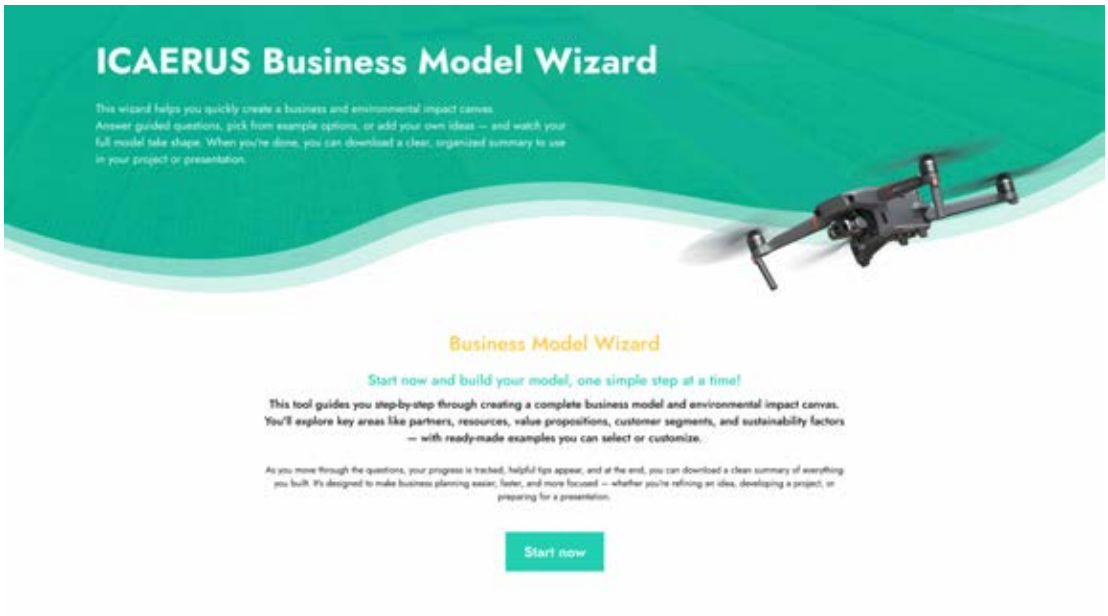


Figure 5.4: The initial menu of the wizard.

Upon initiation, users will be presented with options pertinent to the key elements of a nine-element canvas, prompted to select the options most relevant to their drone business (see Figure 5.5).

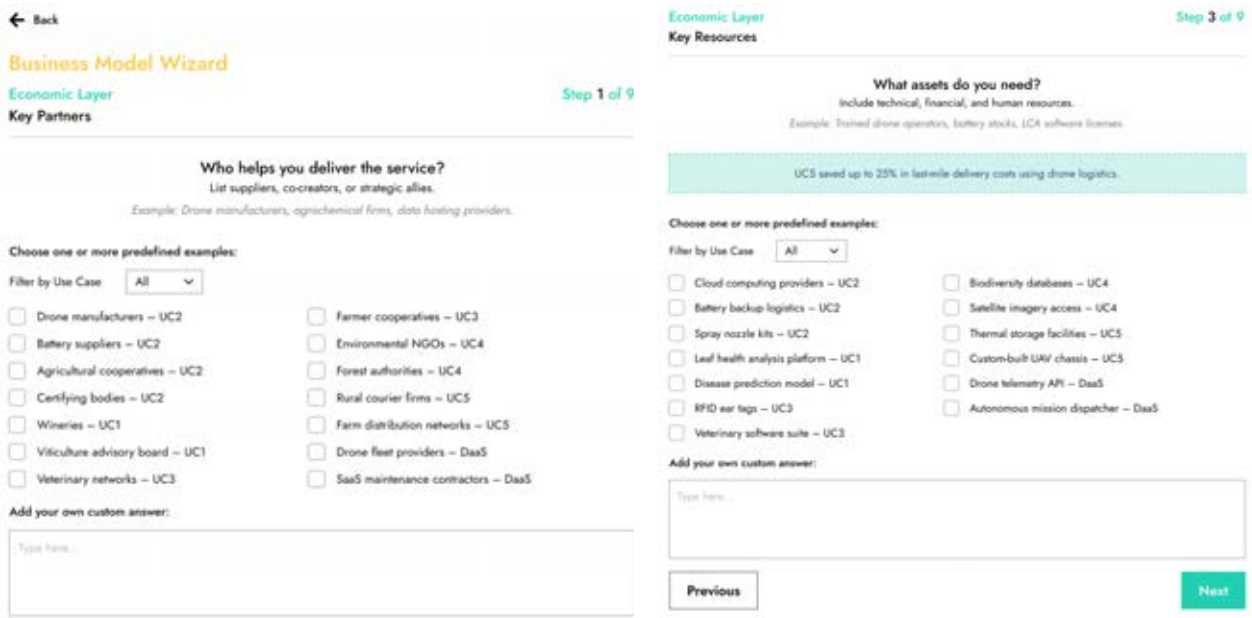


Figure 5.5: Selection screens for the elements of the economic canvas.

Upon selecting all their options in the respective elements, users will be able to review their selection, or be presented with their economic business model canvas (see Figure 5.6).

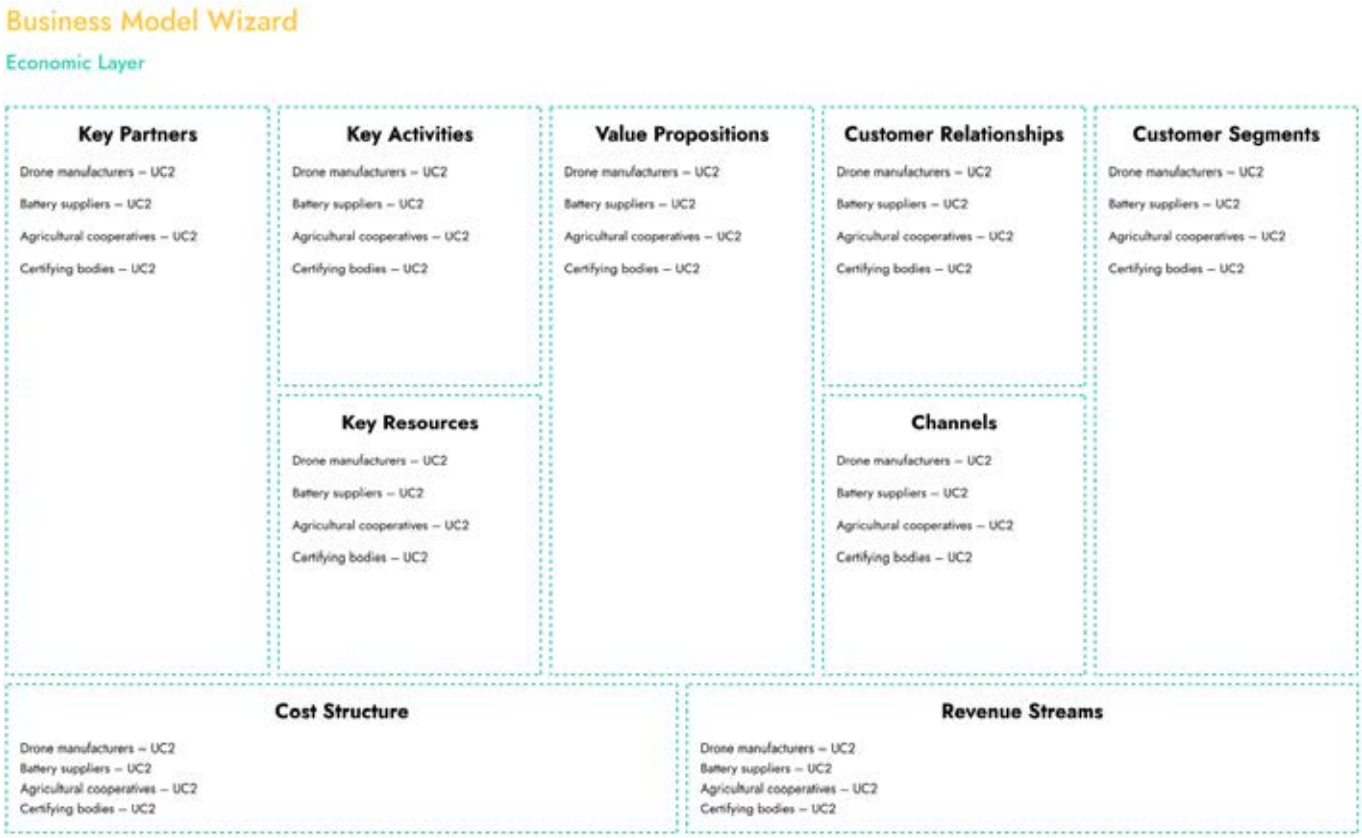


Figure 5.6: The completed canvas for the economic layer.

Users will similarly fill out the environmental and social elements of their canvas, resulting in being presented with a three-layer business model canvas based on their selection.
The toolkit will be expanded with more insights and data to ensure any developments in the business and governance models are included, after which it will be developed and deployed on the ICAERUS Platform. The toolkit will then be tested and evaluated for usability with the recipients of the Value-added services, whose feedback will guide the improvement and refinement of the toolkit.

5.3 Access to demo event on the ICAERUS Platform

As part of ICAERUS' dedication to providing readily available training, all materials (e.g., presentations, videos, recordings) presented in the demonstration events will be made available through the ICAERUS platform. Moreover, to increase awareness of the ICAERUS Use Cases and stakeholder engagement, interactive demo books have been developed for the demonstration events that have been conducted. These demo books provide a summary of the demonstration event, as well as technical details on the exhibitions performed. More information on the demo books is available in D6.3 "Platform Developments and Updates (B)".

6. Conclusions and Next Steps

This deliverable captures the progress made in ICAERUS Task 4.3 (On-site Learning) and Task 4.4 (Value-Added Services) during the third project year, while also setting out the roadmap for the final implementation phase in Year 4.

The on-site learning activities successfully complemented the online learning modules developed in earlier tasks by delivering hands-on, domain-specific training during ICAERUS Use Case demonstration events. In Year 3, five technical workshops were conducted, each tailored to the specific thematic and operational focus of the Use Cases, including crop monitoring, drone spraying, livestock tracking, biodiversity assessment, and rural logistics. These sessions built stakeholder capacity and provided practical exposure to real-world UAV deployments. Planning is now underway for the second round of on-site workshops in Year 4, which will shift focus towards business development using a structured set of strategy tools co-designed with partners: the Market Concentration Calculator, Six Forces Analysis, SWOT Analysis, and the Triple Layered Business Model Canvas (TLBMC).

The Value-Added Services have been launched to support the 20 ICAERUS Open Call Trial (OCT) beneficiaries and have already shown strong potential to foster capacity building and peer learning. Three complementary services—sector-specific working groups, structured workshops, and online digital tools—are being deployed. Working groups have been formed to cluster OCTs by domain and foster thematic exchange, while three workshops (on market analysis, business modelling, and IP management) are being prepared. The digital tools—including the Business Model Wizard and Market Concentration Calculator—are under development and will remain available as part of the ICAERUS legacy.

Overall, the deliverable demonstrates strong alignment between on-site learning and the Value-Added Services, ensuring a coherent capacity-building strategy that addresses technical, strategic, and business readiness aspects. By providing hands-on training, targeted mentoring, and open-access digital resources, ICAERUS is equipping both Use Case partners and Open Call beneficiaries with the knowledge and tools needed to scale sustainable UAV-based services. The lessons learned and materials developed will be leveraged in the final year to deliver a second round of workshops and complete the deployment of the value-added tools, contributing to ICAERUS's long-term impact across rural innovation ecosystems.

6.1 Next Steps for On-site Learning

The second round of on-site learning will focus on business skill development and the application of the four strategy tools. These tools will be presented to Use Case partners in a dedicated session during the ICAERUS project meeting in Vilnius (May 2025). Feedback collected during this session will inform the refinement of slide decks and training guidelines, which will then be used during the final round of demonstrations. The integration of business development content marks a shift from technical knowledge to innovation readiness, helping stakeholders translate ICAERUS pilots into replicable services.

6.2 Next Steps for Value-Added Services

Working Groups: Participants in each working group will have the opportunity to shape the thematic direction of future exchanges by suggesting discussion topics, meeting formats, and collaboration ideas. These discussions will be initiated during the first working group meetings in May 2025, and additional input will be welcomed via email to RFF/AUA. Groups will continue meeting beyond the initial session to foster targeted knowledge exchange.

Workshops: Three workshops are scheduled:

1. Market Analysis (shared across all groups)
2. Triple Layered Business Model Canvas (customised per group)
3. Intellectual Property and Asset Management (shared across all groups)

The content has been developed and will be introduced to OCTs through the working groups. Timing will be finalised based on OCT availability. All sessions will be recorded and made available on the ICAERUS platform.

