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Bloem Relaxation Pod

- Amalie Hjorth Wyke
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Abstract

Modern work environments often lack quiet retreats where people can take a brief break and recharge their batteries. Especially in open plan offices or high traffic learning environments, noise, sensory overload and stress can impair concentration and well-being. As part of the European Project Semester 2026, our interdisciplinary team from various study programs and nationalities worked on a solution to this problem.

The resulting concept “Bloem” is a compact relaxation pod specifically designed for brief breaks during the workday. The goal is to create a shielded space that offers a quiet environment both acoustically and atmospherically. The use of appropriate materials and a well-thought-out design incorporating lighting and optional sound elements aims to provide a pleasant user experience.

Throughout the project, aspects such as sustainability, user-friendliness, and practical feasibility were taken into account. From the initial idea through market analysis to the development of the product, the central question remained: how can modern work environments be improved through simple yet effective solutions?

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Glossary

Abbreviation	Description
EPS	European Project Semester
ISEP	Instituto Superior de Engenharia do Porto
USB	Universal Serial Bus
WHO	World Health Organization

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Introduction

This project was developed as part of the European Project Semester (EPS) at ISEP. The EPS programme gives engineering students from different countries and academic fields the opportunity to collaborate on a multidisciplinary project during one semester. Working in an international team allows students to share their knowledge, approach problems from different perspectives, and develop practical solutions to real engineering challenges.

Throughout the semester, the team worked under academic supervision while managing the project and its development. The outcome presented in this report was produced by the group of students listed in Table 1.

Presentation

An overview of the team members and their backgrounds is presented below in Table 1.

Table 1: Team Members and backgrounds.

Group member	Background	Origin
Carlota Isabel Alcaraz Miralles	Mechanical Engineering & Industrial Design	ES
Amalie Hjorth Wyke	Health Technology	DK
Jordan Kai-ko Jeroen Dorigoni	Architecture & Town Planning	NL
Lena Schilling	Information Technology	PL
Timon Niedergriese	Data Science	DE
Mohammad Yousef Ghaleb Jaber	Computer Engineering	JO

Motivation

During one of the first sessions, several possible project themes were presented to all of the groups. Each team selected three topics that seemed the most interesting. Our main preferences were Smartification of Buildings, Smart Health & Wellbeing, and Smartification of Everyday Objects. Before making the final decision, the team briefly discussed possible problems and potential solutions within these areas in order to better evaluate which direction could be the most suitable. After the preferences were collected, the topic assigned to our team was Smartification of Buildings. However, the specific problem we eventually decided to address within this theme turned out to be different from the idea we had originally considered during the first brainstorming discussions.

Individual Motivation

- Carlota: I chose the EPS program because, after finishing my individual final degree project, I really wanted a new experience that focused more on teamwork. I was looking for the chance to see how a real project comes to life while working together with people from different backgrounds.
- Amalie: I chose EPS to have the opportunity to work on a project with group members from diverse educational and cultural backgrounds. This collaborative environment creates a

dynamic workspace that includes a wide range of perspectives and skills.
- Kai-Ko: I chose the EPS project to have the experience of studying abroad with people from different cultures and education backgrounds. I want to get in touch with the Portugees culture and developing me personally by living abroad and meeting new people.
- Lena: I picked the EPS program to get some hands-on experience and move away from just doing exams. As an IT student, I usually work on digital things, so helping build something tangible while collaborating with people from different countries sounded like a great challenge.“
- Timon: I chose the EPS because it offers the opportunity to work on a practical project instead of focusing solely on exams. In addition, I was interested in meeting people from different backgrounds and see it as a great way to develop personally.
- Mohammad: I chose the EPS program because I believe it is the perfect way to spend an Erasmus semester, gaining practical experience without focusing all my energy on regular exams. I also like the idea of being part of a group throughout the semester to spend time together.

Problem

Mental health conditions such as anxiety, depression and chronic stress are the biggest concerns in modern society and workplaces. According to the World Health Organization (WHO) about 1 out of 8 people experience a mental health disorder once in their life **[1]**. This can occur from high workloads, lack of control or poor support. These mental health issues are not only a personal problem, they also have a high impact on the economy and productivity of companies. WHO estimates that only from depression and anxiety there is a loss of 12 billion working days annually, which is equal to about 1 trillion $ each year due to loss of productivity **[2]**. In addition poor mental health results in increased absenteeism, difficulties with decision-making and higher turnover rates.

Research shows that even very short breaks during the workday can have a meaningful impact on employees’ well-being and energy levels. These so-called microbreaks are brief, voluntary pauses from work activities. A study by Kim, Cho, and Park (2022) found that employees who took short breaks throughout the day were better able to manage their energy and stay engaged with their work, particularly on days when they already felt tired **[3]**.

Objectives

With Bloem the objective is to design a small, enclosed space where people are able to take a short break from their stressful daily environments. Often it's difficult to find a relaxing spot in the office. The idea behind Bloem is to create a capsule that reduces the outside noises as well keeping sound in the capsule, so users have a safe space where they feel undisturbed and without affecting others. This shall be achieved with different layers of various materials.

The space should be used for short sessions up to 15 minutes. During that time the user should be engaged to do simple activities like meditation, breathing exercise, stretching or just relax to nature sounds. Soft lightning and calm interior is supposed to back up the whole experience. At the same time the design should be practical and fit into existing spaces.

Overall, Bloem aims to offer a simple way to create moments of calm in otherwise busy environments.

Requirements

The requirements were defined from the user & buyer perspective (not the same), focusing on creating a space that allows short moments of relaxation and mental recovery in busy environments. As a user, I want:

- a quiet and enclosed space where I am not disturbed by outside noise
- a place where I can relax without feeling observed or interrupted
- a noticeable reduction of sound from both inside and outside the capsule
- a comfortable interior where I can sit, lean, or just relax for a few minutes
- a calming atmosphere that helps me relax quickly
- soft, adjustable lighting that is not too bright or distracting
- a space that is easy to enter and use without instructions
- a short-use experience (around 5–15 minutes) that fits into my daily routine
- enough room to feel comfortable, but still compact
- natural or sustainable materials that feel pleasant and not artificial
- a design that feels safe, clean, and inviting
- a space that can be placed in offices or shared environments without taking up too much space

Tests

Functional Tests

- F1 – Acoustics: Assessing the extent to which external noise is reduced inside and how much sound escapes to the outside.
- F2 – Lighting Environment: Evaluating whether the lighting creates a pleasant and calming atmosphere.
- F3 – Ventilation: Ensuring that there is sufficient air circulation and that users feel comfortable while using the space.

Technical Tests

- T1 – Door Functionality: Testing ease of use (opening/closing), stability and sound insulation.
- T2 – Stability & Material Performance: Check structural stability, durability, resistance to everyday use and how easy the materials are to clean.

Usability Tests

- U1 – User-Friendliness: Check whether the capsule can be used intuitively without instructions.
- U2 – User Experience: Gather feedback on comfort, atmosphere and perceived relaxation.

Report Structure

Chapter	Description
1. Introduction	Overview of the project, team, and objectives.
2. Background and Related Work	Key research and existing solutions.
3. Project Management	Team organization and workflow.
4. Marketing Plan	Target audience and promotion strategy.

Chapter	Description
5. Eco-efficiency Measures for Sustainability	Environmental and social considerations.
6. Ethical and Deontological Concerns	Moral and ethical implications.
7. Project Development	Steps and iterations from concept to solution.
8. Conclusions	Summary of results and lessons learned.

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Background and Related Work

Introduction

To develop the best possible product for the market, it is essential to investigate existing solutions. Therefore, this section presents a state-of-the-art review, including an analysis of five products that either offer similar functionality or provide user experience comparable to what we aim to achieve with our product. Finally, these products are compared to identify their strengths and weaknesses in relation to our solution in a comparative analysis.

Concepts

Bloem is designed as a private space that supports brief mental breaks during the day. A dedicated environment for restoration rather than productivity. Unlike conventional office settings, it prioritizes mental recovery, giving users a moment to step away from constant demands. In today's fast-paced, efficiency-driven routines, even short pauses can make a real difference, reducing stress and mental fatigue.

Research shows that short, structured breaks during work help relieve cognitive load and restore mental energy. A recent meta-analysis found that regular micro-breaks significantly lower fatigue and boost energy, even in high-pressure, productivity-focused workdays **[4]**.

Key aspectsinclude:

- The user experience
- Privacy and personal space
- Sensory stimulation

By combining light, sound, airflow and an enhanced sense of personal privacy, the dome creates an immersive micro-environment that supports short-term restoration and enhances well-being in busy, demanding settings.

Products

In this section, we describe products that are comparable to our solution but are already available on the market.

Figure 1 shows the Framery Pod, a workspace and meeting pod designed for office buildings and universities. Instead of traditional meeting rooms, some workplaces use smaller, sound-insulated pods for focused group work. The Framery Pod includes features as sound insulation (up to 30 dB), adjustable lighting, ventilation, and USB/power outlets. Framery provides a flexible space where group work can be optimized in a controlled, sound-insulated environment, offering separation from the surrounding office area.

Figure 1: Framery Four **[5]**

Figure 2 shows the Breehealth pod. It is a high-tech relaxation capsule designed for rest and mental recovery. The design is large and visually dominant, making it a clear focal point in the space. The user sits in a zero-gravity massage chair inside the capsule, creating a supported resting position. Unlike more open designs, the pod is non-transparent, ensuring a high level of privacy as users are fully enclosed and shielded from their surroundings. This enhances the sense of separation from the external environment. The pod includes features such as guided meditation programs, an integrated audio system, light therapy, and sound reduction, all supporting both physical relaxation and mental well-being.

Figure 2: Breehealth **[6]**

Figure 3 shows a Relax-Space-Wellness-Pod. It is a chair designed for mental wellness breaks, offering a semi-private experience that allows users to step away from a busy workday. The pod includes features such as guided breathing exercises and heated seating, which help users relax and feel refreshed. However, in our opinion, the design may appear somewhat out of character in a typical office environment. Therefore, careful consideration should be given to its placement within the building to ensure it integrates well with the surrounding space. It is also important to note that the pod is not fully private, which should also be taken into consideration when choosing its location.

Figure 3: Relax-Space-Wellness-Pod **[7]**

Figure 4 shows the Inhere meditation pod. Here, we see an example of a more private space that users can enter. Overall, it is very simple, with no integrated technology, featuring a clean and minimalist architectural design. However, since there is no solid material between the wooden panels, the space is not truly private or soundproof. The capsule feels aesthetically integrated into the room and may create a “room within a room” effect, but it does not provide a complete sense of isolation or the full experience of being alone and able to recharge during the workday.

Figure 4: Inhere Pod **[8]**

Figure 5 shows the Iris Pod. This is the closest example to the product we aim to create. It is a private space where the user is alone inside an enclosed capsule. The pod includes technology such as dimmed lighting, guided meditation, and ventilation. The capsule is not fully soundproof and instead provides noise isolation through headphones. This is an area where we aim to differentiate ourselves from the existing product.

Figure 5: Iris Pod **[9]**

Projects

Unfortunately, there are no direct research projects examining how a relaxation pod might affect people’s mental health, as it is a rather unique product and such solutions have not been on the

market for very long. Furthermore, these products aim to incorporate existing stress reduction techniques. However, there are studies that examine how soundproof or acoustic pods, meditation and short breaks promote mental health. Some of these studies are mentioned below, and their findings are briefly explained. Taken together, they paint a picture of how a relaxation pod can be beneficial in work environments. The available studies provide consistent evidence that both the physical design of work environments and targeted recovery have a significant impact on employees' well-being and performance. Acoustic interventions, in particular, appear to play a central role in this regard. For example, the study by Radun, Jokinen, and Kärki (2025) shows that the introduction of soundproofed retreat areas in a real-world office environment with 58 employees led to a significant increase in satisfaction with the acoustic environment as well as the general work atmosphere **[10]**. The high acceptance of these so-called soundproof pods underlies their practical relevance for modern office concepts, particularly in open-plan work environments where noise pollution is often perceived as disruptive. In addition, a parametric study on semi-enclosed meeting pods provides nuanced insights into the underlying acoustic mechanisms. The results show that, in particular, the combination of sound-absorbing materials and strategically placed reflective surfaces improves speech intelligibility within the pods while simultaneously reducing sound transmission to the outside **[11]**. These findings illustrate that it is not only the presence of such retreat spaces that is crucial, but also their specific material and design specifications. Furthermore to optimize the physical work environment, behavioral interventions also demonstrate positive effects. A comprehensive meta-analysis by Goyal et al. (2014) demonstrates that meditation programs including mindfulness based approaches lead to significant reductions in stress and anxiety, as well as improvements in general well-being, both in the short and long term **[12]**. These findings suggest that even short, structured relaxation breaks during the workday can serve as a relevant complement to spatial interventions. Findings on the effects of micro-breaks during work also point in a similar direction. Cho (2022) shows that short, self initiated interruptions such as stretching exercises, small snacks, or social interactions help maintain energy levels and boost work performance **[13]**. These breaks are particularly effective when they are chosen situationally and independently by employees, which highlights the importance of autonomy in the work context. In summary, it can be stated that both acoustically optimized quiet spaces and short regenerative interventions represent complementary strategies for improving the quality of the work environment. While structural measures such as soundproof pods primarily help reduce external stressors, practices like meditation and micro-breaks primarily address individual stress management. The combination of both approaches therefore appears particularly promising for designing health-promoting workplaces.

Comparative Analysis

From the comparison of the five products above, we have conducted a comprehensive comparative analysis in table 3. Below is a combined comparison of the products in terms of price, use cases, acoustics, and technological features. This provides a good overview of the products that are already available on the market.

Table 3: Comparison of products

Product	Cost (€)	Purpose	Acoustic Performance	Smartness
Framery Four	19 900	Supports focused work and small-group collaboration	Approx. 30 dB sound reduction	Lighting control, ventilation, and power outlets

Product	Cost (€)	Purpose	Acoustic Performance	Smartness
BreeHealth	20 000-25 000	Workplace relaxation and well-being	Not specified	Zero-gravity massage chair, guided meditation, audio system, light therapy, and sound reduction
RelaxSpace	29 000	Mindfulness, meditation, and recovery	Not specified	Personalized sessions with visuals, guided breathing, scents, and heated seating
Inhere	8 900	Well-being space	Minimal sound reduction (~0 dB)	No integrated technology
Iris	19 800	Meditation-focused pod	Noise-isolating headphones	Calming light, meditation, airflow, and tablet interface

Summary

Based on the analysis above, it is evident that existing workspace solutions such as meeting pods primarily focus on improving productivity, communication, and overall office efficiency. While these products often provide strong acoustic performance and functional design, they are generally not intended to support mental recovery or offer meaningful breaks from daily work activities.

Relaxation-oriented solutions such as BreeHealth and RelaxSpace provide opportunities to withdraw from the work environment. However, these concepts are highly stationary. Users remain seated in a position, with limited opportunity for physical movement or bodily awareness. Although both solutions represent strong approaches to workplace well-being, they lack, in our view, a balance between movement, privacy, and acoustic isolation.