Digital Tools: A suite of digital tools—including the Business Model Wizard, Market Concentration Calculator, IP Checklist, and strategy templates—will be presented during the workshops and remain available as open-access resources after project completion. These tools are intended to support ongoing strategic planning and innovation scaling across the UAV ecosystem.

6.3 Next Steps for the ICAERUS Platform

The ICAERUS Platform will serve as the long-term repository and access point for all capacity-building materials. As of this deliverable's submission, significant progress has been made on the Value-Added Services toolkit. Mock-ups have been developed and shared with WP6. The toolkit is scheduled for release in the coming months.

A dedicated feedback session will be held during the Vilnius meeting to assess the toolkit's usability. Based on this input, refinements will be made to improve navigation, clarity, and user engagement. Additional content such as case studies, templates, and sector-specific examples will be incorporated to enhance the learning experience and ensure relevance to a broad audience.

References

Antitrust Division | Herfindahl-Hirschman Index. (2015, June 25). https://www.justice.gov/atr/herfindahl-hirschman-index

Besanko, D., Dranove, D., Shanley, M., & Schaefer, S. (2013). *Economics of strategy* (6th edition). Wiley.

Grant, R. M. (2016). *Contemporary strategy analysis: Text and cases* (Ninth edition). Wiley.

Johnson, G., Whittington, R., Regnér, P., Scholes, K., & Angwin, D. (2017). *Exploring Strategy: Text and Cases* (11 edition). Pearson.

Joyce, A., & Paquin, R. L. (2016). The triple layered business model canvas: A tool to design more sustainable business models. *Journal of Cleaner Production*, *135*, 1474–1486. https://doi.org/10.1016/j.jclepro.2016.06.067

Lynch, R. L. (2015). *Strategic management* (Seventh edition). Pearson.

Osterwalder, A., Pigneur, Y., & Clark, T. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. Wiley.

Paroutis, S., Franco, L. A., & Papadopoulos, T. (2015). Visual Interactions with Strategy Tools: Producing Strategic Knowledge in Workshops: Visual Interactions with Strategy Tools. *British Journal of Management*, *26*, S48–S66. https://doi.org/10.1111/1467-8551.12081

Prabhu, V., Taisch, M., & Kiritsis, D. (Eds.). (2013). *Advances in Production Management Systems. Sustainable Production and Service Supply Chains* (Vol. 414). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-41266-0

Savitz, A. W., & Weber, K. (2014). *The triple bottom line: How today's best-run companies are achieving economic, social, and environmental success--and how you can too* (Revised and updated). Jossey-Bass.

Statista. (2024, June 28). *Market share of leading drone vendors worldwide in 2023 [Graph]*. Statista. https://www.statista.com/forecasts/1490315/market-share-drone-vendors-worldwide

Turber, S., Brocke Vom, J., & Gassmann, O. (2015). Designing Business Models in the age of Pervasive Digitization. *Academy of Management Proceedings*, *2015*(1), 11600. https://doi.org/10.5465/ambpp.2015.11600abstract

Wright, R. P., Paroutis, S. E., & Blettner, D. P. (2013). How Useful Are the Strategic Tools We Teach in Business Schools?: Strategic Tools Usefulness. *Journal of Management Studies*, *50*(1), 92–125. https://doi.org/10.1111/j.1467-6486.2012.01082.x

Appendixes

Appendix 1 Invitation for working groups

Invitation to participate
ICAERUS Sector Specific Working Groups

Dear ICAERUS Open Call Beneficiaries,

We are pleased to invite you to participate in the newly established ICAERUS **Sector-Specific Working Groups**, as part of the value-added services offered to all beneficiaries of the ICAERUS Open Calls.

Purpose

These working groups have been formed in direct response to your feedback during the pitch events and bi-monthly OCT meetings, where many of you expressed strong interest in:

- **Networking** with peers facing similar challenges
- **Sharing experiences and learning** from one another
- **Accessing expert support** on technical and market-related topics

The groups aim to:

- Facilitate focused dialogue on shared challenges
- Encourage collaboration across ICAERUS and sister projects
- Provide input for tailored, market-oriented workshops

Group Structure

Projects have been grouped by thematic focus into manageable groups (5–7 participants), including:

- ICAERUS Use Cases (UCs)
- PULL & PUSH Open Call Trials
- Sister project pilots (SPADE, CHAMELEON)

Working Groups:

1. **Crop Monitoring:** Disease detection, stress identification, weed monitoring
2. **Resource Conservation:** Crop health, soil and water management
3. **Livestock Monitoring & Wildlife Management**
4. **Forestry, Environmental & Biodiversity Monitoring**
5. **Rural Logistics, Infrastructure & Cross-Cutting Technologies**

A detailed breakdown of group members can be found below.

First Working Group Meetings

The initial meetings will take place online and will focus on:

- Short introductions from projects listed in the group
- Presentation of ICAERUS value-added services
- Identification of key topics for future exchanges

Only the projects listed in the working group will be expected to present during the first meeting, but meetings are open to all interested OCTs. Calendar invitations will be shared once the dates are confirmed.

* If you believe your project would be better placed in another group, please contact *mackenzie@reframe.food* and *akasimati@aua.gr*.

We look forward to your participation and to supporting strong collaboration across the ICAERUS community.

Best regards,

ICAERUS

Working Group Distribution

Crop Monitoring	• ICAERUS UC1: Crop Monitoring • AgroTwin • Sensor 2.0 • AI4Leafhopper • BeetCraft-AID • DAEPHC • HYGRI • CHAMELEON Crop Pilot • SPADE Crop Pilot
Resource Conservation	• ICAERUS UC2: Drone Spraying • LMDV • OliScan • DiVine • gprSense • SPADE Water Pilot
Livestock Monitoring & Wildlife Management	• ICAERUS UC3: Livestock Monitoring • Flox Robotics • RODENT • CHAMELEON Livestock Pilot • SPADE Livestock Pilot
Forestry, Environmental & Biodiversity Monitoring	• ICAERUS UC4: Forestry & Biodiversity Monitoring • FAMMS • ForestGuard • Heidedrones • CHAMELEON Forestry Pilot • CHAMELEON Forest Fire Pilot • SPADE Forestry Pilot 1 • SPADE Forestry Pilot 2

Rural Logistics, Infrastructure & Cross-Cutting Technologies (Including "Drone-as-a-Service" models)	• ICAERUS UC5: Rural Logistics • OPTIVERY • U-AInSPECT • SHIELD • SKYFAR • AIM

Appendix 2 First working groups meeting agenda

ICAERUS Working Group Meeting Agenda (90 minutes)

Welcome & Value-Added Services Overview [Time: 0–15 min]

- Welcome (ICAERUS team)
- Introduction to the ICAERUS Value-Added Services
- Purpose of the Working Groups and how they will function
- Q&A

Short Project Introductions [Time: 15–50 min | ~5–7 min per project]

- Each listed project gives a short introduction:
  - Name & scope
  - Key technologies or methods
  - Main challenges / interests for the group
  - Open the floor for 1–2 questions

  (Only group members present.)

Discussion: Common Needs & Challenges [Time: 50–75 min]

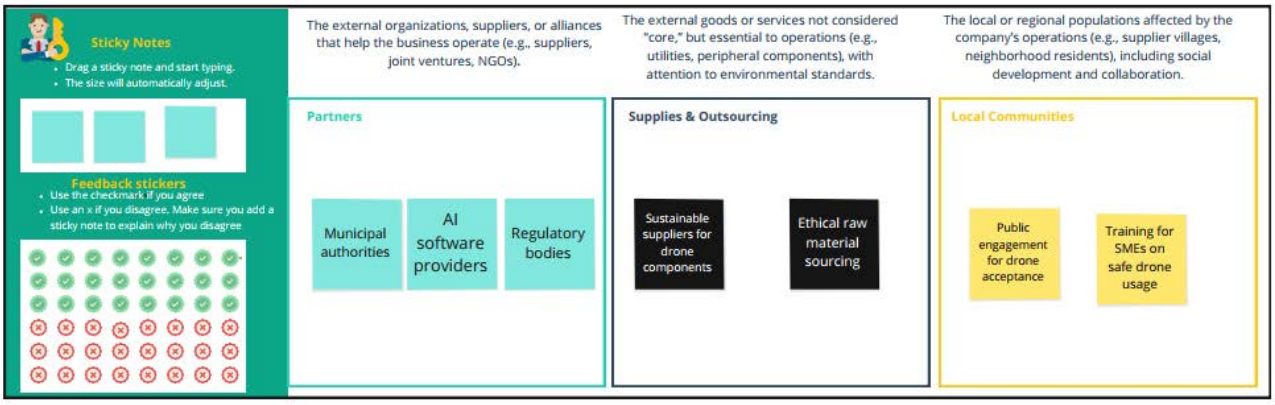
- What are the main shared technical or market challenges in this group?
- What collaboration opportunities or synergies exist between group members?
- Are there topics you'd like to explore further in a future session?

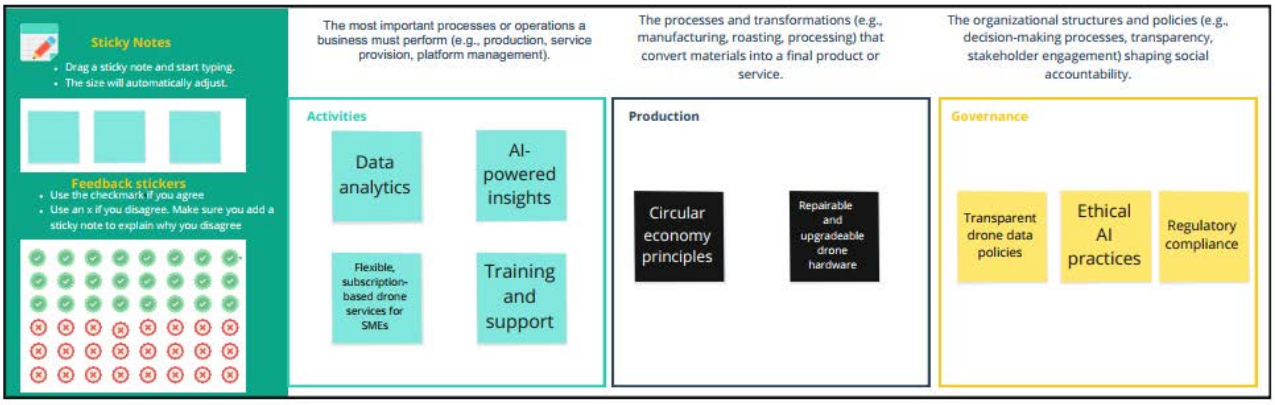
Planning Next Steps [Time: 75–90 min]

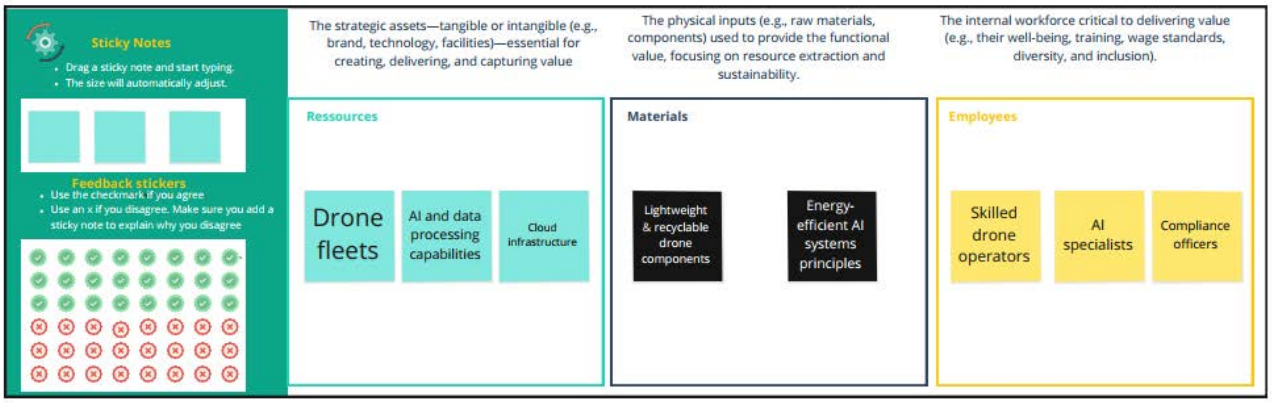
- Suggestions for technical or business-focused workshops
- Topics for future WG meetings (e.g., regulatory hurdles, scaling up, business and governance models etc.)
- Frequency and format of future sessions
- Feedback & closing

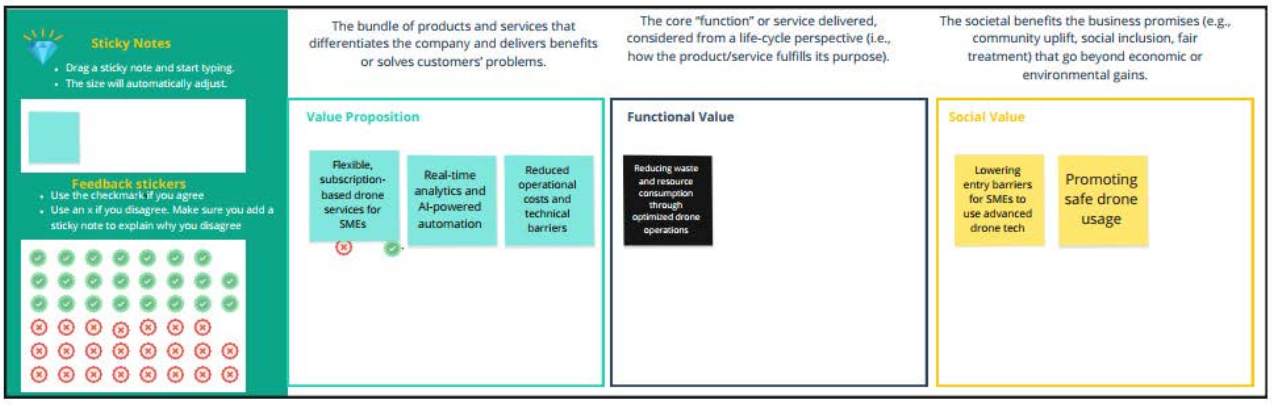
Appendix 3 Triple Layer Business Model Canvases | MIRO boards

Appendix 3.1 Use Case 1 | MIRO Board

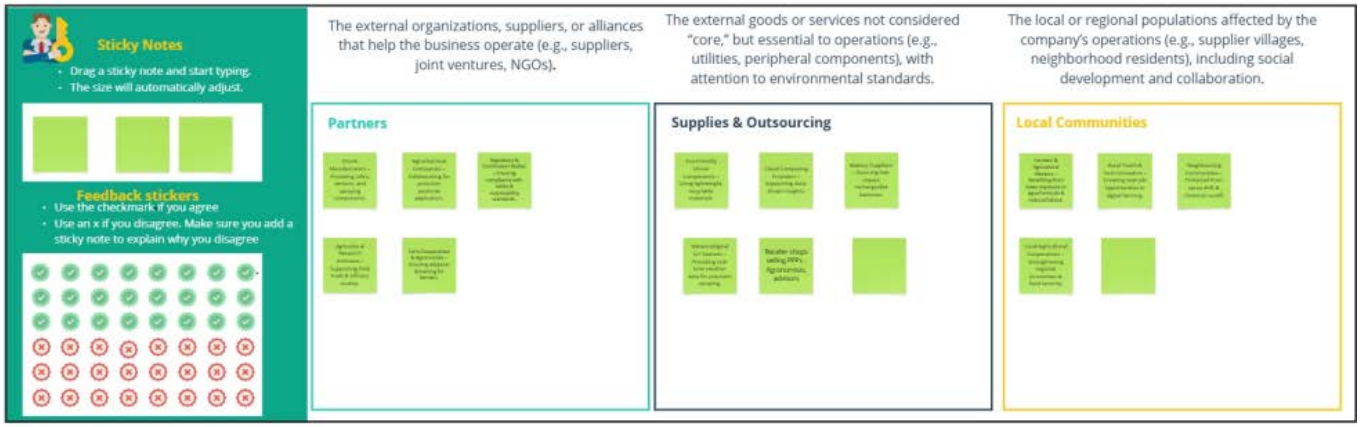


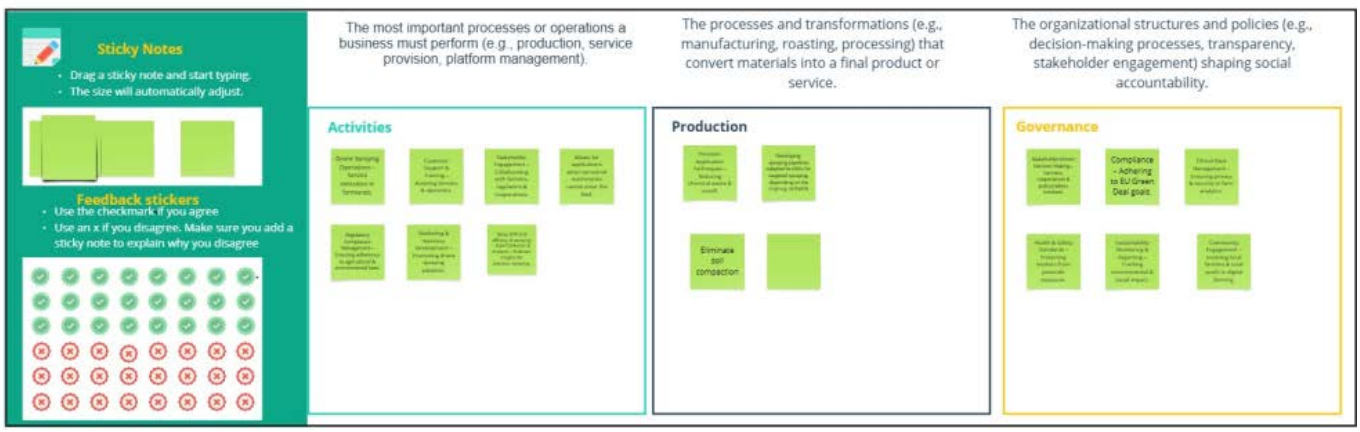


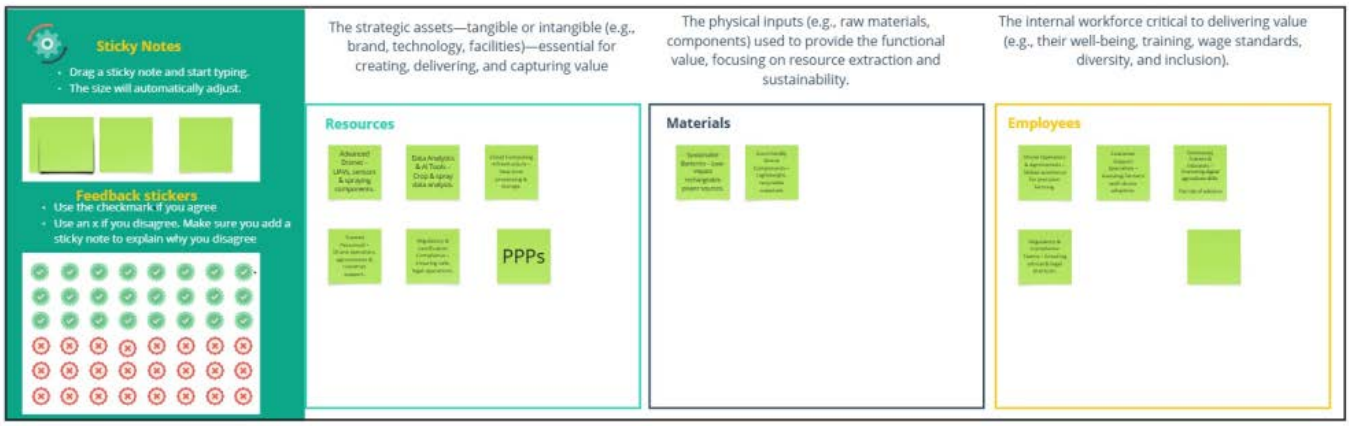


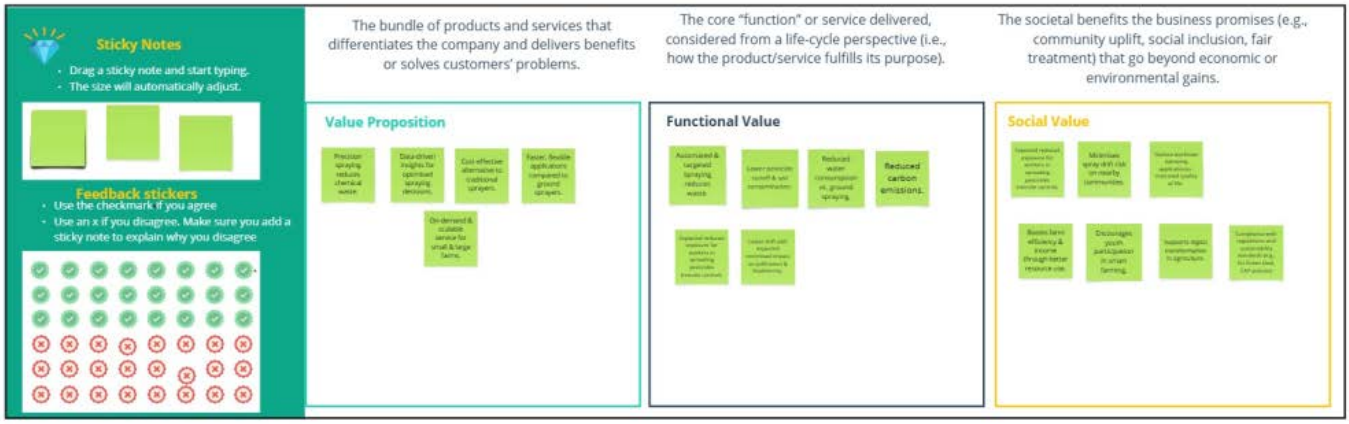


Appendix 3.2 Use Case 2 | MIRO Board






Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The strategic assets—tangible or intangible (e.g., brand, technology, facilities)—essential for creating, delivering, and capturing value
Resources
PPPs
The physical inputs (e.g., raw materials, components) used to provide the functional value, focusing on resource extraction and sustainability.
Materials
The internal workforce critical to delivering value (e.g., their well-being, training, wage standards, diversity, and inclusion).
Employees


Sticky Notes
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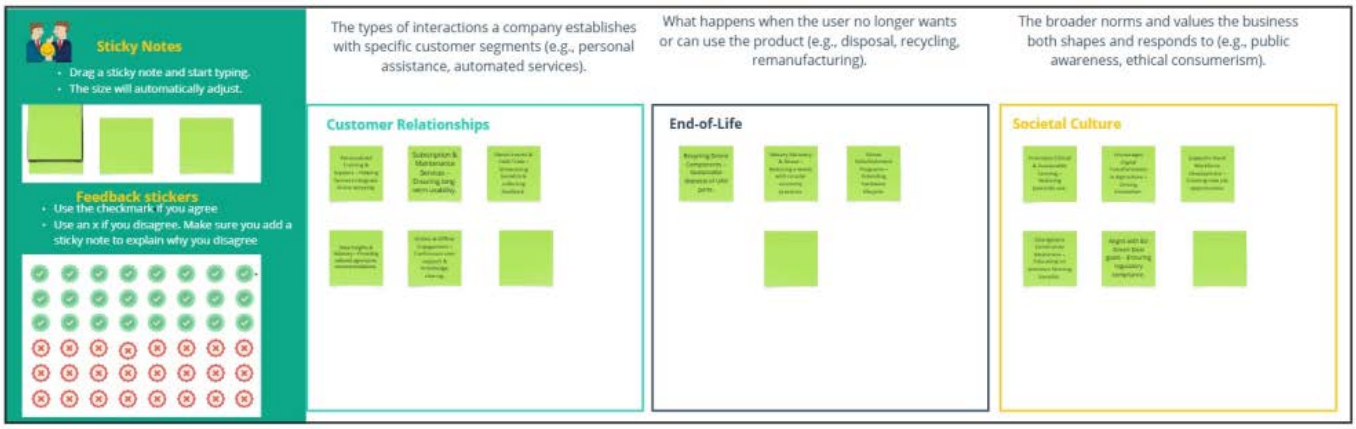
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The bundle of products and services that differentiates the company and delivers benefits or solves customers' problems.
Value Proposition
The core "function" or service delivered, considered from a life-cycle perspective (i.e., how the product/service fulfills its purpose).
Functional Value
Reduced carbon emissions.
The societal benefits the business promises (e.g., community uplift, social inclusion, fair treatment) that go beyond economic or environmental gains.
Social Value