The Inhere pod introduces a more minimal experience, aligning with some of the qualities we aim to achieve. The Iris pod is the solution most closely aligned with our intended direction, as it combines relaxation features with a more enclosed experience. We aim to extend this concept further by integrating acoustic isolation.

Energy pods generally provide opportunities for rest, but our research has revealed a lack of sufficient acoustic separation and privacy. This highlights a gap between productivity-oriented spaces and relaxation-focused solutions. Existing products tend to support either work efficiency or short-term recovery, but rarely combine acoustic isolation, visual privacy, and true disconnection from the work environment.

Based on these findings, the proposed design adopts a closed, non-transparent capsule architecture combined with acoustic insulation materials and a comfort-oriented interior. This approach ensures a high level of sound reduction, visual isolation, and psychological detachment from the surrounding environment. In addition, the integration of controlled lighting, calming audio, and guided meditation supports mental recovery and pause during the workday.

This design direction prioritizes user well-being, mental recovery, and sensory reduction over productivity and collaboration.

In the following chapter, the proposed solution will be presented in detail, including materials, structural design, and key components that enable the desired acoustic performance and user experience.

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Project Management

Provide here an overview of the contents (structure) of this chapter. Explain the project management approach your group followed and justify why you think it is a good approach.

Scope

Defining the scope of Bloem is essential for keeping our efforts focused on the project's core objectives. By mapping out exactly what is included in the project, we can prevent scope creep and make sure every team member understands the roadmap. The Work Breakdown Structure (WBS) in figure 6 below illustrates how we have divided the project into manageable phases to ensure we reach a successful final prototype.

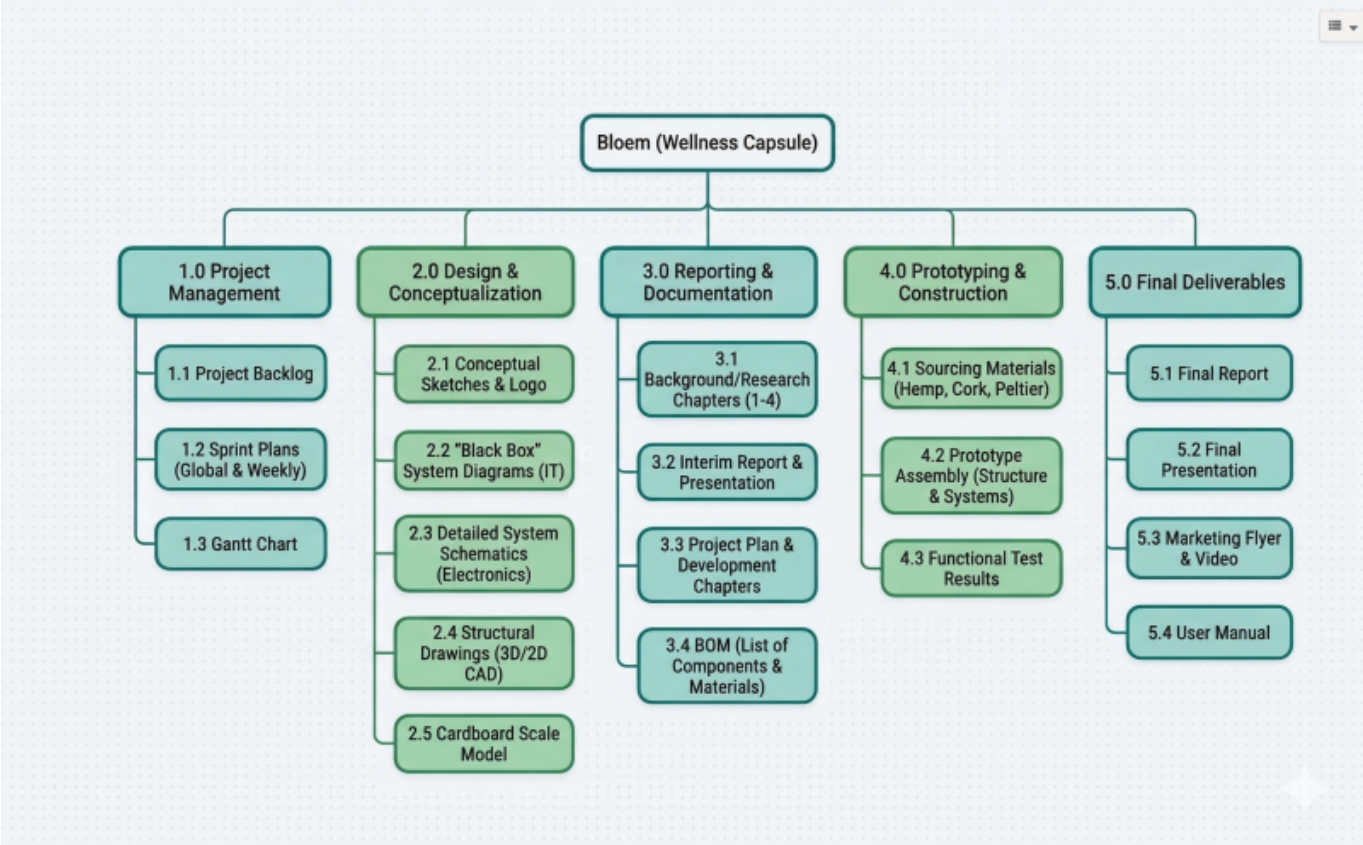


Figure 6: WBS

Time

3.2 Time

In this section, we lay out the schedule and all the major deadlines we have to hit throughout the semester. this is shown in Table 4. Tracking these milestones is really important because it keeps the whole team accountable and makes sure we're actually making steady progress on Bloem. It also helps us see if we're falling behind early on, so we can fix things before they become a real problem.

Table 4: Key milestones

Task	Proposed date
Choose the project proposal	2026-02-28
System Diagrams & Structural Drafts	2026-03-11
List of Components and Materials	2026-03-18
Project Backlog, Global Sprint Plan, Initial Sprint Plan and Release Gantt Chart	2026-03-21
System Schematics, Structural Drawings and cardboard scale model	2026-03-25
Interim Report and Presentation	2026-04-12
Interim Presentation	2026-04-16
3D model video	2026-04-22
Final List of Materials	2026-04-29
Refined Interim Report	2026-05-02
Packaging Solution	2026-05-13
Functional Tests	2026-05-27
Final Report, Presentation, Video, Paper, Poster and Manual	2026-06-13
Final Presentation	2026-06-18
Demonstration of the operation of the prototype	2026-06-25

Cost

The cost analysis for this project considers both the physical components required to build the Bloem prototype and the estimated personnel effort needed to design, develop, and integrate the final solution. Based on the current Bill of Materials, the project cost is mainly driven by the structural elements of the capsule, while the electronic system represents a smaller but essential part of the total investment.

3.3.1 Material Cost

The list of materials below summarizes the components required for the construction of the Bloem capsule, including structural materials, interior elements, control hardware and electronic components.

Table 5: Cost of components

Category	Component	Qty	Unit Price	Total Price	Link
Materials	Cork insulation GO4CORK	10	€31.98	€349.79	Link
Materials	Planed wooden slat WHITE CASQUINHA	16	€4.09	€65.44	Link
Materials	SPAX screws	1	€18.99	€18.99	Link
Materials	Hemp Granules 15	1	€28.41	€28.41	Link
Materials	Plywood Interior Poplar B/BB (wooden shell)	6	€48.55	€291.34	Link

Category	Component	Qty	Unit Price	Total Price	Link
Materials	Wide Square k2 L-brackets	2	€7.93	€15.86	Link
Materials	Pattex wood glue	1	€36.85	€36.85	Link
Materials	Birch plywood board (wooden floor)	4	€107.25	€429.00	Link
Materials	Plywood Interior Poplar B/BB (sliding door)	2	€48.55	€97.10	Link
Materials	Foam board (soft seating area)	1	€43.00	€43.00	Link
Materials	Birch plywood board (seat frame)	4	€107.25	€429.00	Link
Materials	Galaxy Tab A9	1	€159.00	€159.00	Link
Electrical Components	ESP-WROOM-32 ESP32-S Development Board	1	€5.00	€5.00	Link
Electrical Components	RGB 12V LED light strip	1	€16.00	€16.00	Link
Electrical Components	N-channel MOSFET transistor	1	€17.90	€17.90	Link
Electrical Components	Ohm resistor	1	€11.85	€11.85	Link
Electrical Components	BH1750FVI light sensor	1	€6.10	€6.10	Link
Electrical Components	LM2596 adjustable buck converter	1	€1.10	€1.10	Link
Electrical Components	12V power supply	1	€5.60	€5.60	Link
Electrical Components	LogiLink SP0057 speaker	1	€12.40	€12.40	Link
			Total Material Cost	**€2061.89**	

The total material cost of the Bloem prototype is therefore **€2061.89**. Most of this value comes from the structural and interior construction materials, especially the cork insulation, plywood panels, flooring, and seating structure. The electronic system has a comparatively lower cost, with a total of **€98.11**, while still enabling the interactive lighting and sound features required by the concept.

3.3.2 Personnel Cost

In addition to the material cost, the development of Bloem also involves a significant personnel investment. This includes the time dedicated to concept development, structural design, 3D modelling, UI design, electronics integration, sourcing, testing, and documentation. Considering a multidisciplinary student team working on the project over a full semester, the personnel effort represents a much higher value than the prototype materials alone.

Assuming a team of six members, each contributing an average of 6 hours per day over a four-month period, excluding weekends, the total effort corresponds to approximately **3168 working hours**. Using a reference rate of **€14.00/h**, the estimated personnel cost is **€44352.00**.

When combining the physical materials with the estimated labor effort, the total project value of

Bloem is **€46413.89**. Although the actual out-of-pocket prototype expense is mainly associated with the materials, this broader estimate better reflects the real cost of taking the concept from design to a fully developed engineered solution.

Quality

For the Bloem project, quality is about more than just building a nice-looking capsule. It is divided into two main areas: how well the physical product performs and how clear and professional our documentation is.

Bloem Product Quality

The quality metrics for the physical prototype are focused on three main points:

- **Durability and Materials:** The structure must pass load and stress simulations to ensure the egg-shaped design is stable. We are using sustainable materials like cork and hemp, which need to be high quality to ensure the capsule lasts.
- **Functionality:** Every feature we planned, like the sensor integration and the tablet interface, must work perfectly. The user needs to have a smooth experience when controlling the environment inside.
- **Environmental Impact:** To keep our footprint low, we are sourcing materials as locally as possible and focusing on a “circular” design that uses bio-based components.

Documentation Quality

To make sure our report and wiki are easy for the supervisors and other students to follow, we follow these rules:

- **Consistency:** All sections use the same font styles, sizes, and structure. Whether it's the IT part or the Marketing part, it should feel like one single project.
- **Clarity:** We avoid over-complicating the language. We use technical terms when necessary, but we try to keep the explanations direct and easy to read.
- **Visual Appeal:** Every page and document must include the ISEP logo and our Bloem project logo following the color scheme we chose for the brand.

People & Stakeholder Management

3.5 People

At the start of the project, we talked about our different backgrounds and what each of us is good at. This helped us figure out who would take the lead on things like the technical system or the structural design. However, we decided right away that these roles wouldn't be fixed. Since Bloem is a project where everything—from the sensors to the physical shell—has to work together, we stay flexible. If one person has a huge workload or gets stuck on a specific task, the rest of the team jumps in to help, regardless of our “official” focus.

We meet every week for our sprint planning to go over what we’ve done and what’s coming up next. These meetings are key for us to stay aligned and to move people around to different tasks depending on what needs the most attention that week. It keeps the project moving forward and

makes sure no one is overwhelmed.

The supervising teachers also play a huge role in the project. They don't just grade us; they act as guides who give us feedback when our ideas get too complicated or when we're not sure how to solve a technical problem. Their input helps us keep the “big picture” in mind and ensures that Bloem is actually realistic and buildable.

Even though we don't have strict individual roles, we still track our main stakeholders to understand who is involved in the project's success. An overview is seen in Table 6.

Table 6: Project Stakeholders

Stakeholder	Role	Description
Team Bloem	Owners	The core group responsible for the design, build, and management.
Benedita Malheiro	EPS Coordinator	Overall management and organization of the EPS program.
Project Supervisors	Advisors	Providing technical advice and feedback to guide the development.
ISEP	Main Sponsor	Providing the tools, workspace, and funding for the prototype.
Office Workers	Target Group	The end-users who provide the need and feedback for the capsule.
Suppliers	Partners	External providers for our cork, hemp, and electronics.

Communications

3.6 Communications

Staying in sync is the only way we can manage all the different parts of Bloem. To keep things moving, we use a few specific tools to stay connected. Daily talk happens on **WhatsApp**, where we coordinate quickly or ask for help if someone gets stuck. For the official side, we use **Microsoft Teams** to store our report drafts and all project files. We also rely on **Jira** to manage our weekly sprints, which helps everyone see exactly what needs to be done and who is working on what.

We meet in person during class hours several times a week.

Table 7 shows the actual communication channels we use for the project.

Table 7: Communication Channels and Purpose

Stakeholder	Channel	Frequency	Purpose
Team Bloem	WhatsApp, Teams & In-person	Daily / Whenever necessary	Quick updates, file sharing, and sprint planning.
Project Supervisors & EPS Coordinator	MS Teams & In-person	Weekly	Presenting our progress and getting feedback on the work.
ISEP	Email & MS Teams	As needed	Official university updates and program management.

Stakeholder	Channel	Frequency	Purpose
Suppliers / Customers	-	-	N/A (Internal university project).

By sticking to these channels, we make sure we don't lose any information and that everyone stays on the same page as we move toward the final build.

Risk

3.7 Risk Management

Risk management is essential to identify, evaluate, and mitigate potential issues that may arise during the development and implementation of the Bloem capsule. Each identified risk is assessed based on its probability of occurrence and its potential impact on the project. A 5×5 risk matrix is used to classify risks and support decision-making regarding mitigation strategies. This matrix is shown in Figure 7.

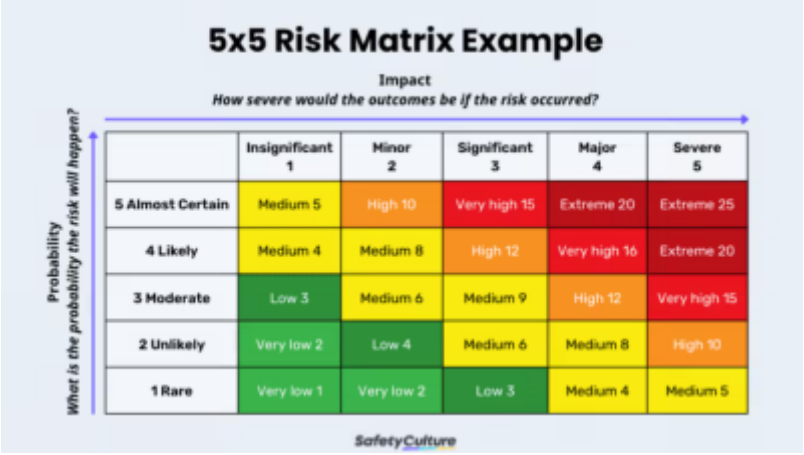


Figure 7: Risk analysis matrix (adapted from Guevara, 2024)

The table 8 below shows a risk assessment of the system. Here is a definition of the probability and impact levels.

The probability levels are defined as:

- 5: Almost certain
  * 4: Likely
  * 3: Moderate
  * 2: Unlikely
  * 1: Rare

The impact levels are defined as:

- 5: Severe
  * 4: Major
  * 3: Significant
  * 2: Minor
  * 1: Insignificant

Risk levels are calculated by multiplying probability by impact and are interpreted as:

- 1–4: Acceptable
  * 5–9: Adequate
  * 10–16: Tolerable
  * 17–25: Unacceptable

Table 8: Risk Analysis

Risk	Probability	Impact	Risk level	Response	Risk handling
Hardware integration issues (LEDs, sensors, ESP32 not working together)	3	4	12 - Tolerable	Mitigate	Perform early prototyping and incremental testing of all electronic components
Tablet/app connectivity problems (communication between tablet and system fails)	3	4	12 - Tolerable	Mitigate	Use reliable communication protocols and test integration regularly
User interface usability issues (confusing booking or controls)	3	3	9 - Adequate	Mitigate	Conduct user testing and iterate UI design based on feedback
Structural instability of the capsule (design or assembly weaknesses)	2	5	10 - Tolerable	Mitigate	Validate structure through simulations and reinforce critical joints
Delays in material delivery or unavailable components	2	3	6 - Adequate	Transfer	Identify alternative suppliers and order materials early
Time management issues within the team	3	3	9 - Adequate	Mitigate	Establish clear deadlines and monitor progress regularly
System does not provide expected relaxation experience	2	4	8 - Adequate	Mitigate	Test lighting and sound scenarios and adjust based on user feedback
Power supply or electrical failure inside the capsule	2	5	10 - Tolerable	Mitigate	Ensure proper circuit design and include safety measures (fuses, regulators)

Risk	Probability	Impact	Risk level	Response	Risk handling
Overcomplication of features leading to unfinished implementation	3	4	12 - Tolerable	Avoid	Prioritize core functionalities and reduce scope if necessary
Legal or safety compliance issues (indoor installation, user safety)	2	4	8 - Adequate	Mitigate	Follow safety guidelines and ensure materials and electronics meet standards

The risk analysis shows that most identified risks fall within the adequate and tolerable categories. These risks can be managed through proper planning, iterative testing, and continuous monitoring throughout the project lifecycle. No risks were classified as unacceptable, meaning the project is considered feasible within the defined scope, provided that mitigation strategies are effectively implemented.

Procurement

3.8 Procurement

Procurement is an important part of the Bloem project because the solution combines architectural materials, furniture elements, and electronic components that must be acquired from different types of suppliers. For this reason, the purchasing strategy was defined to balance cost, availability, delivery time, and reliability, while also keeping the overall concept feasible from a construction point of view. Our procurement plan is shown in tabel 9.

The structural and interior elements of the capsule are mainly sourced from building-material suppliers and wood specialists. Components such as cork insulation, wooden slats, plywood boards, brackets, and adhesives are purchased from suppliers that can provide materials in the required dimensions and in relatively short lead times. Whenever possible, local or regional suppliers are preferred, since this reduces transportation effort and simplifies replacement in case of damaged or unavailable items.

The electronic subsystem follows a different procurement approach. Microcontrollers, sensors, converters, and low-cost supporting modules are acquired from specialized online suppliers, since these components are generally more affordable and easier to find through international platforms. At the same time, items such as the speaker and LED strip are sourced from retailers with faster shipping and easier purchasing conditions. Backup suppliers are also identified for the most relevant electronic elements in order to reduce the risk of delays during assembly and testing.

For the user interface, the team selected a commercial tablet that offers sufficient performance for session booking and environmental control without requiring advanced specifications. This avoids overspending on hardware while still ensuring that the interface can be demonstrated under realistic conditions.

Overall, the procurement strategy for Bloem is based on using reliable suppliers for large structural materials, specialized vendors for electronics, and alternative sources whenever delivery or stock

issues may arise. This mixed approach provides flexibility during implementation and supports both the physical construction of the capsule and the integration of its interactive features.

Table 9: Procurement Plan

Item	Primary Supplier	Backup Supplier	Estimated Cost (€)	Lead Time (Days)	Shipping Time (Days)	Notes
Cork insulation GO4CORK	Leroy Merlin	Local insulation supplier	349.79	2–5	1–3	Main acoustic and thermal insulation material
Planed wooden slat WHITE CASQUINHA	Leroy Merlin	Maxmat	65.44	1–3	0–2	Used for the internal wooden framing
SPAX screws	Leroy Merlin	Maxmat	18.99	1–3	0–2	Fastening elements for structural assembly
Hemp Granules 15	Datapixel	Local sustainable materials supplier	28.41	2–5	1–3	Complementary insulation material
Plywood Interior Poplar B/BB (wooden shell)	ToSize	Local wood supplier	291.34	3–7	2–5	Used for the main shell of the capsule
Wide Square k2 L-brackets	Leroy Merlin	Maxmat	15.86	1–3	0–2	Reinforcement of structural joints
Pattex wood glue	Leroy Merlin	Local hardware store	36.85	1–3	0–2	Adhesive for wood assembly
Birch plywood board (wooden floor)	Leroy Merlin	Local wood supplier	429.00	2–5	1–3	Flooring base of the capsule
Plywood Interior Poplar B/BB (sliding door)	ToSize	Local wood supplier	97.10	3–7	2–5	Material for the sliding door panel
Foam board	Feira dos Tecidos	Local upholstery supplier	43.00	1–3	1–3	Soft seating area
Birch plywood board (seat frame)	Leroy Merlin	Local wood supplier	429.00	2–5	1–3	Frame supporting the seating area
Galaxy Tab A9	Worten	Local electronics retailer	159.00	1–2	0–2	Interface device for booking and control
ESP-WROOM-32 ESP32-S Development Board	AliExpress	Amazon	5.00	2–5	5–10	Main controller for the electronic subsystem
RGB 12V LED light strip	Worten	Amazon	16.00	1–3	1–3	Ambient lighting system

Item	Primary Supplier	Backup Supplier	Estimated Cost (€)	Lead Time (Days)	Shipping Time (Days)	Notes
N-channel MOSFET transistor	Worten	Mauser	17.90	1–3	1–3	Switching element for LED control
Ohm resistor	Worten	Mauser	11.85	1–3	1–3	Supporting electrical component
BH1750FVI light sensor	AliExpress	Amazon	6.10	2–5	5–10	Measures light intensity
LM2596 adjustable buck converter	AliExpress	Amazon	1.10	2–5	5–10	Voltage regulation module
12V power supply	AliExpress	Amazon	5.60	2–5	5–10	Power source for prototype electronics
LogiLink SP0057 speaker	Mauser	El Corte Inglés	12.40	1–3	1–3	Audio output for relaxation soundscapes
			Total Estimated Cost	**2061.89**		

Project Plan

The project is organized into one-week sprints to support an iterative and flexible development workflow. The full timeline is presented in Table 10, which serves as a structured reference for monitoring progress and ensuring alignment with the overall project goals.

Table 10: Global Sprint Plan

Sprint	Start	Finish	Status
1	26/02/2026	04/03/2026	Finished
2	05/03/2026	11/03/2026	Finished
3	12/03/2026	18/03/2026	Finished
4	19/03/2026	25/03/2026	Finished
5	26/03/2026	01/04/2026	Ongoing
6	02/04/2026	08/04/2026	Planned
7	09/04/2026	15/04/2026	Planned
8	16/04/2026	22/04/2026	Planned
9	23/04/2026	29/04/2026	Planned
10	30/04/2026	06/05/2026	Planned
11	07/05/2026	13/05/2026	Planned
12	14/05/2026	20/05/2026	Planned
13	21/05/2026	27/05/2026	Planned
14	28/05/2026	03/06/2026	Planned

Our project backlog works as a roadmap for the team, helping us stay on top of all the EPS milestones. We've arranged these tasks to make sure the workflow stays consistent and that we're hitting our deadlines as we build Bloem. The detailed list of these items and their current status is provided in Table 11 below.

Table 11: Project Backlog

PBI	Title	Status
A	Define project theme	Done
B	Upload “black box” System Diagrams & Structural Drafts	Done
C	Upload List of Components and Materials (draft)	Done
D	Define Project Backlog, Global Sprint Plan & Initial Sprint Plan	Ongoing
E	Release Gantt Chart of the project	Ongoing
F	Upload Detailed System Schematics & Structural Drawings	Planned
G	Cardboard scale model of the structure	Planned
H	Interim Report and Presentation	Planned
I	3D model video	Planned
J	Final List of Materials	Planned
K	Refined Interim Report (based on feedback)	Planned
L	Packaging solution	Planned
M	Results of the Functional Tests	Planned
N	Final Report, Presentation, Video, Paper, Poster and Manual	Planned
O	Final Presentation, Individual Discussion and Assessment	Planned
P	MS Teams folder upload (refined deliverables + code + drawings)	Planned

To manage our time effectively, we’ve broken the project down into one-week 'sprints.' This allows us to focus on specific tasks each week and ensures that we are making steady progress toward our final goals. Table 12 shows our schedule, including the duration of each task and who is responsible for leading them.

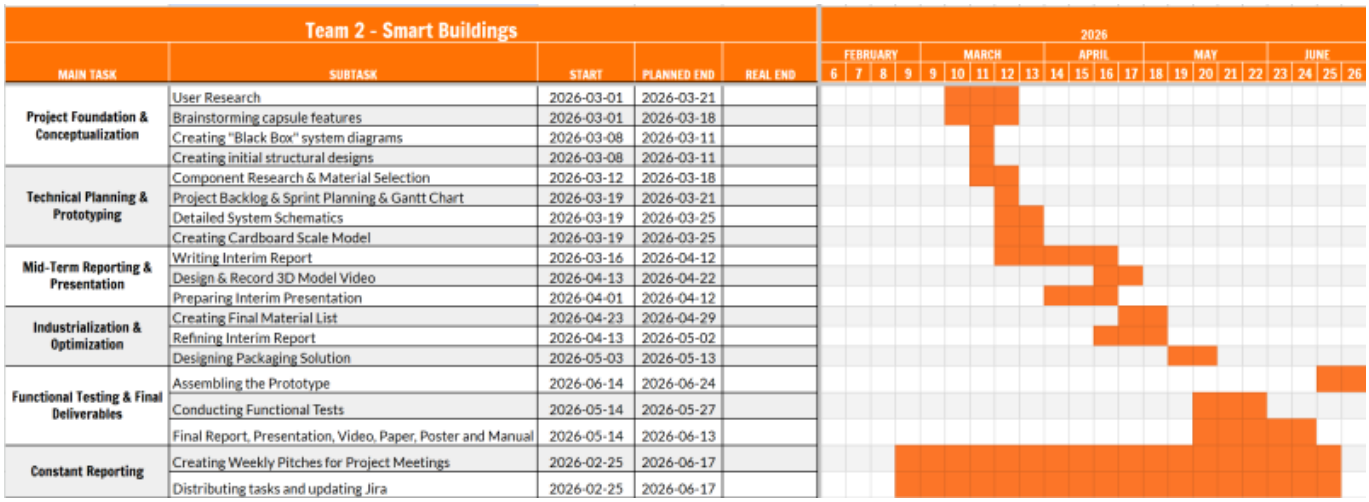
Table 12: Sprint Plan

Sprint	Task	Importance	Responsible	Involved
26/02/2026 - 04/03/2026				
1	Choose and share top-3 preferred project proposals	5	Everyone	Everyone
05/03/2026 - 11/03/2026				
2	“Black box” System Diagrams	3	Everyone	Everyone
2	Structural Drafts	4	Carlota	Everyone
2	Write Background and Related Work chapters	3	Amelia & Timon	Everyone
2	Brainstorm other ideas inside the Smart Buildings topic	5	Everyone	Everyone
12/03/2026 - 18/03/2026				
3	Research Components and Materials	3	Everyone	Everyone

Sprint	Task	Importance	Responsible	Involved
3	List of Components and Materials (initial upload)	5	Amalie & Lena	Everyone
3	Write Marketing chapters	2	Timon	Everyone
3	Improve BlackBox Diagram	2	Lena	Everyone
19/03/2026 - 25/03/2026				
4	Detailed System Schematics	5	Amelia	Everyone
4	Structural Drawings	5	Carlota	Everyone
4	Cardboard scale model of Bloem	3	Kaiko	Everyone
4	Create a flyer draft	3	Kaiko	Everyone
4	Update Material List	3	Mohammed	Everyone
4	Settle on a name and logo	4	Everyone	Everyone
4	Write Project Plan & Development chapters	2	Lena & Carlota	Everyone
26/03/2026 - 01/04/2026				
5	Create Case Study Presentation	3	Mohammed	Everyone
5		3	Mohmmed	Everyone
02/04/2026 - 08/04/2026				
6				
09/04/2026 - 15/04/2026				
7				
16/04/2026 - 22/04/2026				
8				
23/04/2026 - 29/04/2026				
9				
30/04/2026 - 06/05/2026				
10				
07/05/2026 - 13/05/2026				
11				
14/05/2026 - 20/05/2026				
12				
21/05/2026 - 27/05/2026				

Sprint	Task	Importance	Responsible	Involved
13				
28/05/2026 - 03/06/2026				
14				
04/06/2026 - 10/06/2026				
15				
11/06/2026 - 17/06/2026				
16				
18/06/2026 - 25/06/2026				
17				

Figure 8 provides a visual overview of our complete schedule. It allows us to track the duration of each task at a glance and see how they fit together over the semester, making it easier to manage the long-term deadlines for Bloem.



MAIN TASK	SUBTASK	START	PLANNED END	REAL END
Project Foundation & Conceptualization	User Research	2026-03-01	2026-03-21	
	Brainstorming capsule features	2026-03-01	2026-03-18	
	Creating "Black Box" system diagrams	2026-03-08	2026-03-11	
	Creating initial structural designs	2026-03-08	2026-03-11	
Technical Planning & Prototyping	Component Research & Material Selection	2026-03-12	2026-03-18	
	Project Backlog & Sprint Planning & Gantt Chart	2026-03-19	2026-03-21	
	Detailed System Schematics	2026-03-19	2026-03-25	
	Creating Cardboard Scale Model	2026-03-19	2026-03-25	
Mid-Term Reporting & Presentation	Writing Interim Report	2026-03-16	2026-04-12	
	Design & Record 3D Model Video	2026-04-13	2026-04-22	
	Preparing Interim Presentation	2026-04-01	2026-04-12	
Industrialization & Optimization	Creating Final Material List	2026-04-23	2026-04-29	
	Refining Interim Report	2026-04-13	2026-05-02	
	Designing Packaging Solution	2026-05-03	2026-05-13	
Functional Testing & Final Deliverables	Assembling the Prototype	2026-06-14	2026-06-24	
	Conducting Functional Tests	2026-05-14	2026-05-27	
	Final Report, Presentation, Video, Paper, Poster and Manual	2026-05-14	2026-06-13	
Constant Reporting	Creating Weekly Pitches for Project Meetings	2026-02-25	2026-06-17	
	Distributing tasks and updating Jira	2026-02-25	2026-06-17	

Figure 8: Gantt chart of our project

Sprint Outcomes

Include the outcomes of all sprint reviews (what was the sprint backlog, completion status, planned capacity vs. achieved velocity).