Sticky Notes
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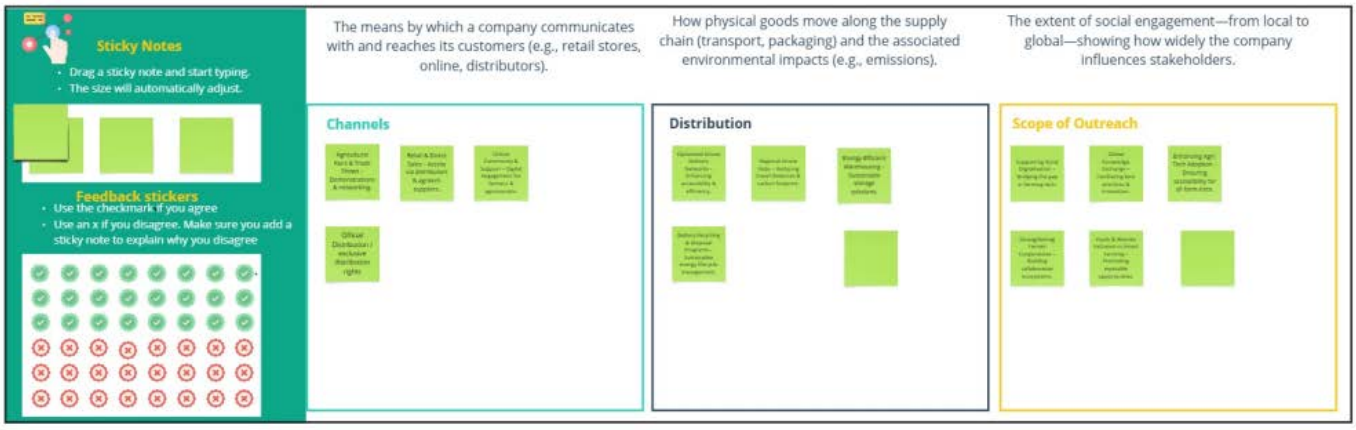
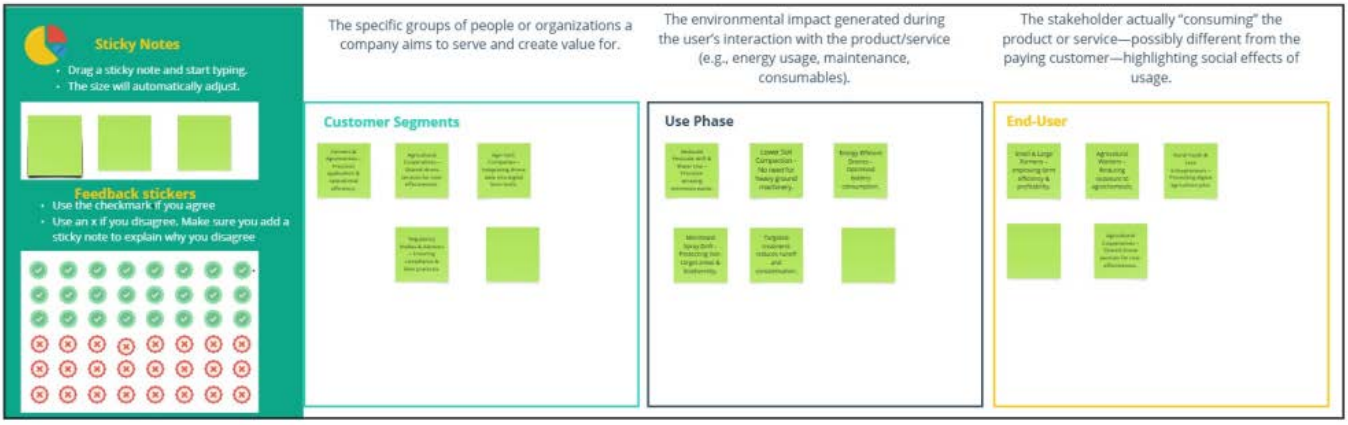
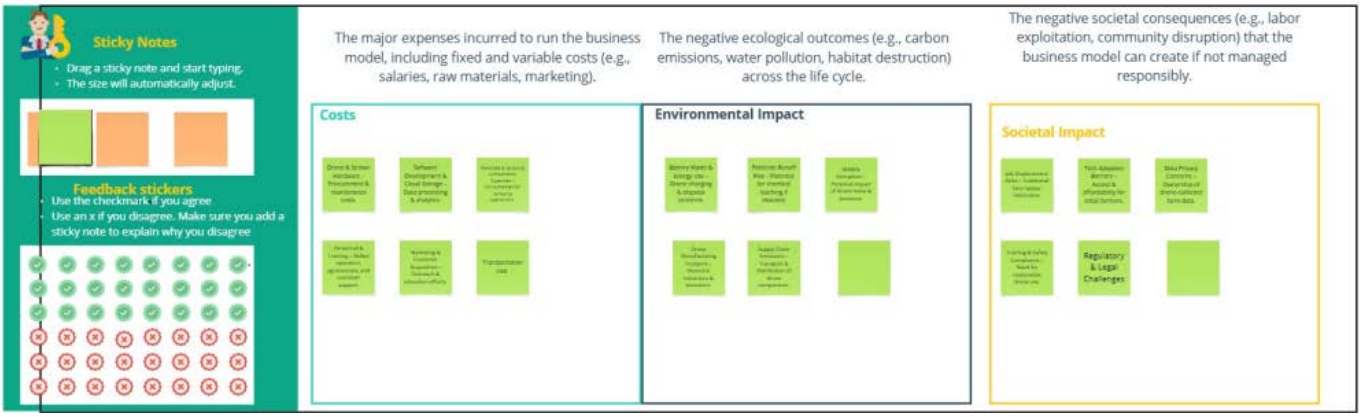
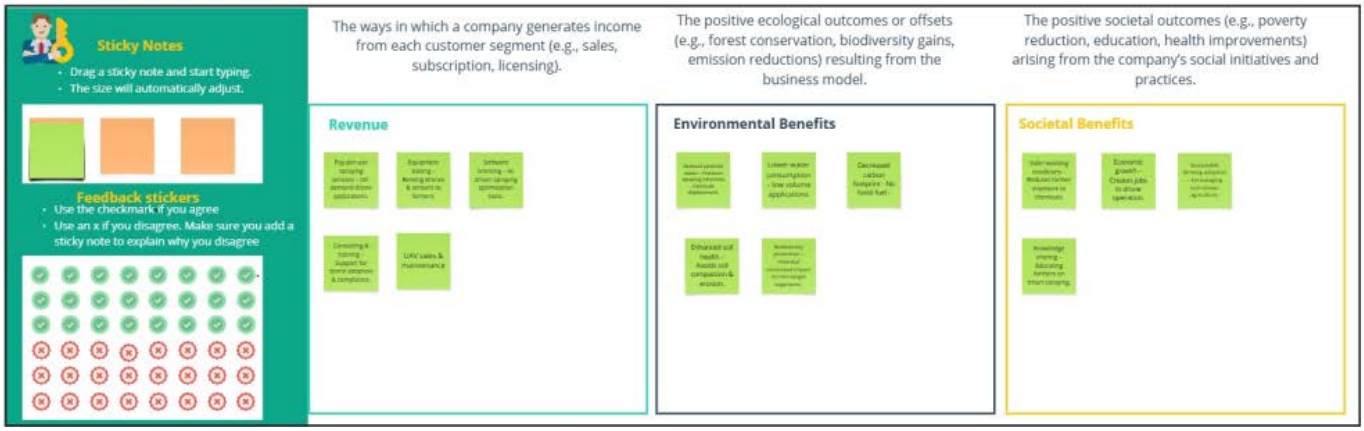
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The types of interactions a company establishes with specific customer segments (e.g., personal assistance, automated services).
Customer Relationships
What happens when the user no longer wants or can use the product (e.g., disposal, recycling, remanufacturing).
End-of-Life
The broader norms and values the business both shapes and responds to (e.g., public awareness, ethical consumerism).
Societal Culture

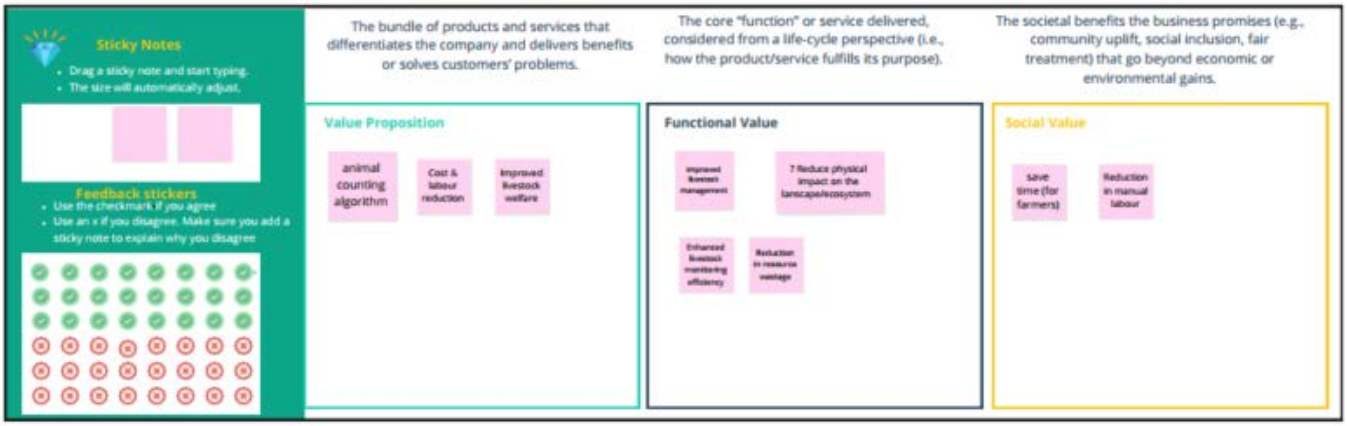

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The means by which a company communicates with and reaches its customers (e.g., retail stores, online, distributors).
Channels
How physical goods move along the supply chain (transport, packaging) and the associated environmental impacts (e.g., emissions).
Distribution
The extent of social engagement—from local to global—showing how widely the company influences stakeholders.
Scope of Outreach

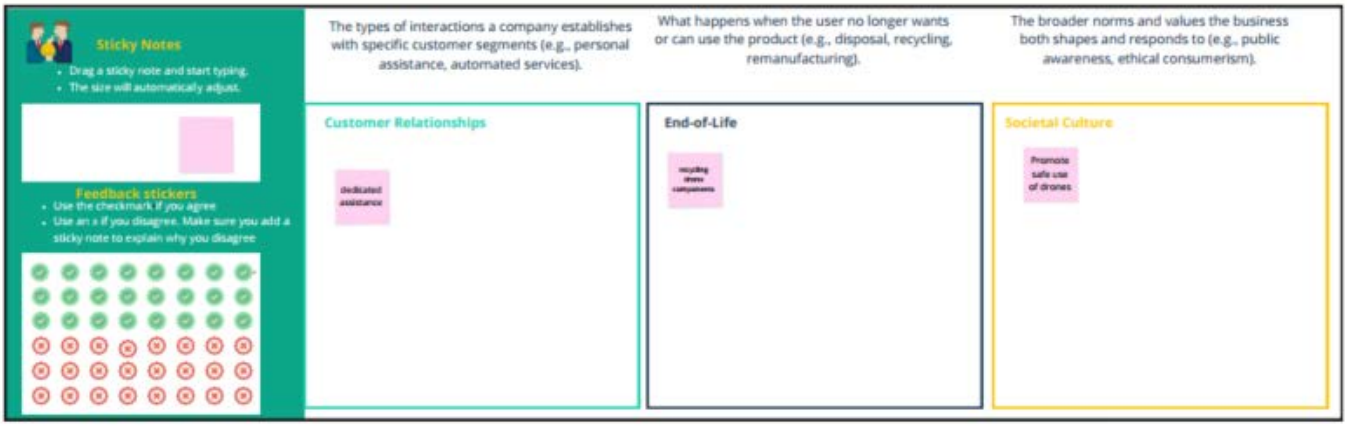

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The specific groups of people or organizations a company aims to serve and create value for.
Customer Segments
The environmental impact generated during the user's interaction with the product/service (e.g., energy usage, maintenance, consumables).
Use Phase
The stakeholder actually "consuming" the product or service—possibly different from the paying customer—highlighting social effects of usage.
End-User

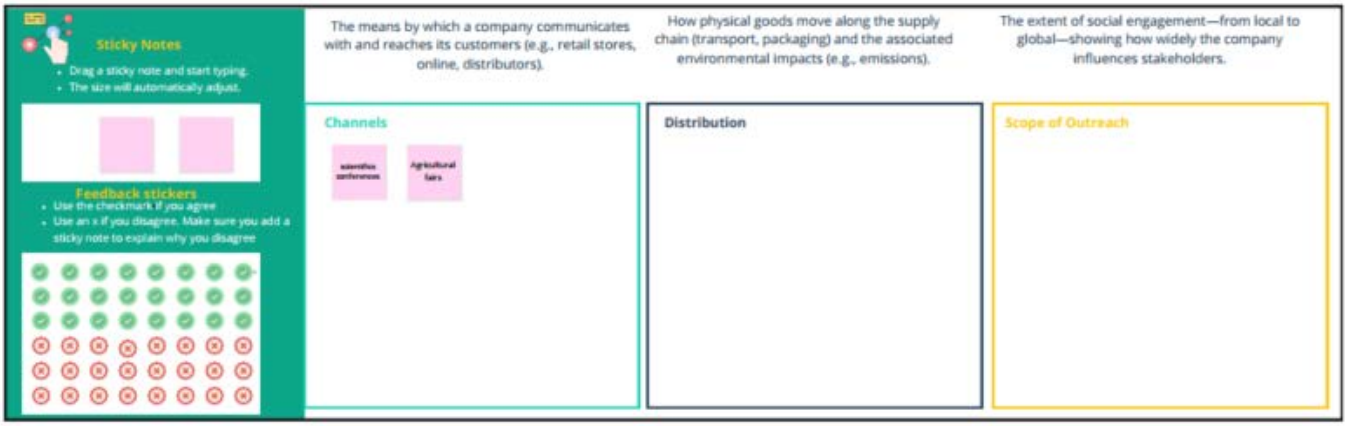

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The major expenses incurred to run the business model, including fixed and variable costs (e.g., salaries, raw materials, marketing).
Costs
The negative ecological outcomes (e.g., carbon emissions, water pollution, habitat destruction) across the life cycle.
Environmental Impact
The negative societal consequences (e.g., labor exploitation, community disruption) that the business model can create if not managed responsibly.
Societal Impact
Regulatory & Legal Challenges