Table 13 shows the outcome of sprint 1.

Table 13: Sprint 1 Overview

Sprint	Task	Duration	Responsible	Involved
26/02/2026 - 04/03/2026				
1	Choose and share top-3 preferred project proposals	5	Everyone	Everyone

Sprint 1 Summary:

Main Achievements:

- Held our first team meetings to discuss project interests.
- Researching and ranking our top 3 project choices for the supervisors.
- Agreed on the initial vision for a dehumidifier structure.

Progress Check: 100% of the planned work for this week is finished.

Workload Stats:

- **Tasks Planned:** 1
- **Tasks Finished:** 1

Table 14 shows the outcome of sprint 2.

Table 14: Sprint 2 Overview

Sprint	Task	Duration	Responsible	Involved
05/03/2026 - 11/03/2026				
2	“Black box” System Diagrams	3	Everyone	Everyone
2	Structural Drafts	4	Carlota	Everyone
2	Brainstorming Smart Building concepts	3	Everyone	Everyone
2	Write Background and Related Work chapters	4	Amelia & Timon	Everyone

Sprint 2 Summary:

What we got done:

- Explored different “Smart Building” ideas and officially chose the wellness capsule.
- Developed the “Black Box” diagrams to map out how the sensors and systems will interact.
- Carlota started the first structural sketches to visualize the egg-shaped design.
- Amelia and Timon began writing the Background and Related Work sections for the report to provide the research foundation for our project.

Current Status: All 4 tasks for this sprint were completed on time.

Workload Summary:

- **Planned Tasks:** 4
- **Completed Tasks:** 4

Table 15 shows the outcome of sprint 3.

Table 15: Sprint 3 Overview

Sprint	Task	Duration	Responsible	Involved
12/03/2026 - 18/03/2026				
3	Research Components and Materials	4	Everyone	Everyone

Sprint	Task	Duration	Responsible	Involved
3	List of Components and Materials (initial upload)	2	Amalie & Lena	Everyone
3	Write Marketing chapters	2	Timon	Everyone
3	Improve BlackBox Diagram	2	Lena	Everyone

Sprint 3 Summary:

Tasks Completed:

- The whole team researched sustainable materials (like cork and hemp) and technical components to ensure the capsule meets our wellness goals.
- Amalie and Lena compiled the initial material list and uploaded it to the project wiki.
- Timon drafted the Marketing chapters.
- Lena refined the Black Box diagram based on the new research and feedback from our supervisors.

Status Update: 100% of tasks were finished by the end of the week.

Efficiency Metrics:

- **Tasks in the plan:** 4
- **Tasks carried out:** 4

Table 16 shows the outcome of sprint 4.

Table 16: Sprint 4 Overview

Sprint	Task	Duration	Responsible	Involved
19/03/2026 - 25/03/2026				
4	Detailed System Schematics	5	Amelia	Everyone
4	Structural Drawings	5	Carlota	Everyone
4	Cardboard scale model of Bloem	3	Kaiko	Everyone
4	Create a flyer draft	3	Kaiko	Everyone
4	Update Material List	3	Mohmmed	Everyone
4	Settle on a name and logo	2	Everyone	Everyone
4	Write Project Plan & Development chapters	4	Lena & Carlota	Everyone

Sprint 4 Summary:

Key Results for this period:

- Officially rebranded the project to **Bloem** and finalized the core logo concept to match our “nature meets wellness” theme.
- Kaiko built the first physical scale model using cardboard to test the dimensions and the egg-shaped curve of the capsule.
- Amelia and Carlota produced the detailed technical schematics and structural drawings needed for the upcoming prototype phase.
- We started working on the Project Plan and Development chapters.
- Updated our material list and created a first draft of the marketing flyer to promote Bloem's

benefits.

Current Status: Sprint successfully completed with 100% of tasks finished.

Effort Breakdown:

- **Tasks in the plan:** 7
- **Tasks carried out:** 7

3.12 Sprint Evaluations

Sprint 1 Evaluation

In the first sprint, the team focused on getting organized. We chose our initial topic and attended the introduction sessions. It was mostly about figuring out how we would work together and getting the basic tools ready. The reflection is shown in Table 17.

Table 17: Sprint 1 Reflection

Aspect	Reflection
Positive	Good teamwork and high motivation to start the project.
Negative	More time could have been spent looking at different project ideas to avoid changing ideas in the future.

Sprint 2 Evaluation

During this sprint, we did a deep dive into Smart Buildings and officially decided to create the wellness capsule. We started on the first structural drawings and the Black Box diagrams to see how it would all work. We also began the first research chapters for the report. See Table 18.

Table 18: Sprint 2 Reflection

Aspect	Reflection
Positive	Settling on the wellness capsule gave the team a clear and exciting goal.
Negative	It was a bit challenging to define the technical inputs/outputs while the design was still changing.

Sprint 3 Evaluation

Sprint 3 was all about research. We looked into sustainable materials to see what would work best for the shell. While the marketing chapters were being drafted, the IT side focused on refining the system logic. We also uploaded our first official list of components. See Table 19.

Table 19: Sprint 3 Reflection

Aspect	Reflection
Positive	Timon did an amazing job writing an extensive marketing part of the report.
Negative	The research for the material list could have been conducted in a more detailed way.

Sprint 4 Evaluation

This was a big week for us. We officially rebranded to **Bloem**, finalized the logo and built a physical cardboard model to check the scale. We also did the detailed technical drawings and worked on the

Project Plan and Development chapters to document our progress. Shown in Table 20.

Table 20: Sprint 4 Reflection

Aspect	Reflection
Positive	It felt relieving to finally settle on a name and branding decisions after a long time of debating them
Negative	The workload for the drawing part was very high and we should have planned to start it earlier.

Summary

This chapter showed how we kept the Bloem project organized from the very first week. By using tools like Jira and a Gantt chart, we were able to map out a clear timeline and make sure everyone knew their roles. Breaking the semester into weekly sprints was really helpful because it allowed us to stay on top of the workload and adjust our plans as we moved from brainstorming to technical design.

Throughout these first four weeks, the team successfully navigated the shift from a broad “Smart Building” concept to the specific Bloem wellness capsule. We've now reached a point where we have a solid technical foundation, including detailed drawings and a physical cardboard scale model.

With the project management and initial planning now established, the following chapter will focus on our Marketing Plan and how we intend to position Bloem in the wellness market.

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Marketing Plan

Introduction

This chapter provides an overview of Bloem’s marketing strategy. It covers the business idea, business plan, marketing and SWOT analyses, strategic objectives, market segmentation and target audience targeting, market positioning, and the marketing mix. Finally, it outlines specific marketing programs, budget constraints and control mechanisms.

Business Idea Formulation

About 1 of 8 people suffer from mental health issues like burnout or depression once in their life, resulting into a yearly loss of productivity of 1 trillion $ **[14]**. Bloem is therefore adressing a common problem in modern work environments. Constant noice, lack of privacy, high workloads and limited opportunities for a short mental recovery during the day. This does not only affects the employees, but also the productivity, turnover rate and therefore the earning of a company. The business idea is to market a compact and enclosed capsule that can be integrated into existing indoor environments. The design will reduce external noise as well as preventing internal noise to get out to a certain amount. With this companies can engage their employees to take short uninterrupted breaks and regain their focus for the important tasks at work. The capsule can be booked via an app for a

controlled and relaxing session of 5-15 minutes with supporting activities like meditation, stretching, breathing exercises or just a simply relax to nature sounds. The user experience is enriched through dimmable lights and a sustainable layered design. Bloem is designed for companies and shared spaces, helping them improve employee well-being, focus and overall productivity with a simple, easy-to-integrate solution.

Business Model

The Business Model Canvas, which is shown in figure 9 was used to systematically develop and analyze the Bloem project. It ensures that all key aspects of the business, from value creation to revenue generation are aligned and connected.

The core value proposition lies in a quiet and private space that helps reduce stress, improve relaxation as well as the overall well-being. Unlike other products Bloem focuses on affordability for companies, sustainable and natural materials. This should make the capsule accessible for larger and smaller organizations that may not have the biggest budget for high end or luxury alternatives. At the same time they should be able to include the capsule without any major changes of the existing environment, which lowers the barrier of adaption.

Bloem primarily targets business customers, like offices, co-working spaces and universities, which increasingly invest in the well-being of their employees and want to reduce negative side affects of high-stress work situations. Secondary customer segments are wellness-centers, yoga studios or healthcare and therapy centers, which need a calm and controlled environment. In all cases the end-user are individuals seeking short breaks of relaxation, but the purchasing decision always lies with the organizations that want to improve the working environment.

Customer relationship will be built through a mix of personal support, services and community engagement. Companies receive assistance during the setup and integration process of the capsules, ensuring that the product is implement effectively. At the same time the user experience will be supported with pre-installed guidance and content to guarantee an easy interaction. Later Bloem can implement a community around mindfulness and well-being, co-creation and feedback for continues improvement for example on the pre-installed experience.

To reach the customers a combination of digital and physical channels is required. A online presence, including a website and social media platforms enables to discover and experience the product as well as communicating and selling. In addition partnerships are needed with furniture retailers, interior design providers and office equipment suppliers which allows a more direct B2B distribution and can help selling the product if the capsule gets recommended by these channels. Collaborations with universities s and co-working spaces can serve as pilot environments where the product can be tested, demonstrated and refined.

Revenue is primarily generated through the direct sale of the capsule to organizations. This core stream can be enhanced with premium features and add-ons, such as more lightning or loud options, higher support and more guided experiences. Additional income can also be generated in the long-term through leasing or renting models that reduce upfront costs and make it more accessible to smaller organizations. On top the app based experiences like guided meditation, breath work or relaxation programs come with a subscription. This guarantees continuing developments on the user experience. This multi-layered revenue structure allows flexibility while maintaining a clear focus on B2B sales.

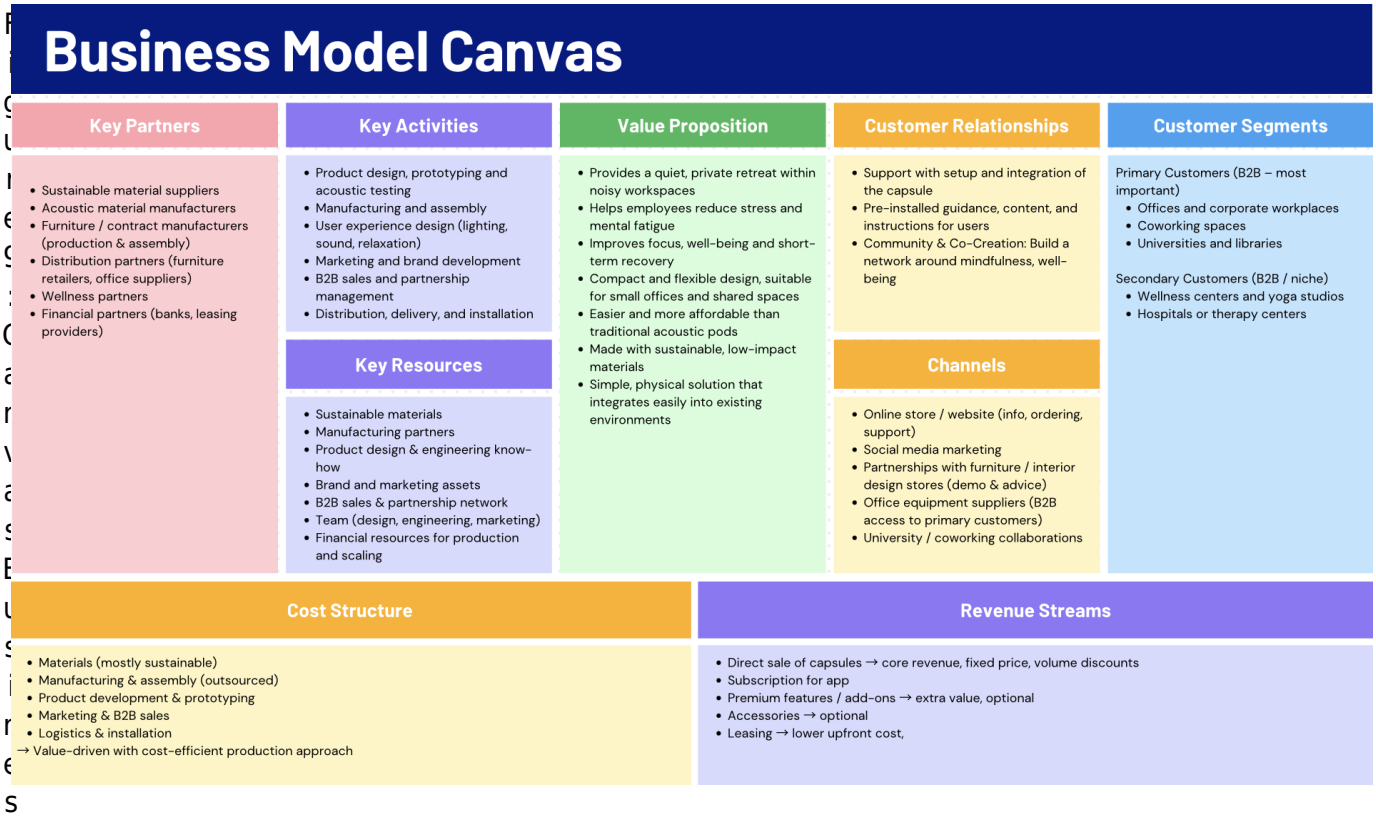
The realization of the business concept depends on several key resources. These include sustainable materials, manufacturing capabilities and technical know-how in product design and acoustic engineering. At the same time branding and marketing assets that communicate the value of the product are very important. Financial resources are required to support prototyping, production and scaling efforts.

Key activities focus on the development, production, and delivery of the Bloem capsule. This includes product design and prototyping, acoustic testing and optimization and the selection of materials. Manufacturing and assembly are the core operational tasks, while marketing and brand development ensure market visibility and demand generation. In addition, managing B2B sales, partnerships and distribution channels is essential for reaching customers and developing the business.

To achieve all the mentioned activities its necessary to have network partners. Suplliers provide the needed sustainable materials in a high quality, while manufacturing partners handle production, which reduces the in-house costs. Distribution partner will help to access the target customers and establish Bloem in the market, while collaborations with wellness organizations can enhance the user experience through latest relevant content. Financial partners may support enable alternative payment models such as leasing.