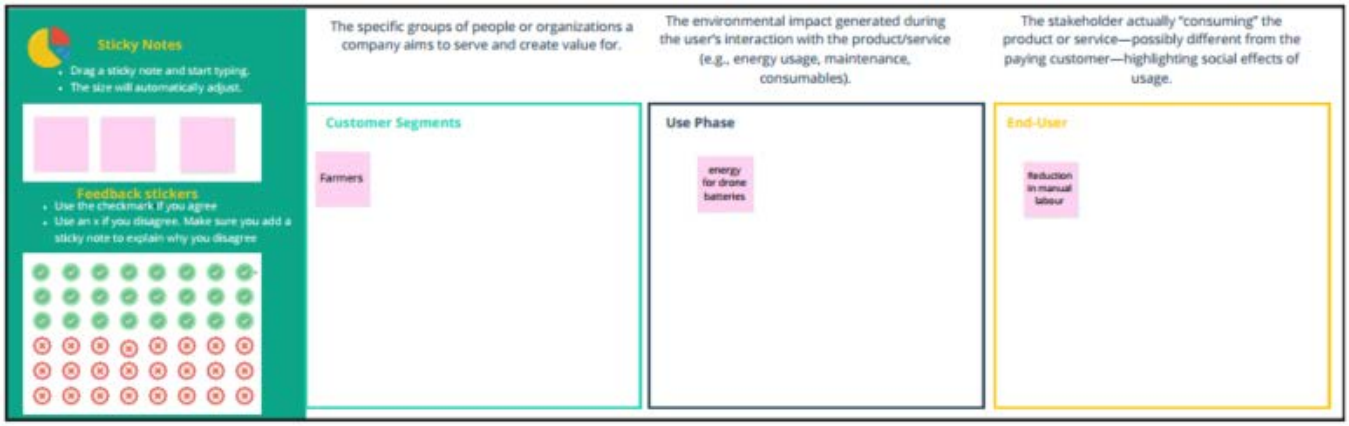

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The ways in which a company generates income from each customer segment (e.g., sales, subscription, licensing).
Revenue
The positive ecological outcomes or offsets (e.g., forest conservation, biodiversity gains, emission reductions) resulting from the business model.
Environmental Benefits
The positive societal outcomes (e.g., poverty reduction, education, health improvements) arising from the company's social initiatives and practices.
Societal Benefits

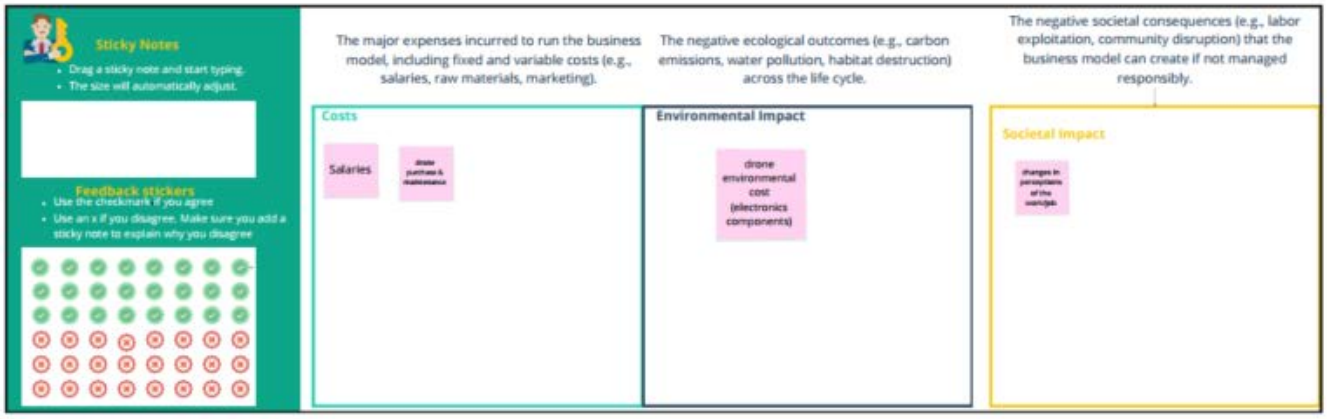
Appendix 3.3 Use Case 3 | MIRO Board

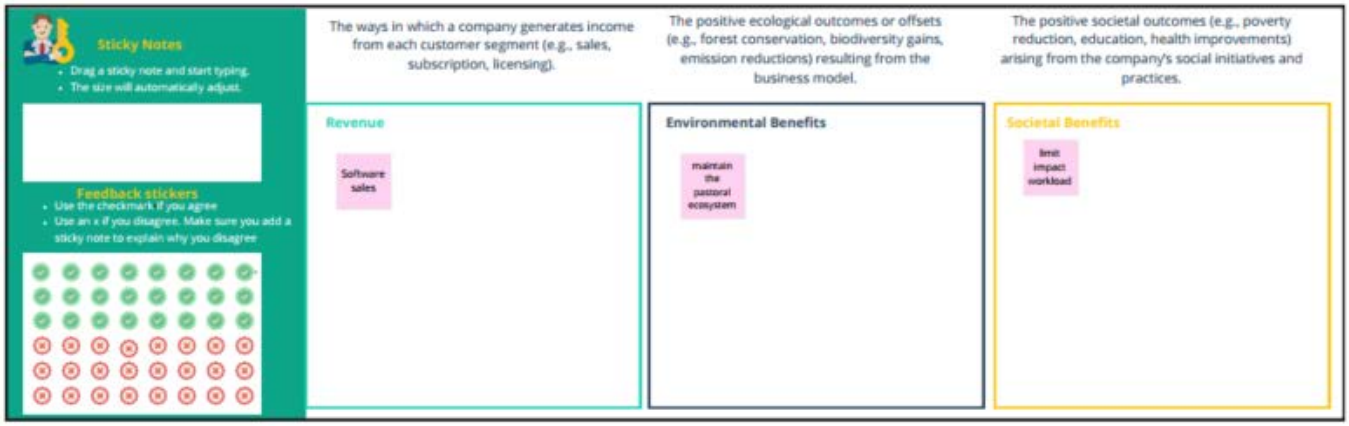

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The bundle of products and services that differentiates the company and delivers benefits or solves customers' problems.
The core "function" or service delivered, considered from a life-cycle perspective (i.e., how the product/service fulfills its purpose).
The societal benefits the business promises (e.g., community uplift, social inclusion, fair treatment) that go beyond economic or environmental gains.
Value Proposition
animal counting algorithm
Cost & labour reduction
Improved livestock welfare
Functional Value
Social Value
save time (for farmers)
Reduction in manual labour


Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The types of interactions a company establishes with specific customer segments (e.g., personal assistance, automated services).
What happens when the user no longer wants or can use the product (e.g., disposal, recycling, remanufacturing).
The broader norms and values the business both shapes and responds to (e.g., public awareness, ethical consumerism).
Customer Relationships
dedicated assistance
End-of-Life
Societal Culture
Promote safe use of drones

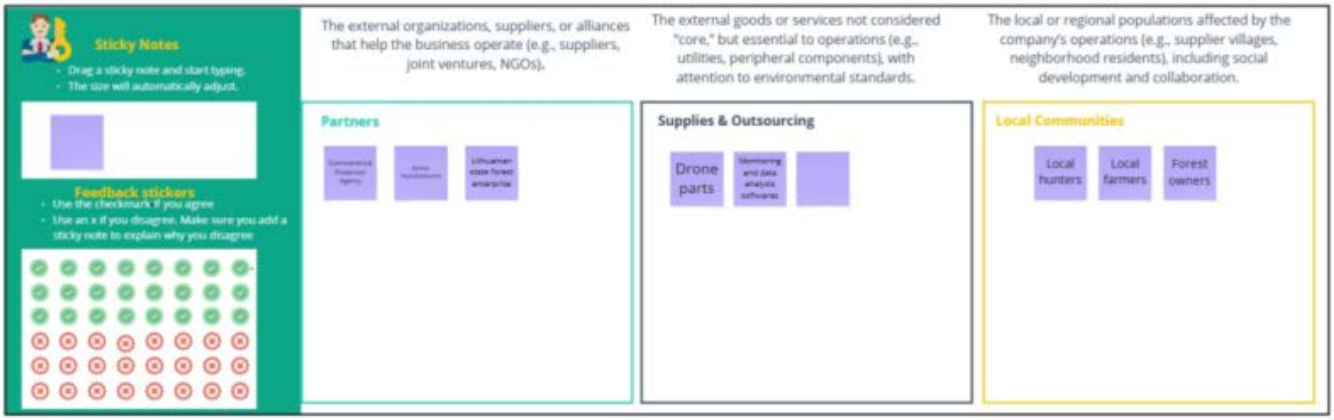

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The means by which a company communicates with and reaches its customers (e.g., retail stores, online, distributors).
How physical goods move along the supply chain (transport, packaging) and the associated environmental impacts (e.g., emissions).
The extent of social engagement—from local to global—showing how widely the company influences stakeholders.
Channels
Agricultural fairs
Distribution
Scope of Outreach

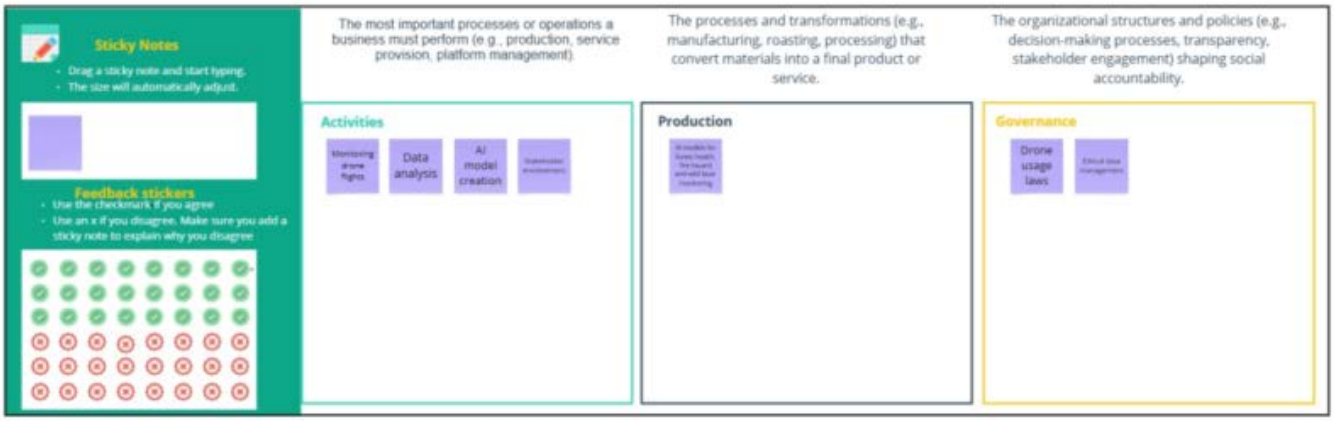

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The specific groups of people or organizations a company aims to serve and create value for.
Customer Segments
Farmers
The environmental impact generated during the user's interaction with the product/service (e.g., energy usage, maintenance, consumables).
Use Phase
energy for drone batteries
The stakeholder actually "consuming" the product or service—possibly different from the paying customer—highlighting social effects of usage.
End-User
Reduction in manual labour