The cost structure is primary driven by resources like materials and production. Sustainable materials with high quality can represent a high cost factor, making it depended on some markets and prices. Additional costs from marketing activities and logistics, including delivery and installation add up to the cost structure as important factors.

Overall, the business model is value-driven, focusing on delivering a good and sustainable quality with a meaningful user experience for a fair price in the market.



s Model

Market Analysis

In order to determine how Bloem should be positioned and marketed in the future, the relevant market in which the company will operate must first be defined. Various methods and approaches are combined to conduct a thorough analysis of current market conditions. These include PESTEL analysis, competitive analysis using Porter's Five Forces, analysis of market trends and the identification of market opportunities and gaps.

The **PESTEL analysis** is a strategic tool for examining the macroeconomic environment of a market. It considers six external factors. The goal is to identify opportunities and risks in the external environment at an early stage.

Political:

- EU policies such as the European Green Deal promote sustainability and circular economy principles, increasing demand for environmentally friendly materials, which can indirectly benefit products like Bloem.
- Companies are facing increasing political pressure to improve working conditions and employee well-being.
- Public institutions (universities, government agencies) as potential customers often benefit from funding programs for innovative workplace solutions.

Economic:

- Budget pressures on companies vs. investment in employee well-being.
- Companies are increasingly investing in employee well-being, yet there is significant cost pressure, particularly among small and medium-sized enterprises.
- High-priced acoustic pods are often out of reach, therefore there is a demand for cost-effective alternatives.
- Economic uncertainty may delay investments in non-essential equipment.

Social:

- Increasing stress in the workplace
- Growing awareness of mental health, stress reduction and work-life balance
- Open-plan offices lead to increased noise pollution and concentration issues
- A trend toward microbreaks and short recovery periods during work, which supports the use of a product like Bloem
- Sometimes people tend not to take advantage of the benefits offered to them, or the use of a capsule like that might not be well-received by supervisors.

Technological:

- Advances in acoustic materials and sustainable building materials enable more effective and environmentally friendly solutions.
- The integration of simple technologies (e.g. lighting control, sound systems, sensors, guided activities) enhances the user experience.
- At the same time, technically mature competing products already exist, which means the pressure to innovate remains high.

Environmental:

- Strong focus in Europe on sustainability, CO_2 reduction and the circular economy.
- Demand for products made from recycled or natural materials is rising.
- Companies are paying increasing attention to the environmental footprint of their office equipment.
- There is global pressure on materials, including unexpected price increases due to supply chain disruptions, which can lead to dependencies and shortages.

Legal:

- Strict requirements regarding fire safety, material approvals, and occupational safety in indoor spaces.
- Standards for acoustic conditions in work environments may apply.
- Data protection may be a consideration if usage data (e.g. from sensors) is collected.

Next the **Porter's Five Forces** analyzes the intensity of competition within an industry based on five forces.

Competitive Rivalry (Intensity of Competition) – Moderate:

The market for acoustic solutions and office pods is already highly competitive, with established providers of acoustic pods, phone booths, and modular workstations. These often offer high quality, but at high prices. However, most offer only pure work solutions. The focus is on relaxation. For this specific purpose, there are already some competitors, but they differ significantly in features, cost, and design. Additionally, some of the competitors are only available in the U.S. and not for the international/European market. Competition is therefore moderate, as some companies address similar problems.

Threat of New Entrants – Moderate:

Market entry is generally possible, as there are no extremely high technological barriers. However, developing a viable product requires expertise in acoustics, design and material selection, as well as access to production and distribution channels. Furthermore, a few players or standards could gain a dominant position, leaving only a handful of competitors to contend with. New entrants are possible, but not trivial, therefore moderate risk.

Threat of Substitutes – Moderate-High:

There are many alternatives to the product:

- Meeting rooms or quiet zones
- Noise-canceling headphones
- Flexible work models (working from home)
- Simple furniture or space solutions

These are often cheaper or already available, which may mean that buyers do not need or want to diversify further. This increases the pressure on Bloem to deliver clear added value.

Customer Bargaining Power – High:

Customers are primarily businesses (B2B) that:

- compare prices
- have several alternatives

- often purchase in large quantities

This gives them a strong bargaining position, especially for larger orders. Value for money is crucial, as they want good quality but are constrained by their planned budget.

Suppliers' Bargaining Power – Low:

Bloem relies on specific materials such as sustainable insulation materials.

- For standard materials: low dependence, as the market is very large. Additionally, more and more sustainable materials are becoming established, leading to a better market supply. Therefore, we can work with various suppliers and select those with the best offers and high quality. The goal should always be to work with a few suppliers over the long term; however, should they become unavailable or show significant changes in price or quality, switching suppliers requires effort of course, but there will be other options.
- For specialized sustainable materials: higher dependence; however, almost none of the products required are so niche.

Overall low, but important for the cost structure.

The next step is to specify **trends** to identify relevant market developments and use these insights to inform strategic decisions regarding positioning and product development in the coming chapters. A key trend is the growing focus on employee well-being and mental health. In many European companies, issues such as stress, burnout, and mental exhaustion are becoming increasingly significant, driving up demand for solutions that enable targeted breaks for relaxation during the workday. Bloem addresses this need by providing a retreat space for short relaxation sessions. At the same time, the world of work is changing due to the shift toward flexible and hybrid work models. Traditional office layouts are increasingly being replaced by multifunctional work environments that require distinct zones for concentration, collaboration, and privacy. This increases the need for modular and flexibly integrable solutions like Bloem. Another relevant trend is the rising demand for acoustic solutions in open-plan office designs. Open-plan offices often lead to noise pollution and concentration problems, which is why companies are increasingly looking for ways to create quiet and screened-off areas. Solutions that are both functional and acoustically effective are thus gaining in importance. In addition, the topic of sustainability is coming into sharper focus. Companies are under increasing pressure to use environmentally friendly materials and implement sustainable concepts. The use of recycled and natural materials represents a key competitive factor here, which Bloem specifically addresses. Finally, work environments are increasingly evolving into experience-oriented spaces where, in addition to functionality, the user experience plays a central role. Factors such as light, sound, and atmosphere contribute significantly to the quality of the workplace. Bloem combines these elements into a holistic relaxation experience, positioning itself within the context of modern “experience workspaces.”

Market opportunity or gap analysis can be used to identify needs and gaps in the existing market offering. It highlights where current solutions fall short and enables the targeted development of products or services that effectively fill these gaps. In the chapter Background and Related Work the main competitors were already specified and discussed. From this the gap can be addressed. While some providers in the U.S. already offer similar acoustic room solutions, these are mostly positioned in the premium or luxury segment. They are primarily aimed at large companies, are correspondingly expensive, and are often quite large and inflexible. Although they offer features such as soundproofing and privacy, they are simply out of reach for many potential users. This is precisely where a market gap emerges for a solution that is more cost-effective without compromising on quality and functionality. Especially with unique features of what the user can do in capsule can make

a difference. Bloem addresses this need by offering a more compact, affordable alternative that still delivers high comfort and excellent acoustic properties. By focusing on appealing design as well as sustainable and modular materials, Bloem also positions itself as a flexible solution suitable not only for large companies but for a wide variety of work environments.

SWOT Analysis

A SWOT analysis is a strategic tool that systematically assesses the strengths, weaknesses, opportunities and threats of a project or business. The SWOT analysis below explains this for Bloem (See Figure 10).

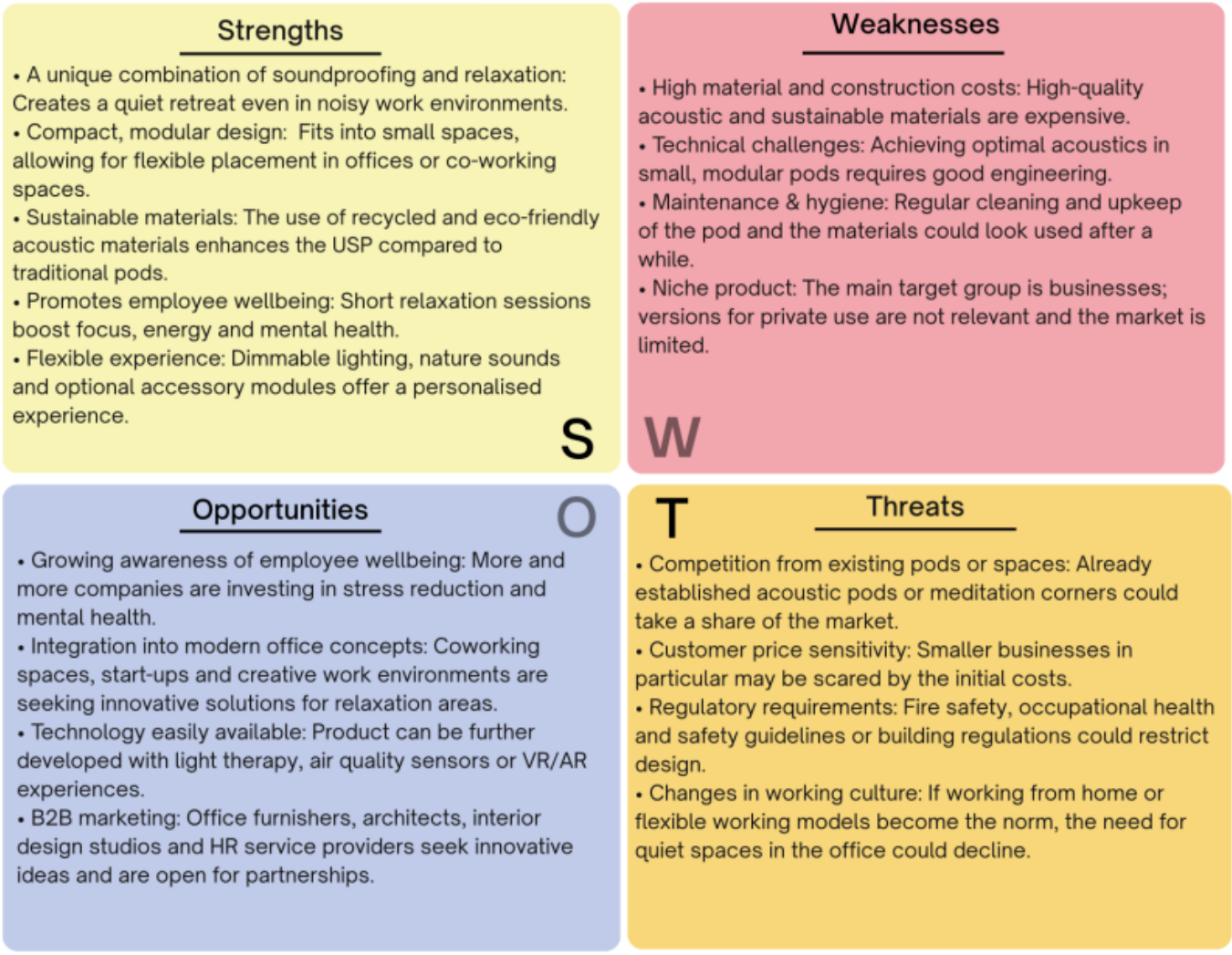


Figure 10: SWOT-Analysis

Strategy

Strategic Objectives

Business and Market

- Position BloomShell as a cost-effective alternative to traditional acoustic pods in the European B2B market.

- Achieve a successful market entry by focusing on offices, coworking spaces and universities as key customers.
- Generate revenue through direct sales and scalable distribution partnerships.

User and Well-being

- Create a retreat for short breaks (5–15 minutes) that reduces stress and improves concentration.
- Increase user satisfaction and perceived well-being through a comfortable, private and calming environment.
- Encourage the incorporation of microbreaks into the daily work routine.

Product and Performance

- Develop a pod that provides effective sound insulation and privacy in noisy environments.
- Create a high-quality user experience through lighting, sound, and interior design.
- Ensure that the product is durable, low-maintenance and suitable for daily use.

Sustainability

- Use of eco-friendly and recyclable materials.
- Reduction of environmental impact through efficient use of materials and long product lifespans.
- Positioning as a sustainable alternative in the office equipment sector.

Segmentation and Targeting

Segmentation

The market is first segmented by application areas and organizational types. These include, in particular, medium-sized to large companies (approx. 100–500+ employees) with open-plan office layouts, coworking spaces, and educational institutions such as universities and libraries. These environments are often characterized by high noise levels and a lack of quiet spaces, creating a specific need for acoustically shielded relaxation areas. Additionally, segmentation is based on organizational characteristics, particularly company size and level of innovation. Growth-oriented companies, startups and modern organizations that actively invest in new workplace concepts and employee well-being are particularly relevant. Smaller companies with limited budgets are less relevant, while very large corporations often already use established but more expensive solutions. Another segment consists of wellness facilities such as yoga studios, wellness centers or therapy centers, which specifically require quiet, secluded spaces for relaxation and mental regeneration but often do not use fully soundproofed solutions. On the user side, segmentation is based on specific needs and usage scenarios. Relevant users are primarily knowledge workers, students, and individuals in mentally demanding roles who regularly suffer from noise, sensory overload, or stress. These users have a clear need for short, effective periods of retreat (5–15 minutes) for recovery, focus or mental relief.

Targeting

Bloem pursues a focused B2B targeting strategy in which organizations are approached as paying customers, while the actual users are addressed indirectly. Market entry initially targets early adopters which are organizations with a high degree of openness to innovative workplace and well-

being concepts. These are specifically targeted through direct sales (B2B Sales) as well as through partnerships with interior design and office furniture providers. This allows Bloem to be integrated into existing space concepts at an early stage. At the same time, demand is built at the user level by actively communicating the benefits of short recovery breaks. This is achieved through targeted content on stress reduction, productivity and microbreaks, which creates indirect pressure on companies to provide corresponding solutions. For secondary target groups such as wellness and yoga facilities, a tailored approach is pursued, with a stronger focus on the experiential aspect and the expansion of existing offerings. These groups are reached primarily through collaborations and targeted outreach to the industry.

Positioning

Functional vs. Experience-Oriented

Existing solutions focus on noise reduction and the functional separation of the work environment, whereas Bloem prioritizes the user experience and aims to include many features that contribute to a relaxing experience. To this end, the focus is on relaxation, stress reduction, and mental recovery through pre-installed meditation guides, relaxation techniques, stretching exercises and coping strategies such as breathing exercises or acoustic nature experiences.

Price vs. Value

Bloem is intended to be positioned as more accessible and cost-effective. This appeals to most corporate budgets and allows it to stand out from the competition compared to high-end pods. Combined with the communicated benefits of our user experience, this aims to convince customers that our offering fulfills all the key functions a company needs for its employees even with a lower price.

Sustainability

Unlike many competitors, Bloem incorporates sustainable and potentially recycled materials into its design. This positions the product as an environmentally conscious choice and reflects the growing importance of sustainability in European markets and in corporate procurement decisions.

Compact and Flexible Design

In terms of design, Bloem should be positioned as a space saving solution that can be flexibly placed and integrated into existing spaces, even for small and medium-sized businesses. This contrasts with larger, less flexible alternatives that require more space.

Marketing-Mix

Product

Bloem is a modular relaxation pod designed specifically for short breaks of 5–15 minutes. The product combines pre-installed relaxation programs, acoustic insulation, soothing lighting, and a minimalist, calming design to create a peaceful environment.

Price

Bloem is positioned in the mid-price segment to offer a balance between quality and affordability. For businesses, a one-time purchase price or, alternatively, a leasing/rental model is offered to lower the barrier to entry. A leasing model can be particularly attractive for larger customers, as costs can be spread over several years. Additionally, optional add-on modules (e.g. lighting systems, sound modules, and apps) can be priced separately to allow for customization.

Place

Sales are primarily conducted in the B2B sector, directly to businesses, universities, and coworking spaces.

Distribution is supported by:

- Direct sales outreach (sales / email / personal contacts)
- collaborations with interior design and office furnishing companies
- partnerships with interior design and architecture firms that integrate Bloem into their projects

In the long term, indirect sales through retailers or platforms may also be pursued to increase reach.

Promotion

Bloem is marketed through a combination of digital communication and direct B2B outreach. Key channels include:

- Website with product information and use cases
- Social media (especially LinkedIn) to reach businesses
- Targeted presentations at trade shows and industry events
- Collaborations with partner companies in the office design sector

Additionally, the product's benefits are actively communicated, particularly regarding stress reduction, productivity, microbreaks and mental health.

Brand

The brand name "Bloem" comes from Dutch and means "flower." This name was chosen intentionally because it symbolizes growth, tranquility and naturalness. These values form the core of the product. The "Bloem Relaxation Capsule" was developed to create a space where users can briefly relax, recharge their energy and mentally unwind, just like a plant that grows and thrives under the right conditions. The product itself is named "Bloem Relaxation Capsule," making the connection between the brand and its function clearly recognizable. The name alone conveys that this is not merely a functional object, but a place of relaxation and retreat. The logo shown in the subchapter Project Development|Concept visually captures this idea. It depicts an abstract figure in a meditative sitting posture, embodying calm, balance and mindfulness. At the same time, the shape resembles a flower, reinforcing the connection to the name "Bloem." This combination of human and nature underscores the product's holistic approach.

Marketing Programmmes

Programmes

Bloem's marketing program is based on a combination of direct B2B sales, a digital presence, and hands-on product demonstrations. Since this is a product that requires explanation, the focus is primarily on personal contact with potential customers. Companies, coworking spaces, and educational institutions are specifically targeted, particularly decision-makers in the areas of office management, HR or facility management. Personal presentations and direct conversations play a key role in clearly communicating the benefits of the capsule. Pilot projects and demo installations are a central component. Bloem should not simply be described; users should be able to experience it. That is why the first units are being installed on a trial basis in real work environments. These test phases make it possible to gather feedback, observe actual usage, and simultaneously build trust with potential customers. Successful pilot projects can then serve as references for other customers. In addition, a digital presence will be established, primarily to provide information and increase visibility. A clear, user-friendly website will introduce the product and the concept and provide information about its features and use cases. A 3D model and promotional video will also help demonstrate the benefits to end customers regarding stress reduction, microbreaks, and modern work environments, and will further support the product’s positioning. Platforms like LinkedIn also play an important role in this regard, as they allow for targeted outreach to the target audience and decision-makers within companies. Another key component is partnerships, such as with interior design firms, office furnishing companies, or architects. These partners can also position Bloem with relevant target groups and integrate it into spatial concepts. The advantage is that these partners already have existing networks and customer relationships, which can facilitate market access. For the secondary market, the approach will be slightly adapted. Here, initial collaborations will be sought through targeted outreach. Additionally, the focus will be on participating in trade shows and industry events. There, the product can be presented to a broader professional audience while simultaneously establishing contacts with potential customers, partners, and investors. Especially in this context, the physical experience of the product is a decisive advantage.

Budget

Bloem marketing budget focuses on initiatives that directly impact sales, brand building, and customer acquisition. The key areas of focus are:

- **Sales expenses:**
  - Personnel
  - Business development
  - Presentations
  - Client meetings
- **Product demonstrations and pilot projects:**
  - Production of demo units
  - Transportation
  - Installation
- **Digital infrastructure:**
  - Website development
  - Acquisition
  - Hosting
  - Content creation
- **Online Marketing:**
  - LinkedIn Ads,

    - Targeted B2B campaigns
    - SEO
- **Trade Shows & Events:**
    - Booth fees
    - Acquisition
    - Transportation
    - Presentation materials
- **Partnerships & Networking:**
    - Collaborations
    - Commissions

Control

The mentioned marketing activities should be tracked through a structured and continuous monitoring process. To this end, various key performance indicators (KPIs) will be defined to measure success. These include, in particular, the number of B2B leads acquired, leads generated through various channels such as the website, events, and social media, the conversion rate of inquiries into actual sales and feedback from pilot projects. These metrics must be evaluated regularly, typically in monthly and quarterly reports. A target-actual comparison should be conducted to identify early on which measures are working well and where adjustments are needed. On this basis, the marketing strategy remains flexible and can be continuously refined. Successful campaigns and channels will be expanded strategically, while less effective approaches will be adjusted or scaled back. This also includes refining the approach to target audiences as needed. In addition, ongoing cost control is implemented. Marketing expenditures are regularly reviewed and evaluated in terms of their cost-benefit ratio. The goal is to use available resources as efficiently as possible and to focus on the measures that deliver the greatest value.

Summary

Based on market and competitive analysis, the team decided to develop a compact, soundproof relaxation pod for modern work environments. The product is primarily intended for the B2B market, particularly offices, coworking spaces, and educational institutions, as there is a heightened need for quiet spaces and stress reduction in these settings. The analysis shows that existing solutions are often expensive or less functional. Therefore, the intended solution should meet several requirements, such as guided relaxation exercises, the use of lighting control, or optional sound elements. Furthermore, the use of sustainable materials plays a decisive role in creating a pleasant room atmosphere and meeting European market requirements. As sustainability is such an important factor it will be addressed separately in the next chapter.

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Eco-efficiency Measures for Sustainability

Sustainability is a widely used concept that is applied by companies, organizations and politicians in various contexts. This chapter deals with specific measures to minimize the environmental footprint. An overview of the most important aspects of sustainable development and eco-efficiency. The eco-

efficiency measures for sustainability provide a foundation for understanding our environmental responsibility and resource efficiency.

Introduction

Bloem capsule was developed with the focus on using renewable materials, reducing waste, and creating a product that supports both people and the environment. Sustainability in this context means not only lowering environmental impact but also ensuring that the product remains useful, durable, and beneficial over time.

The Bloem project aligns with several United Nations Sustainable Development Goals (SDGs) **[15]**. See Figure 11.

Figure 11: All SDGs

Table 21 ...

Table 21: Bloem SDGs

SDG	**Rationale**
SDG 3 — Good Health and Wellbeing	The capsule supports mental health and stress reduction by providing a dedicated space for relaxation and meditation.
SDG 8 — Decent Work and Economic Growth	It improves productivity by allowing users to recharge in work environments.
SDG 11 — Sustainable Cities and Communities	Designed for urban spaces, it promotes healthier and more human-centered environments.
SDG 12 — Responsible Consumption and Production	The capsule uses recyclable materials such as, and biodegradable materials like cork and hemp. Components can be recycled instead of becoming mixed waste.
SDG 13 — Climate Action	Materials such as cork and hemp help reduce carbon emissions due to their low embodied energy and carbon absorption properties.

Environmental

While considering the environmental performance of Bloem, priority was given to natural and renewable materials such as *cork*, *wood*, and *hemp*, all of which have significantly lower environmental impact compared to synthetic alternatives.

- Cork insulation is a key element, as it is harvested without cutting down trees, making it a highly renewable resource. It also absorbs carbon dioxide during its lifecycle and is fully recyclable and biodegradable. In addition, cork provides excellent thermal and acoustic insulation, which reduces the need for extra energy use inside the capsule.
- Hemp insulation further strengthens the environmental profile. It is a fast-growing, low-impact crop that requires minimal resources to produce. Hemp is fully biodegradable, recyclable, and breathable, helping regulate humidity and improve indoor air quality while preventing mold formation.
- The material layering is designed to maximize performance while minimizing environmental impact. Hemp is placed in the outer layer, where its breathability and moisture-regulating properties help protect the structure and extend its lifespan. Cork is used in the inner layer, where its superior acoustic and thermal insulation enhances user comfort while reducing the need for additional energy input. This combination improves efficiency without introducing extra materials or complexity
- Wooden framing and plywood components are also renewable and have a low carbon footprint. Wood stores carbon throughout its life and can be reused or recycled at the end of its use. Flexible plywood was specifically chosen for the shell because it allows curved shapes with minimal material waste, which is ideal for the capsule’s form.

Economical

From an economic perspective, Bloem is designed to be both cost efficient and durable. The selected materials, such as wood, cork, and hemp, are not only sustainable but also relatively affordable and widely available, which helps control production costs. Based on global market data, cork insulation typically ranges between 17 €/m² to 22 €/m², while hemp insulation is around 10–25 €/m², depending on thickness and supplier. Timber is commonly priced at approximately 400 €/m³ to 800 €/m³, which translates into low-cost structural elements when processed into smaller sections. These values are consistent with industry data reported by organizations such as GreenMatch**[16]** and Timberlot**[17]**.

Durability plays a major role in economic sustainability. Materials like plywood and solid wood provide strong structural performance, ensuring a long lifespan for the capsule. This reduces the need for frequent replacements and lowers long-term costs.

The modular design also contributes economically by allowing easy maintenance and part replacement. Instead of replacing the entire unit, individual components can be repaired or swapped, saving both materials and costs over time.

By combining multiple functions such as insulation, structure, and comfort into a limited number of materials, the design avoids unnecessary complexity and reduces overall resource consumption, making the product both economically and environmentally efficient.

*Timber prices refer to raw wood material, which applies directly to the wooden framing. Processed wood products such as plywood (used in the shell and floor) have higher added value due to

manufacturing but remain cost-efficient and widely available.

Social

Bloem capsule is designed to create a positive and inclusive experience while supporting key social aspects such as community, education, equality, justice, social resources, health, well-being, and quality of life.

In terms of *community*, Bloem can be integrated into shared environments such as offices, universities, and public spaces, encouraging a culture that values mental health and mutual respect. It creates a supportive atmosphere where individuals feel encouraged to take breaks and recharge.

Regarding *quality education and quality of life*, the capsule provides a quiet space for focus, learning, and self-development. It can be used for mindfulness practices, or stress management, all of which contribute to improved learning conditions and overall life quality.

In terms of *equality* and *justice*, Bloem is designed as an accessible and universally usable space, offering equal opportunity for all users to benefit from rest and mental recovery, regardless of their role or background. This promotes fairness in shared environments.

The capsule also contributes to *social resources* by acting as a dedicated space that organizations can provide to support their users, improving the overall environment without requiring complex infrastructure.

A major focus is on *health* and *well-being*. Bloem directly supports mental health by reducing stress, fatigue, and burnout. The use of natural, non-toxic materials such as cork and hemp improves indoor air quality, creating a safe and comfortable environment for relaxation. Hemp is placed in the outer layer to enhance breathability and moisture regulation, while cork is used on the inner layer to improve acoustic insulation and thermal comfort, directly enhancing the user experience.

Overall, Bloem enhances quality of life by combining comfort, privacy, making it a socially sustainable solution that benefits individuals and communities alike.

Life Cycle Analysis

This Life Cycle Analysis (LCA) assessment of Bloem is guided by standardized LCA principles in accordance with ISO/TS 14072 **[18]**, ensuring a structured and consistent evaluation.

Raw material and production phase: The primary materials used wood, cork, and hemp are renewable and have relatively low embodied energy compared to synthetic alternatives. Cork and hemp contribute positively by absorbing CO_2 during growth, reducing the overall carbon footprint. Wood components also act as carbon storage throughout their lifespan. Additionally, the use of flexible plywood allows efficient shaping with minimal material waste. However, some impact is associated with processing (e.g., plywood manufacturing and adhesives), although this is limited by keeping material variety low.

Transportation and assembly: The lightweight nature of the selected materials reduces transportation emissions, minimizing the need for energy-intensive manufacturing processes and enabling easier

distribution and installation.

Use phase: During operation, Bloem has minimal environmental impact. The combination of cork and hemp provides effective thermal and acoustic insulation, reducing the need for additional energy input. The breathable hemp layer helps regulate humidity, while cork enhances comfort, contributing to a passive and energy-efficient system.

Maintenance and lifespan: The use of durable materials such as plywood and solid wood ensures a long product lifespan. The modular design allows individual components to be repaired or replaced instead of discarding the entire unit, reducing material consumption over time.

End-of-life phase: At the end of its life cycle, Bloem is designed for disassembly. Wood components can be reused, repurposed, or biodegraded; cork and hemp insulation are fully biodegradable or recyclable; and metal connectors can be recycled without loss of quality. The limited use of adhesives improves the ability to separate materials, supporting a circular lifecycle approach.

Overall, the LCA demonstrates that Bloem minimizes environmental impact through renewable materials, efficient design, low operational energy demand, and high end-of-life recoverability.

Summary

Bloem capsule demonstrates a balanced approach to sustainability by combining renewable materials, efficient design, and user-focused functionality. Its use of cork, hemp, and wood reduces environmental impact while ensuring durability, recyclability, and comfort.

Consequently, the team decided to design a solution with the following features: use of recyclable and biodegradable materials, efficient insulation to reduce energy use and more privacy. And in the next chapter we will discuss the ethical and deontological concerns Of Bloem.

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Ethical and Deontological Concerns

Introduction

Our team has considered these values throughout the Bloem project. The analysis is based on general engineering ethics frameworks, such as those defined by the IEEE Code of Ethics, which emphasize safety, honesty, sustainability and responsibility towards society. (IEEE, 2020)

The analysis covers five essential areas:

- Professional responsibility in engineering
- Integrity in sales and marketing
- Environmental impact
- Legal liability
- Ethical design decisions

These principles act as guiding values for responsible engineering. By addressing these aspects, we ensure that our solution is not only functional and innovative, but also respectful of societal values, sustainable development and human wellbeing.

Engineering Ethics

The team is committed to respecting core engineering ethics such as honesty, accuracy and prioritization of user safety. During the development of Bloem, all technical decisions are made with consideration of safety, comfort and reliability.

Engineers have a professional and moral responsibility to protect public health, safety and welfare. This is especially important for Bloem, as it is an enclosed space where users seek relaxation. Therefore, specific risks must be considered and minimized. These include:

- Insufficient ventilation leading to poor air quality or CO2 buildup
- Electrical failure of lighting or sound systems
- Excessive sound isolation reducing awareness of external emergencies
- User discomfort or panic in an enclosed environment

The team addresses these risks through design decisions such as ensuring proper airflow, using safe low-voltage systems and creating an intuitive and easy-to-exit structure.

Engineering ethics also requires transparency and accountability. Any claims about the benefits of Bloem, such as stress reduction, must be realistic and based on existing research.