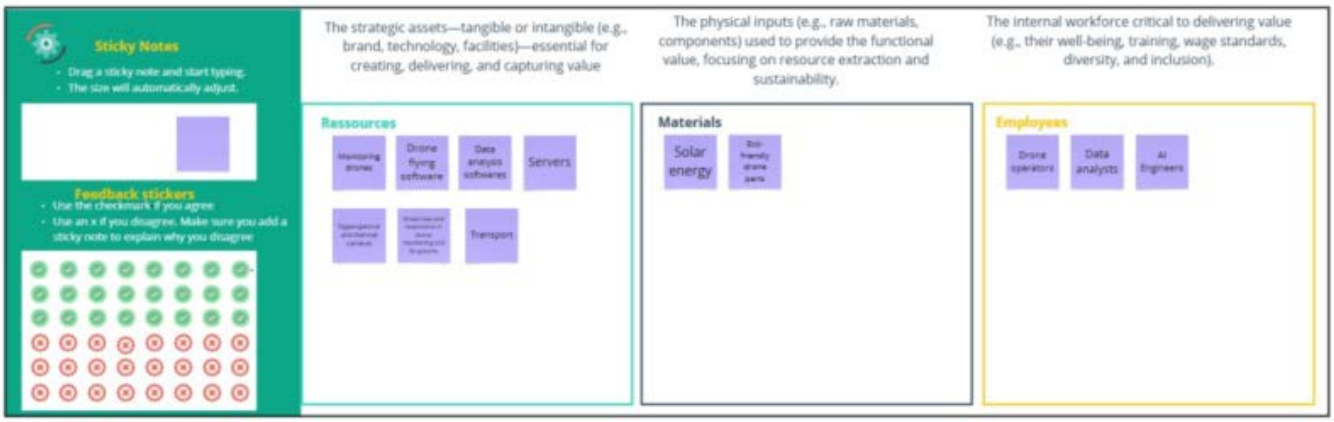

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The major expenses incurred to run the business model, including fixed and variable costs (e.g., salaries, raw materials, marketing).
Costs
Salaries
The negative ecological outcomes (e.g., carbon emissions, water pollution, habitat destruction) across the life cycle.
Environmental Impact
drone environmental cost (electronics components)
The negative societal consequences (e.g., labor exploitation, community disruption) that the business model can create if not managed responsibly.
Societal Impact

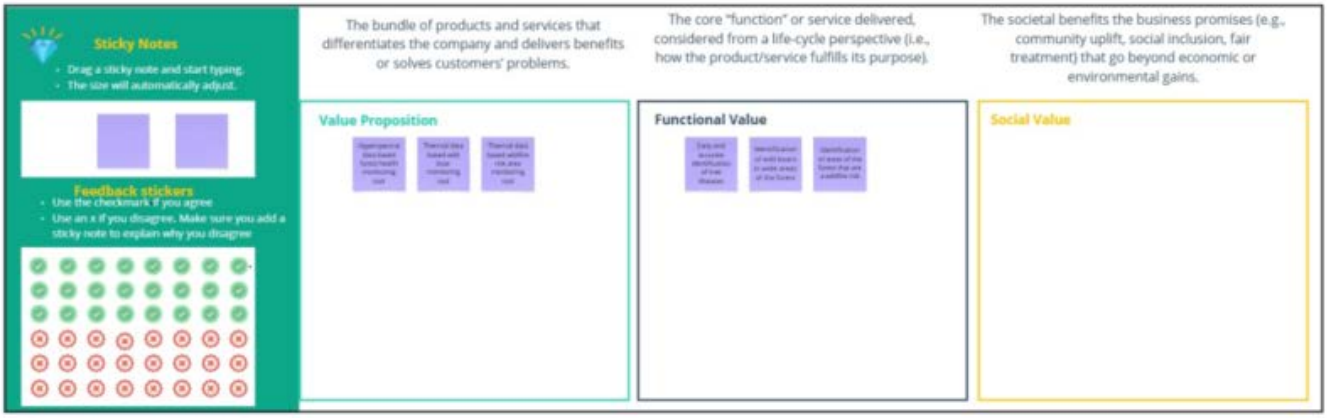

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The ways in which a company generates income from each customer segment (e.g., sales, subscription, licensing).
Revenue
Software sales
The positive ecological outcomes or offsets (e.g., forest conservation, biodiversity gains, emission reductions) resulting from the business model.
Environmental Benefits
maintain the pastoral ecosystem
The positive societal outcomes (e.g., poverty reduction, education, health improvements) arising from the company's social initiatives and practices.
Societal Benefits
limit impact workload

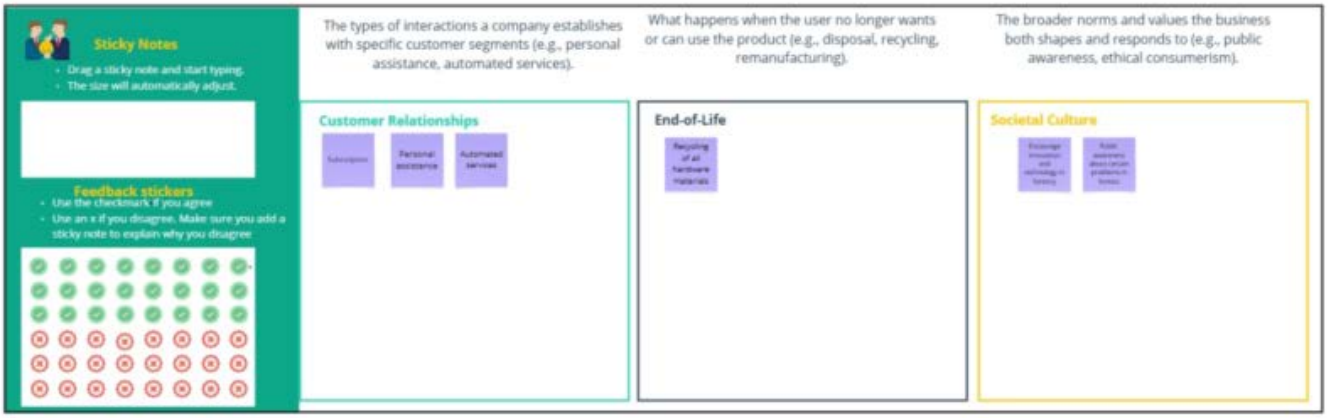
Appendix 3.4 Use Case 4 | MIRO Board

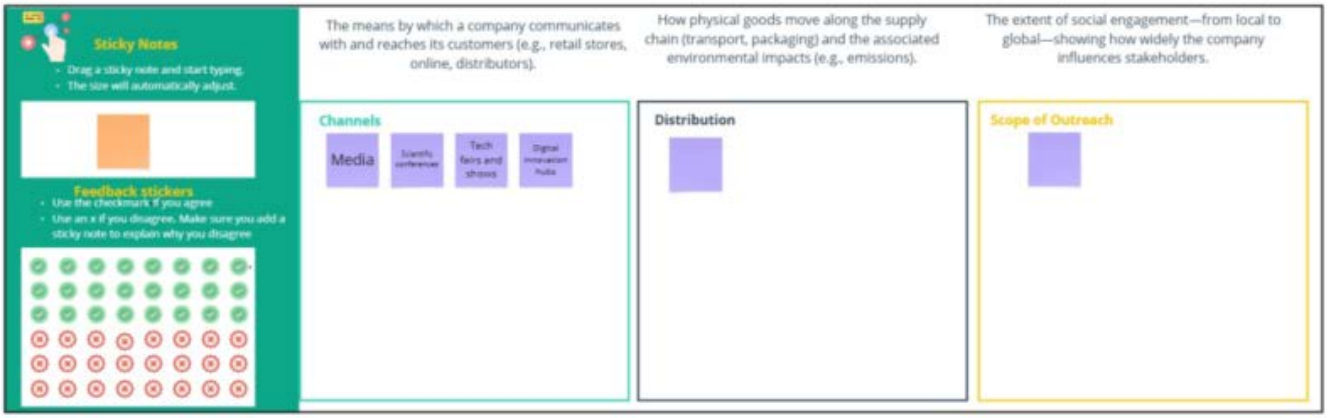


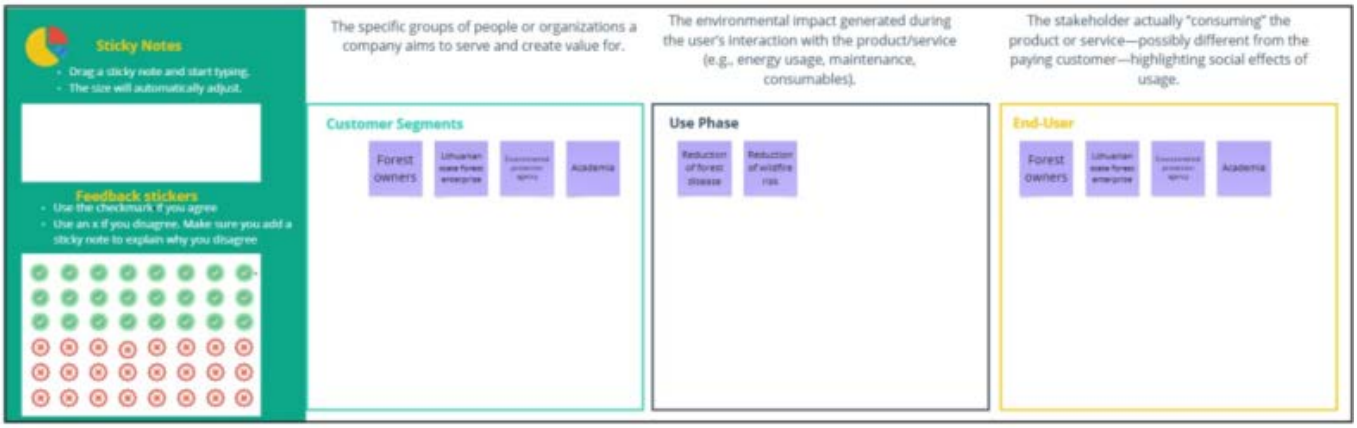




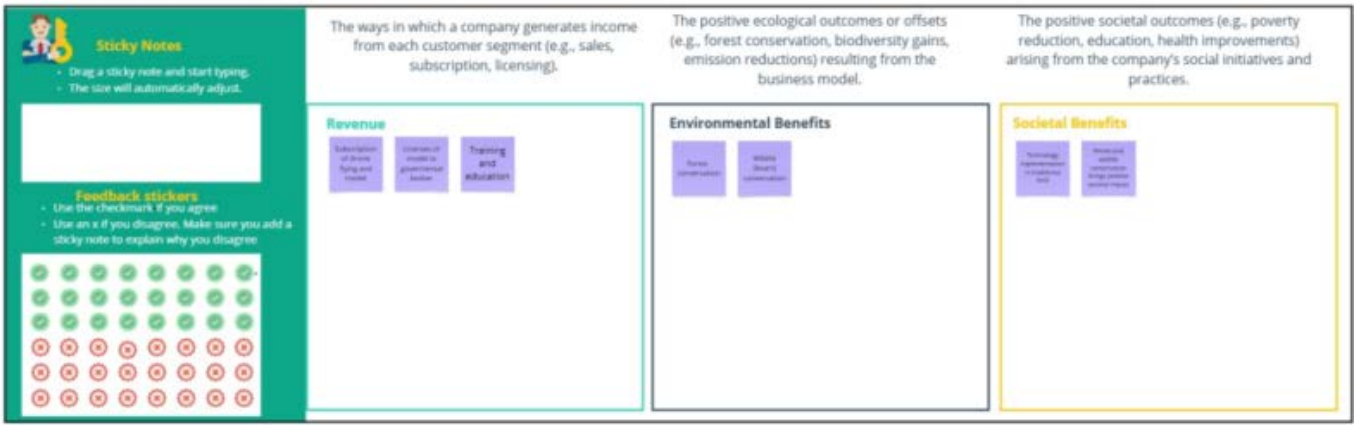

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The bundle of products and services that differentiates the company and delivers benefits or solves customers' problems.
Value Proposition
The core "function" or service delivered, considered from a life-cycle perspective (i.e., how the product/service fulfills its purpose).
Functional Value
The societal benefits the business promises (e.g., community uplift, social inclusion, fair treatment) that go beyond economic or environmental gains.
Social Value


Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The types of interactions a company establishes with specific customer segments (e.g., personal assistance, automated services).
Customer Relationships
What happens when the user no longer wants or can use the product (e.g., disposal, recycling, remanufacturing).
End-of-Life
The broader norms and values the business both shapes and responds to (e.g., public awareness, ethical consumerism).
Societal Culture

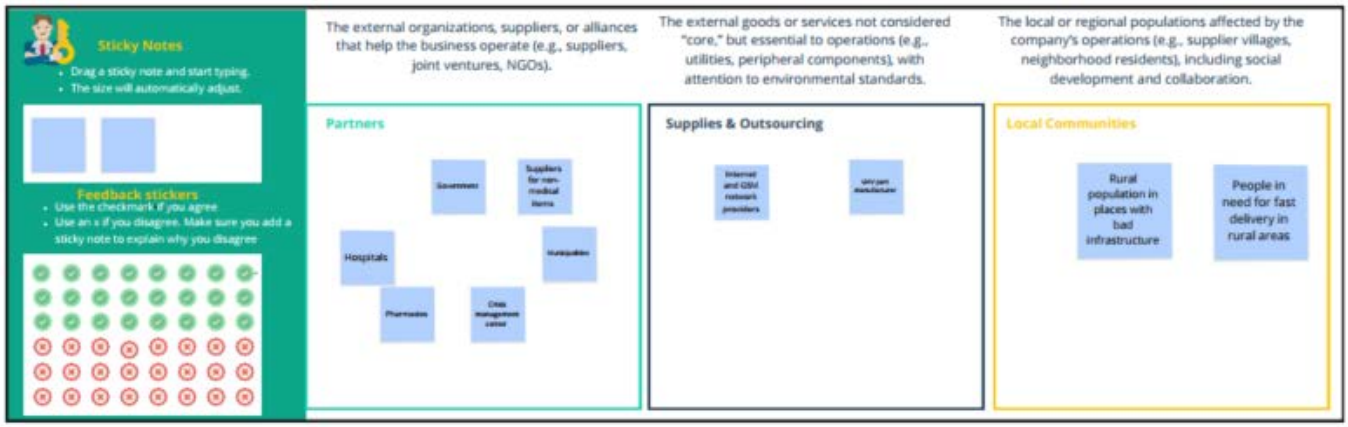

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The means by which a company communicates with and reaches its customers (e.g., retail stores, online, distributors).
Channels
Media
How physical goods move along the supply chain (transport, packaging) and the associated environmental impacts (e.g., emissions).
Distribution
The extent of social engagement—from local to global—showing how widely the company influences stakeholders.
Scope of Outreach

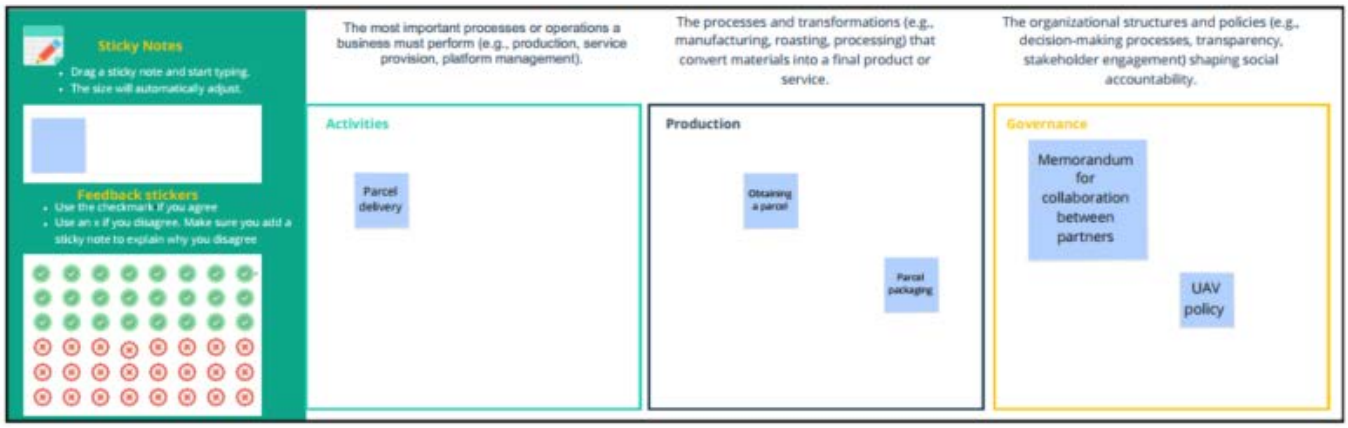

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The specific groups of people or organizations a company aims to serve and create value for.
Customer Segments
Forest owners
Academia
The environmental impact generated during the user's interaction with the product/service (e.g., energy usage, maintenance, consumables).
Use Phase
The stakeholder actually "consuming" the product or service—possibly different from the paying customer—highlighting social effects of usage.
End-User
Forest owners
Academia

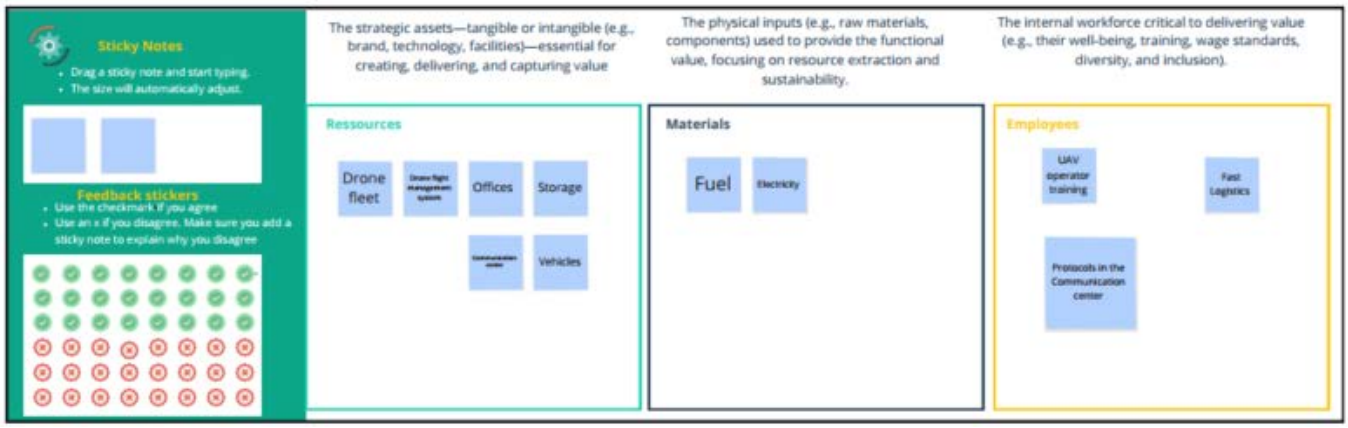

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The major expenses incurred to run the business model, including fixed and variable costs (e.g., salaries, raw materials, marketing).
Costs
Personnel
The negative ecological outcomes (e.g., carbon emissions, water pollution, habitat destruction) across the life cycle.
Environmental Impact
Energy usage
The negative societal consequences (e.g., labor exploitation, community disruption) that the business model can create if not managed responsibly.
Societal Impact

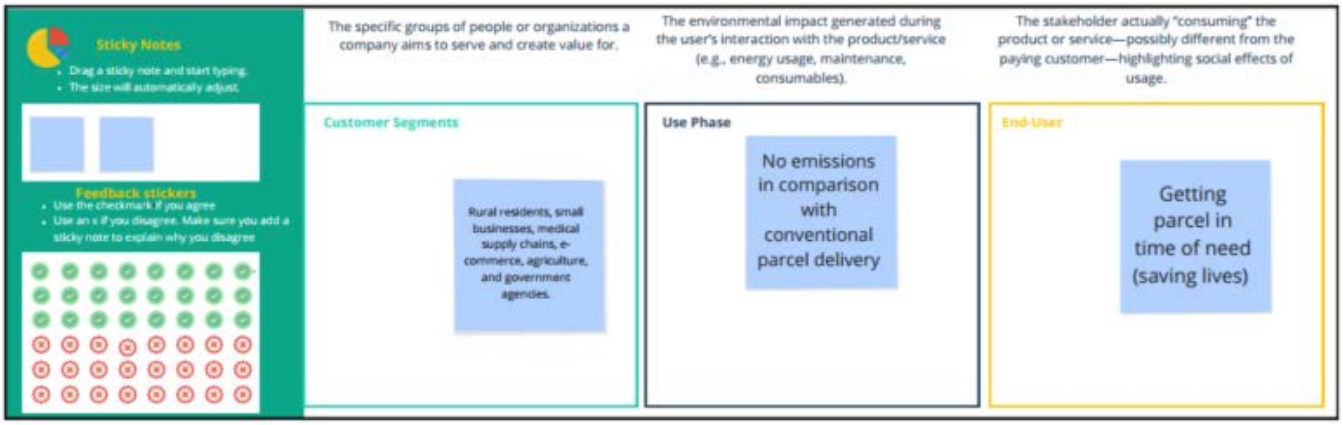

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The ways in which a company generates income from each customer segment (e.g., sales, subscription, licensing).
Revenue
Training and education
The positive ecological outcomes or offsets (e.g., forest conservation, biodiversity gains, emission reductions) resulting from the business model.
Environmental Benefits
The positive societal outcomes (e.g., poverty reduction, education, health improvements) arising from the company's social initiatives and practices.
Societal Benefits