The team applied these principles by:

- Designing a safe and accessible enclosed structure
- Selecting non-toxic and sustainable materials
- Ensuring proper ventilation and user comfort
- Creating an intuitive user experience without the need for instructions

This ensures that the final design is safe, responsible and aligned with professional engineering standards.

Sales and Marketing Ethics

In Bloem’s marketing and communication, the team aims to provide clear, honest and transparent information about the product. The capsule is designed to support relaxation and short mental breaks, but it should not be presented as a medical solution or a guaranteed treatment for mental health issues.

Ethical marketing includes:

- Honest communication without exaggerated claims
- Transparency about limitations and realistic benefits
- Use of reliable and research-based information
- Respect for user privacy and informed decision-making

Marketing efforts should clearly explain what the product offers: a quiet, enclosed space that supports relaxation in busy environments.

In addition, inclusivity is important. Bloem is designed for a wide range of users, so communication should reflect accessibility and not target only a specific group. This approach helps build trust and ensures compliance with consumer protection standards.

Environmental Ethics

Bloem is designed with sustainability as a core principle. The use of natural materials such as cork and hemp reduces environmental impact while also improving acoustic performance.

The project supports environmental responsibility through:

- Use of renewable and sustainable materials
    - Reduction of synthetic and non-recyclable components
    - Design for durability and long product lifespan
    - Possibility for repair and replacement of components

  In addition, responsible sourcing of materials is considered to ensure minimal environmental harm during production. The design also aims to fit naturally within office environments without being visually or physically disruptive.

At the end of its lifecycle, materials should be recyclable or biodegradable where possible. These decisions align with broader European sustainability goals and contribute to more responsible product design.(European Commission, 2019)

Liability

As future engineers, the team understands the importance of liability and accountability for design decisions. Since Bloem is a physical product that users enter, safety and compliance are critical.

Possible risks include:

- Unordered List ItemPoor ventilation inside the capsule
- Electrical malfunction of lighting or sound systems
- Structural instability or material failure
- User misuse due to unclear instructions

The team addresses liability through:

- Risk identification during the design phase
- Clear user guidance and intuitive design
- Safe material and component selection
- Regular testing and validation of the system

From a legal perspective, the product must comply with relevant European regulations, such as:

- Low Voltage Directive (2014/35/EU) ensuring electrical safety of lighting and electronics
- EMC Directive (2014/30/EU) preventing electromagnetic interference between components
- General Product Safety Directive (2001/95/EC) ensuring overall product safety
- Machinery Directive (2006/42/EC) if moving or mechanical parts are included

Compliance with these directives is necessary for CE marking and allows the product to be legally introduced to the European market. If digital features are included, data protection must also be considered. Only necessary data should be collected and users must be informed transparently about its use. By addressing these aspects, the team reduces risks and ensures accountability for the final product. (European Commission, 2026)

Summary

Ethical and deontological considerations play an important role in the development of Bloem. The project integrates principles of safety, transparency, sustainability and responsibility into every stage of the design process.

Engineering ethics ensures that user wellbeing remains the top priority, while ethical marketing guarantees honest communication. Environmental considerations reduce the impact of the product and liability ensures safety and legal compliance.

by combining these aspects, Bloem represents a responsible and human-centered engineering solution that aligns with both professional standards and societal needs.

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Project Development

Introduction

This chapter relates to Bloem's development process, showing how the main ideas behind the machine evolved over time to become a complete system. It begins with the ideation and conceptual stages, where initial sketches and preliminary designs are analyzed to show the transition from a creative vision to a functional solution. This is followed by a detailed design phase that includes the physical structure, smart systems and packaging.

To provide a clear view of the project, external programs, tables, and images are used to justify technical and material choices, including a fuctional analysis of the system's components. Finally, the chapter concludes with the prototyping stage and the tests performed to evaluate the final product.

Ideation

Choice of subject

The development of the project began with an initial selection phase, where we were presented with twelve potential themes covering a wide range of challenges. After an internal review, we narrowed the focus down to the three areas that best aligned with our intrests: Smartification of Everyday Objects (Smart Cities), Smart Health and Well-being (Smart Health), and Smart Marine Habitat Structures (Sustainable Environment).

Ultimately, we decided to proceed with smartification of everyday objects within the framework of Smart Cities. This choice was the result of strategic assesment of our teams's profile. As an international and interdisciplinary group, we recognized that our diverse backgrounds provided us with a unique combination of skills and technical knowledge. We concluded that the Smart Cities gave us the best opportunity to combine our knowledge and work together effectively to create a unique solution.

Brainstorming

Due to the broad nature of the Smart Cities theme, our initial brainstorming session generated a wide variety of ideas. After an initial screening, we focused our research on three specific concepts:

· A smart dehumidifier designed to collect ambient moisture and repurpose the water to automatically irrigate indoor plants.

· External facade panels aimed at improving the thermal insulation of buildings to mantain cooler temperatures more efficiently.

· A micro-break capsule specifically designed for employees to rest and recharge during work hours.

To organice our thoughts to evaluate these options, we used Miro, a collaborative digital tool that allowed us to visualize the pros and cons of each proposal. As shown in Figure 12, we mapped out the potential impact and technical feasibility of each idea.

After weighing the strenghts and weaknesses of each concept, we ultimately decided to move fordward with the micro-break capsule. We found that this area was the least explored compared to the others, meaning there was significantly less existing competition in the market. This provided us with a unique opportunity to combine our different skills into a single project that addresses a real gap in urban well-being, allowing us to create something truly original.

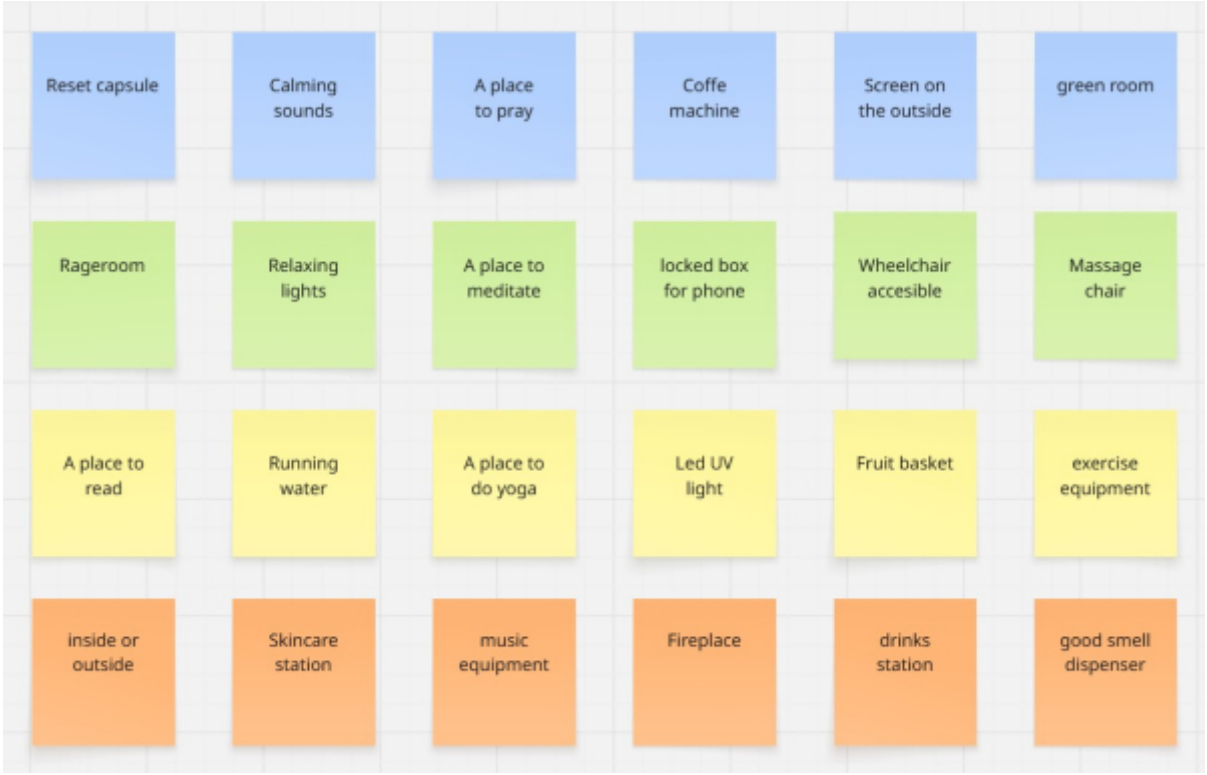

Figure 12: Brainstorming Phase

Design thinking

Once the micro-break capsule was chosen as our final concept, we moved into a Design Thinking phase to explore its phisical form. To do this, we developed five quick sketches, each representing a different approach to how the capsule could look and function. These initial ideas, shown in Figure 13, allowed us to visualize various layouts and user experiences.

· The Onion Pod: A private, fully enclosed room that prioritizes total isolation, though it requires a significant amount of floor space.

· The Wide Lounge: A large and spacious horizontal structure designed for maximum comfort, focusing on internal volume.

· The Minimalist Tipi: A practical and nature-inspired design that uses a minimalist aesthetic to create a calm, functional retreat.

· The Open Swivel: A cost-effective and compact chair system designed for very short breaks, though it lacks the privacy of a closed system.

· The Hanging Capsule: A smaller, suspended unit designed as a closed retreat, offering a sense of weightlessness while saving floor space.

As we did in the braisntorming stage, we carefully analyzed the pros and cons of each sketch. We considered factors such as user comfort, the space required in an office setting, and the tecnical feasibility of the structure.

After comparing the different designs, we ultimately chose the full-body capsule model. This design allows a person to step inside and remain standing, providing enough room to stretch, move slightly, or practice meditation in private. We decided that this spacious configuration was the most effective way to help users disconnect from workplace stress and focus on their physical and mental well-

being.

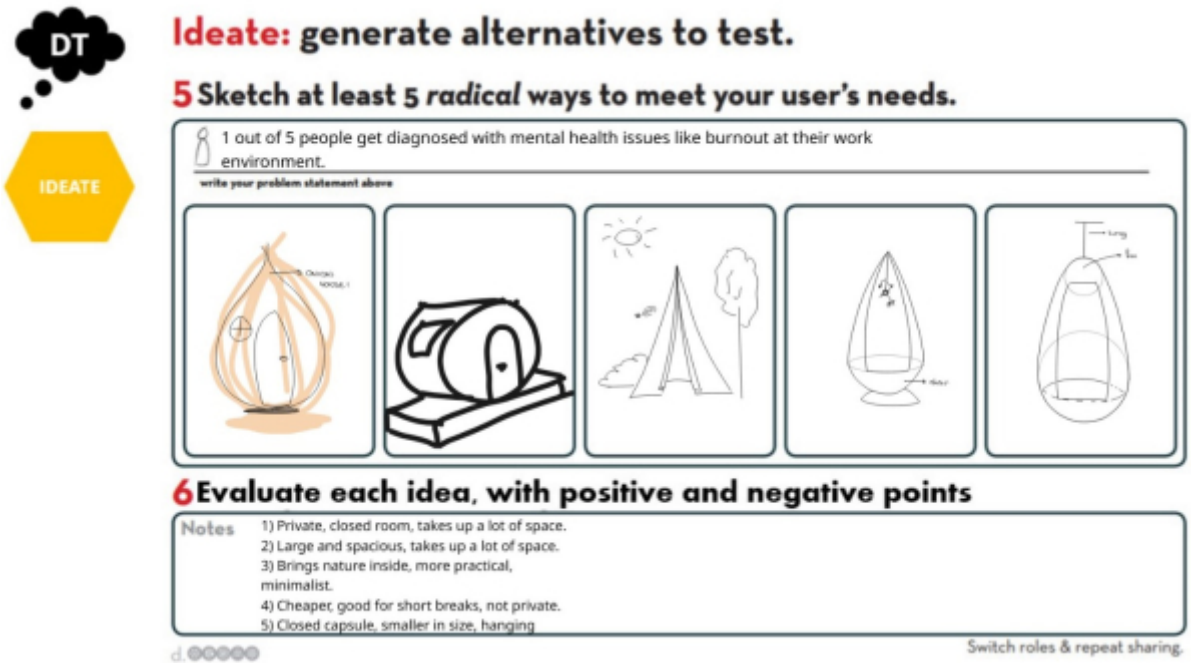

Figure 13: Design Thinking Phase

The idea

The final concept developed for this project is an egg-shaped capsule designed to integrate seamlessly into modern corporative environments, such as large halls or corridors. Our goal was to create a private sanctuary for “micro-breaks” during long working hours, a space where employees can scape the pressure of the office to perform a “power nap”, meditate, strech or even release tension in total privacy.

The structure is dimensioned to be inclusive, providing enough space for a person to of average height to stand, lie down, or practice yoga confortably. A core principle of design is total isolation. The capsule is engineered to be both visually and acoustically opaque, ensuring that nothing can be seen or heard from the outside, and vice versa. This crates a true “break from the world” for the user.

Functionality is also integrated into the exterior through a smart lighting system that iluminates when the capsule is occupied, signaling to others that the space is in use. Furthermore, Bloem is designed to be part of a larger digital ecosystem; it will be liked to a user interface for reservations and can provide helpful “newsletters” or guidance on mental healh and physical well-being. This ensures the capsule is not just a physical space but a proactive tool for workplace health.