Appendix 3.5 Use Case 5 | MIRO Board

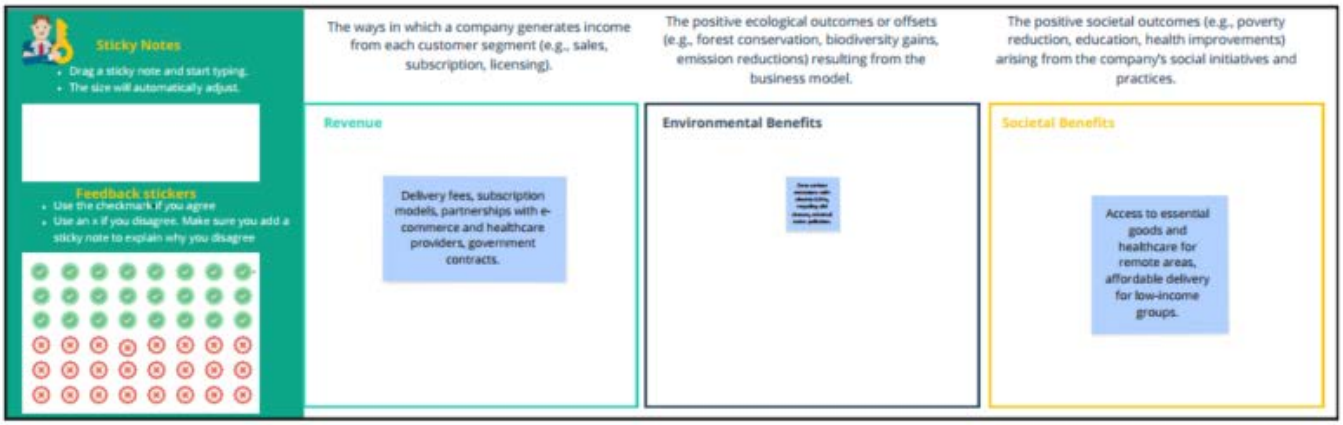




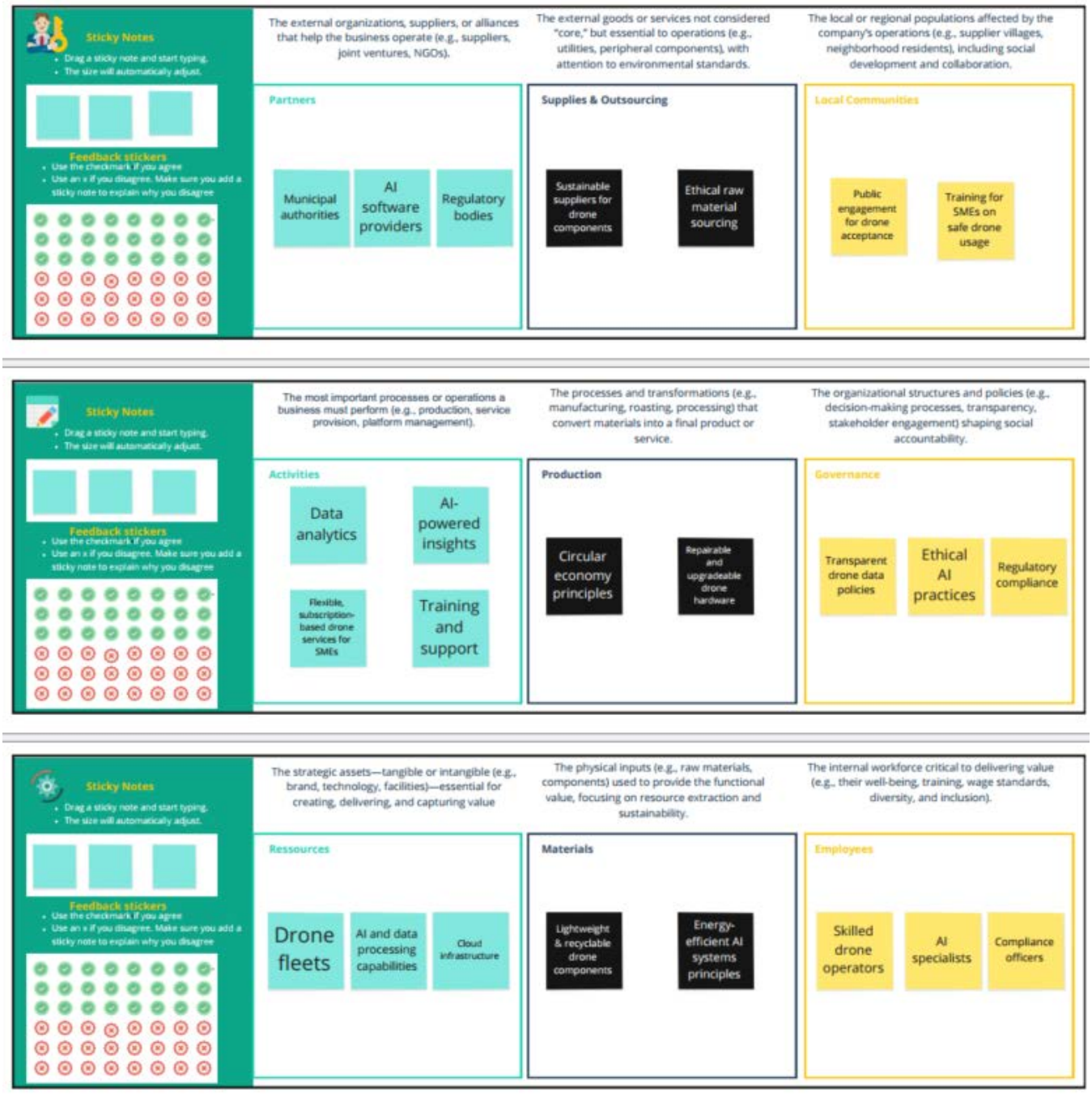


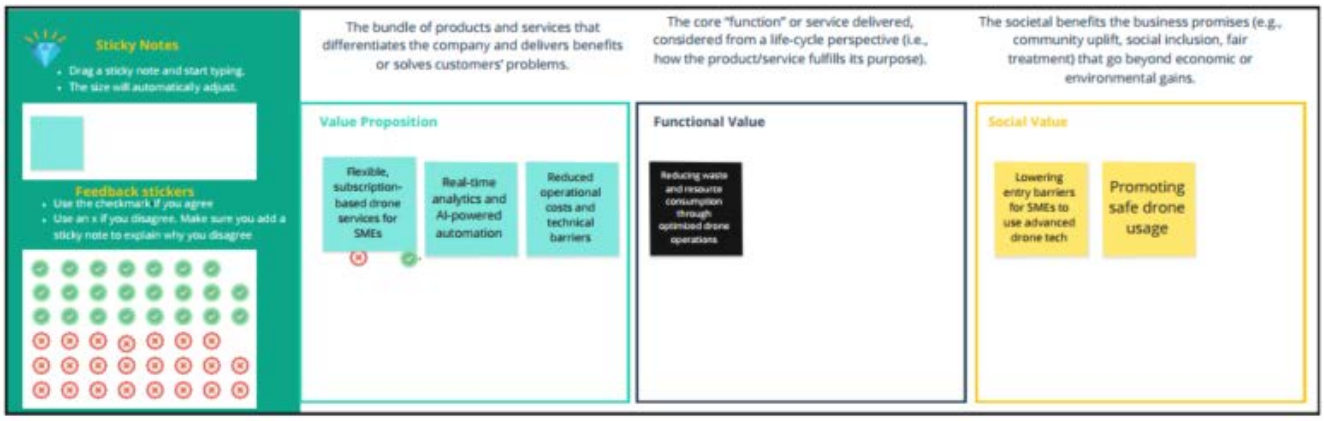

Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The specific groups of people or organizations a company aims to serve and create value for.
The environmental impact generated during the user's interaction with the product/service (e.g., energy usage, maintenance, consumables).
The stakeholder actually "consuming" the product or service—possibly different from the paying customer—highlighting social effects of usage.
Customer Segments
Rural residents, small businesses, medical supply chains, e-commerce, agriculture, and government agencies.
Use Phase
No emissions in comparison with conventional parcel delivery
End-User
Getting parcel in time of need (saving lives)


Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The major expenses incurred to run the business model, including fixed and variable costs (e.g., salaries, raw materials, marketing).
The negative ecological outcomes (e.g., carbon emissions, water pollution, habitat destruction) across the life cycle.
The negative societal consequences (e.g., labor exploitation, community disruption) that the business model can create if not managed responsibly.
Costs
Drone manufacturing, maintenance, software development, personnel costs, insurance, compliance, and operational costs.
Environmental Impact
educed road congestion, lower CO_2 emissions compared to traditional vehicles, conservation of natural habitats by minimizing land infrastructure needs.
Societal Impact
Faster medical response times, reduced urban-rural divide in logistics, improved quality of life for rural populations.


Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The ways in which a company generates income from each customer segment (e.g., sales, subscription, licensing).
The positive ecological outcomes or offsets (e.g., forest conservation, biodiversity gains, emission reductions) resulting from the business model.
The positive societal outcomes (e.g., poverty reduction, education, health improvements) arising from the company's social initiatives and practices.
Revenue
Delivery fees, subscription models, partnerships with e-commerce and healthcare providers, government contracts.
Environmental Benefits
Societal Benefits
Access to essential goods and healthcare for remote areas, affordable delivery for low-income groups.

Appendix 3.6 Daas | MIRO Board




Sticky Notes
Drag a sticky note and start typing.
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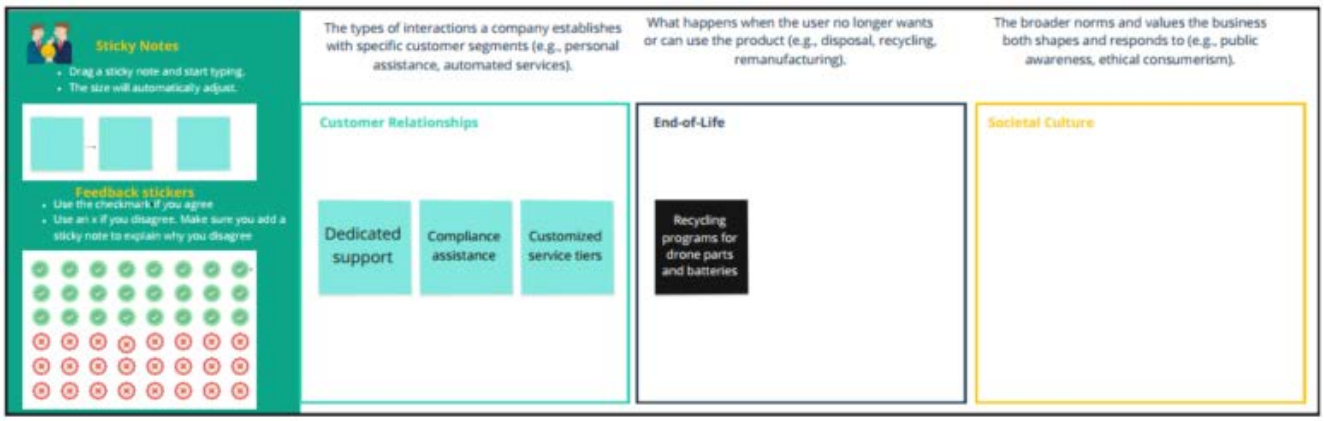
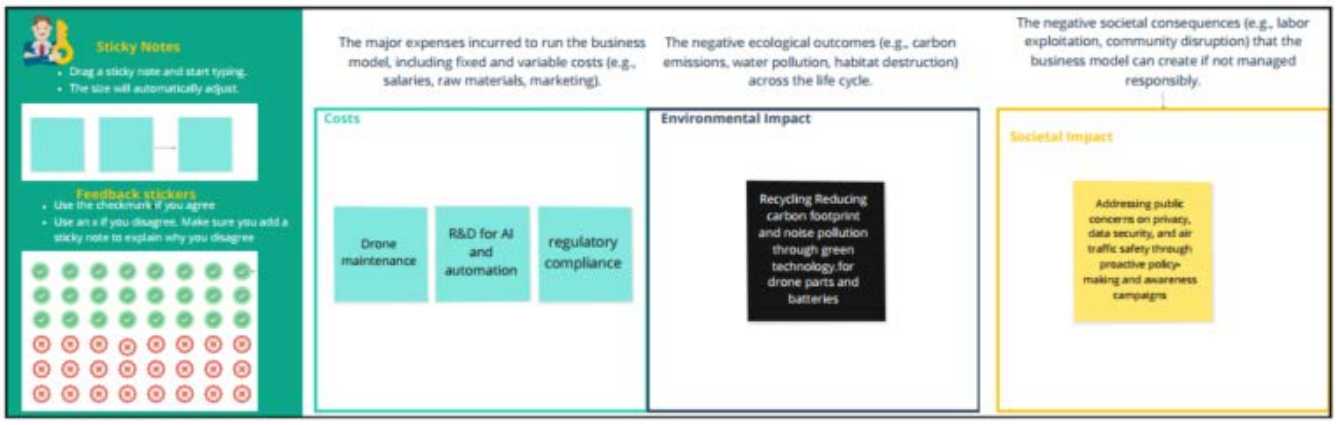
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The bundle of products and services that differentiates the company and delivers benefits or solves customers' problems.
The core "function" or service delivered, considered from a life-cycle perspective (i.e., how the product/service fulfills its purpose).
The societal benefits the business promises (e.g., community uplift, social inclusion, fair treatment) that go beyond economic or environmental gains.
Value Proposition
Flexible, subscription-based drone services for SMEs
Real-time analytics and AI-powered automation
Reduced operational costs and technical barriers
Functional Value
Reducing waste and resource consumption through optimized drone operations
Social Value
Lowering entry barriers for SMEs to use advanced drone tech
Promoting safe drone usage


Sticky Notes
Drag a sticky note and start typing.
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The types of interactions a company establishes with specific customer segments (e.g., personal assistance, automated services).
What happens when the user no longer wants or can use the product (e.g., disposal, recycling, remanufacturing).
The broader norms and values the business both shapes and responds to (e.g., public awareness, ethical consumerism).
Customer Relationships
Dedicated support
Compliance assistance
Customized service tiers
End-of-Life
Recycling programs for drone parts and batteries
Societal Culture


Sticky Notes
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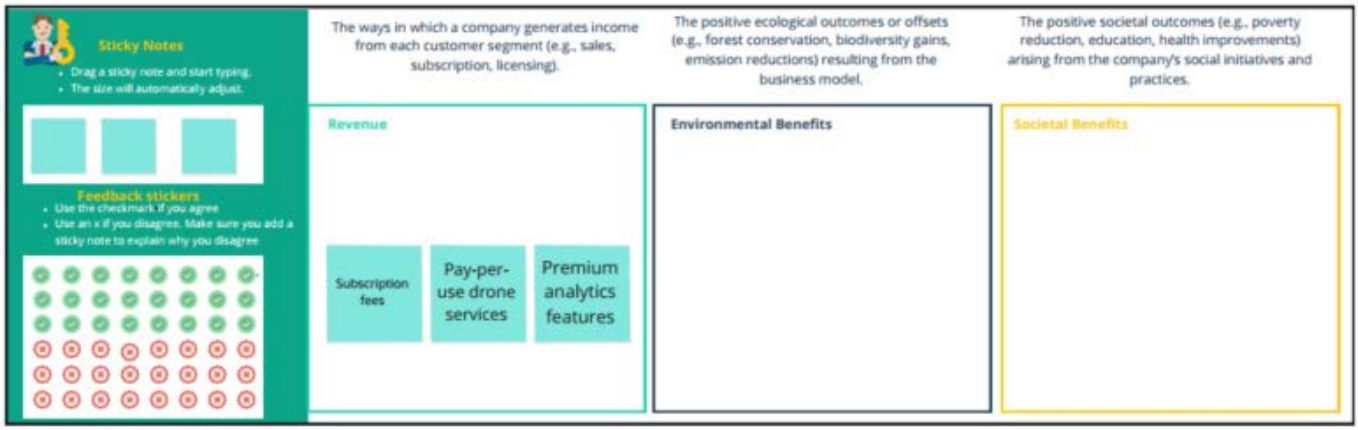
The size will automatically adjust.
Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The major expenses incurred to run the business model, including fixed and variable costs (e.g., salaries, raw materials, marketing).
The negative ecological outcomes (e.g., carbon emissions, water pollution, habitat destruction) across the life cycle.
The negative societal consequences (e.g., labor exploitation, community disruption) that the business model can create if not managed responsibly.
Costs
Drone maintenance
R&D for AI and automation
regulatory compliance
Environmental Impact
Recycling Reducing carbon footprint and noise pollution through green technology for drone parts and batteries
Societal Impact
Addressing public concerns on privacy, data security, and air traffic safety through proactive policy-making and awareness campaigns


Sticky Notes
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Feedback stickers
Use the checkmark if you agree
Use an x if you disagree. Make sure you add a sticky note to explain why you disagree
The ways in which a company generates income from each customer segment (e.g., sales, subscription, licensing).
The positive ecological outcomes or offsets (e.g., forest conservation, biodiversity gains, emission reductions) resulting from the business model.
The positive societal outcomes (e.g., poverty reduction, education, health improvements) arising from the company's social initiatives and practices.
Revenue
Subscription fees
Pay-per-use drone services
Premium analytics features
Environmental Benefits
Societal Benefits

END OF DOCUMENT