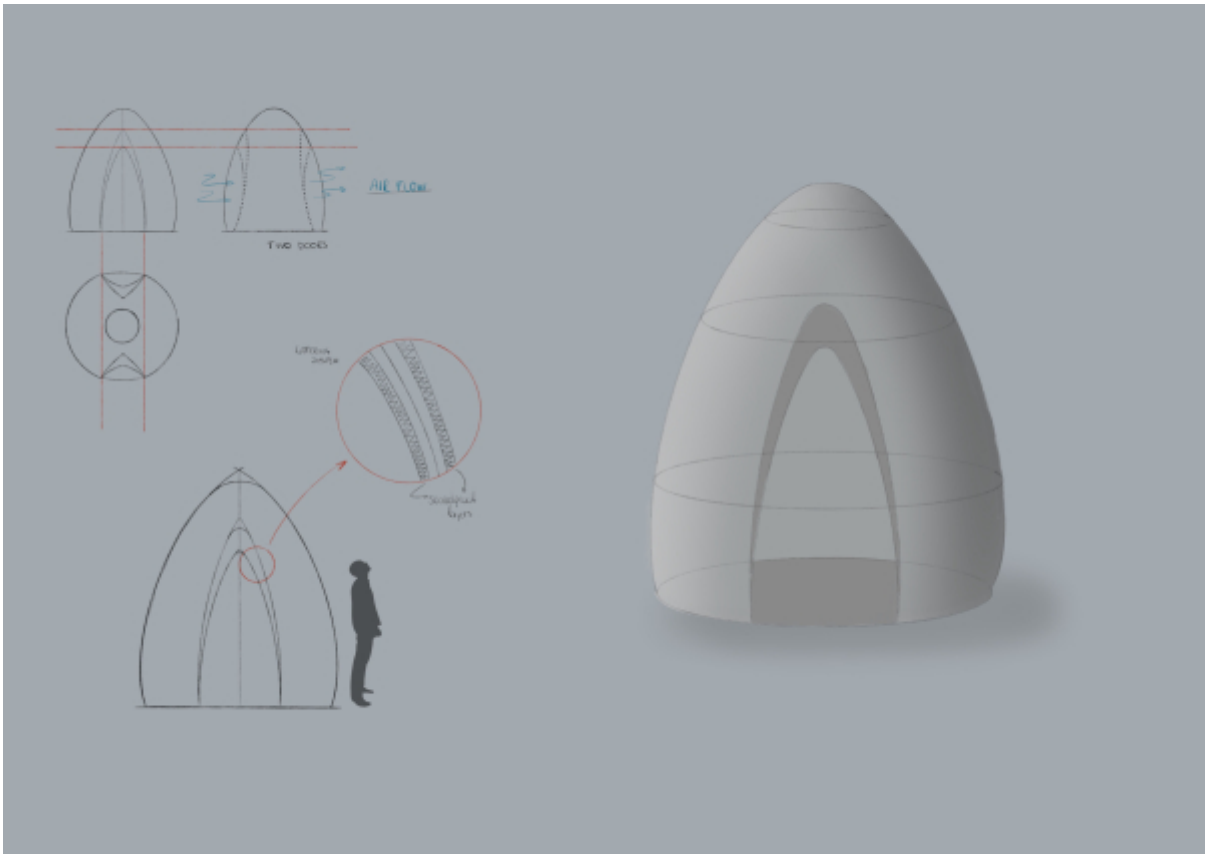

Figure 14: First Drafts

Concept

This section details the conceptual framework of Bloem, outlining how various elements converge to create a private sanctuary for workplace well-being. The process begins with the definition of the corporate identity, where the development of the logo and color palette establishes a cohesive visual language. From there, the focus shifts to the evolution of the user interface, tracing the journey from the sketches to the final prototypes.

A central part of this visualization, is the integration of the capsule's physical design with its smart functionalities. Particular emphasis is placed on the occupancy signaling system and the structural aesthetics that allow Bloem to function as a seamless addition to corporate environments. By combining digital reservation tools with a specialized physical enclosure, the project is shaped into a dynamic solution for mental and physical health. Each component, from the external lighting to the internal ergonomics, contributes to the overall success and functionality of the platform.

Logo Design

The Bloem logo is designed to be simple and meaningful, combining three main ideas into one icon. A flower petal, a person meditating, and the letter “B”. By merging the human shape with the petal, the logo clearly shows our goal: helping people “bloom” and feel better at work. We used soft, rounded edges instead of sharp corners to make the brand feel safe and welcoming. This cleanlook works perfectly on everything from small phone screens to the side of the physical capsule, keeping the brand looking professional and modern.

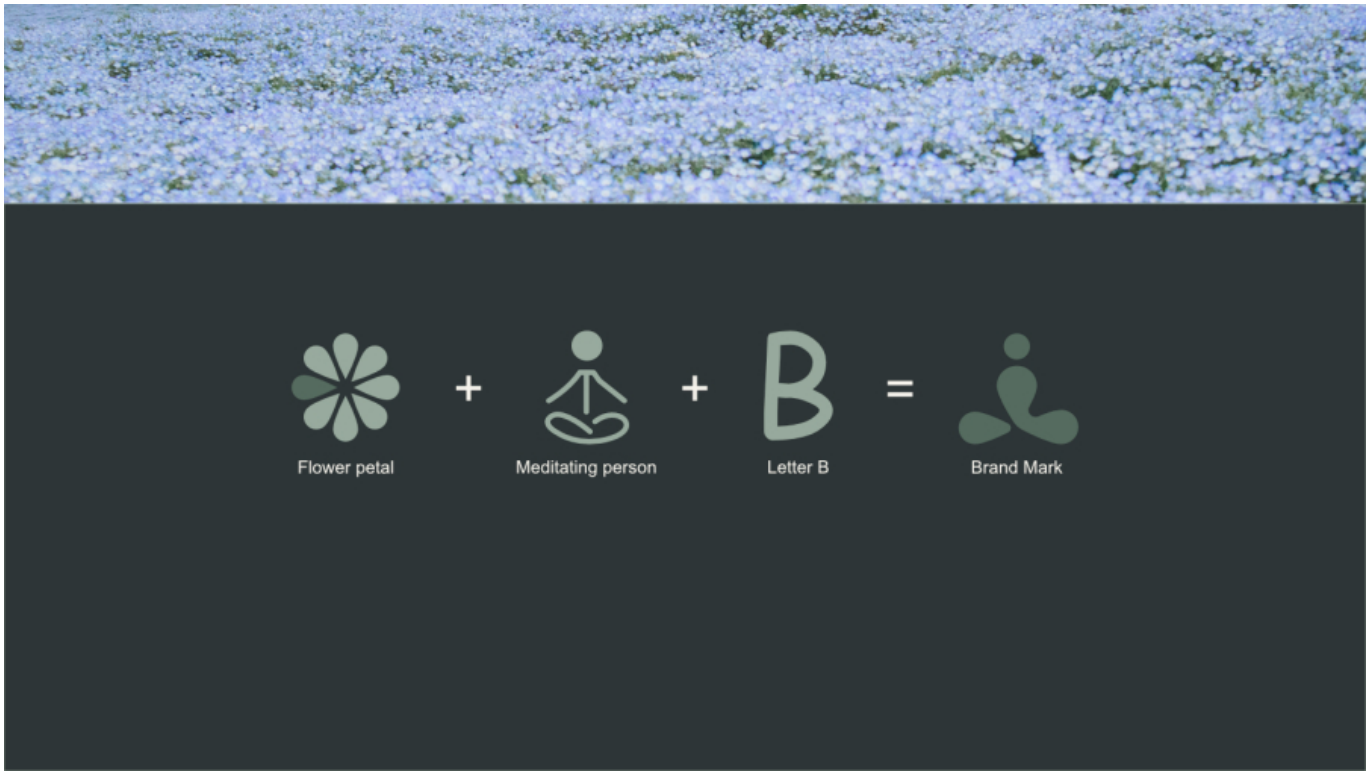

Figure 15: Final logo

Color Palette

The Bloem color palette is designed to communicate a balance between professional stability and organic tranquility. By utilizing a range of desaturated, nature-inspired tones, the brand establishes a visual language that feels both sophisticated and calming. The identity relies on a specific hierarchy of colors that ensures the brand remains versatile while consistently evoking a sense of peace.

The lighter shades, Plaster and Mist, serve as the brand's primary background tones. They provide a clean, airy feel that represents openness and clarity, allowing the brand to exist comfortably within modern corporate aesthetics without appearing aggressive. These are complemented by the core botanical tones, Moss and Eucalyptus, which ground the identity in its natural roots. These greens are strategically chosen to symbolize growth and renewal, creating a “natural refuge” within the visual identity that invites the audience to slow down and breathe.

To complete the palette, Soot is used as the foundational anchor for typography and structural brand elements. This deep charcoal provides the necessary weight and high-end contrast, ensuring that the brand is perceived as premium, reliable, and professional entity. Together, these five tones create a harmonious ecosystem that reinforces the Bloem promise “a space where human well-being and professional life can coexist in perfect balance”.

Figure 16: Color palette

Design

The design of Bloem centers on a philosophy of “Organic Minimalism”, where fluid shapes and high-performance materials work together to support the user's well-being. By stepping away from the sharp, rigid lines of traditional office furniture, we have created a form that feels naturally protective and inviting. This softer approach is more than just an aesthetic choice, it's a deliberate way to signal safety and relaxation the moment a person sees it.

The effectiveness of the design relies heavily on its materiality. Every surface and texture is chosen to create a true sensory escape, using advanced acoustic shielding to block out the noise and sustainable, tactile finishes to provide physical confort.

Structure

The skeletal framework of Bloem draws deep inspiration from traditional Japanese joinery, a caftsmanship philosophy that prioritizes the assembly of wooden structures without the use of nails, screws, or industrial adhesives. By relying on interlocking joints, the structure benefits from a superior level of durability and flexibility. Unlike rigid mechanical fasteners that can weaken wood over time, these traditional techniques allow the material to expand and contract naturally, ensuring a long-lasting structural integrity. As seen in figure 17 the structural drawings, the capsule is built around a series of vertical wooden ribs that converge at a central ring. This “puzzle like” assembly that is both an engineering feat and a warm, organic alternative to industrial frames.

This structural choice is also fundamental commitment to sustainability and circular design. By eliminating metal fasteners and chemical adhesives, the capsule becomes a mono-material system that is significantly easier to disassemble and recycle at the end of its life cycle. This design ensures that each wooden component can be individually repaired or repurposed without damaging the rest of

the frame, drastically reducing the project's carbon footprint. Ultimatelly, by merging ancestral assembly techniques with modern professional needs, the structure of Bloem stands as a durable, low-impact solution that respects both natural resources and high-quality craftmanship.

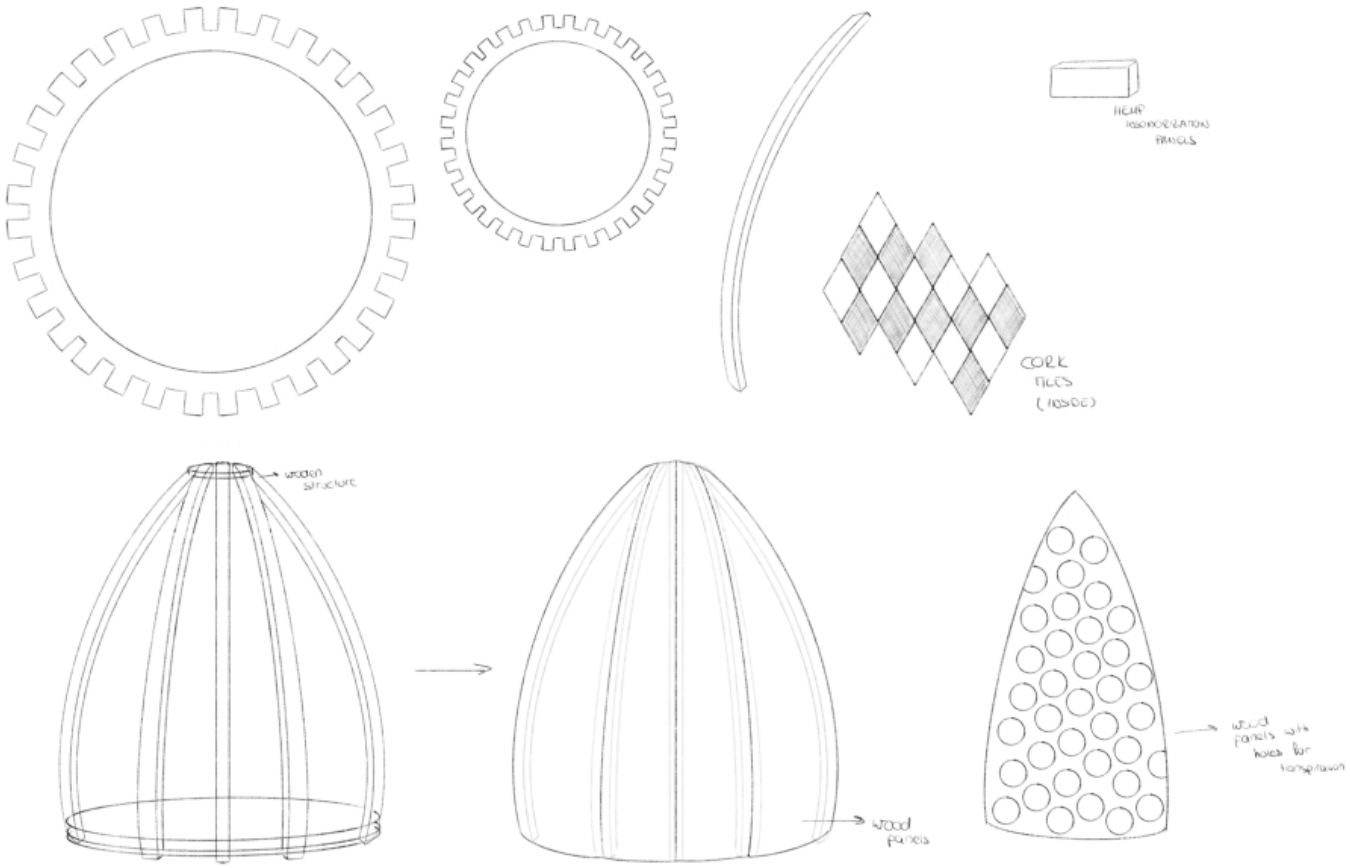

Figure 17: Structural drawings

Materials

The choice of materials for Bloem is a tribute to Portuguese industruial heritage, prioritizing “kilometer 0” sourcing and high-performance sustanaibility. By utilizing local resources like cork and hemp, the project not only supports regional craftmanship but also achieves superior acoustic insulation through natural, breathable materials.

Theinterior is lined with cork tiles. Beyond the warm and organic aesthetic , these tiles provide excellent sound absorption, creating a soft, quiet atmosphere that is essential for meditation and rest. Following the layering system shown in the technical sketches, the exterior of the wooden frame is reinforced with hemp blocks. Known for their exceptional thermal and sound-proofing properties, these blocks act as a dense acoustic barrier, shielding the user from the high-frecuency noise of a busy office.

While the hemp blocks provide soundproofing, their raw appearance is elegantly concealed by an outer skin that defines the capsule's botanical silhouette. We are currently exploring sustainable fabrics and natural fibers for this decorative layer, seeking a material that is both durable and tactile. This outer shell will mimic the soft, overlapping curves of flower petals, ensuring that the capsule remains a beatufil piece of biophilic design while hiding the complex technical layers of insulation underneath. This combination of traditional materials and smart layering ensures that Bloem is as

effective as it is respectful of the environment.

Structure

The structural drawings of Bloem illustrate a highly engineered system designed to balance formal elegance with technical performance. The assembly is built around a primary wooden skeleton, as detailed in Figure 17, wich utilizes a central compression ring to secure the vertical ribs. This radial configuration allows for a self-supporting dome structure that maximizes internal volume while maintaining a compact footprint within the office environment. By relying on traditional joinery as shown in the components of figure 17, the frame remains flexible yet stable without the need for mechanical fasteners.

A key focus of the technical development is the multi-layered wall system shown in the details of figure 18. The capsule's shell is composed of several functional layers designed for total acoustic isolation:

- Interior Skin: Aesthetic cork tiles for immediate sound absorption and tactile warmth.
- Insulation Layer: High-density hemp blocks that serve as a dense acoustic barrier.
- Outer Finish: A flexible decorative skin, currently in development, which gives the capsule its distinctive petal-like texture.

Furthermore, figure 18 specifies a dual-door system and integrated “transpiration holes” in the wood panels to facilitate natural Air Flow. By placing openings on opposite sides, the design promotes passive ventilation, ensuring a constant supply of fresh air without compromising the soundproof integrity of the space. The synergy of these technical details demsonstrates a design that is as functional as it is visually inspiring.

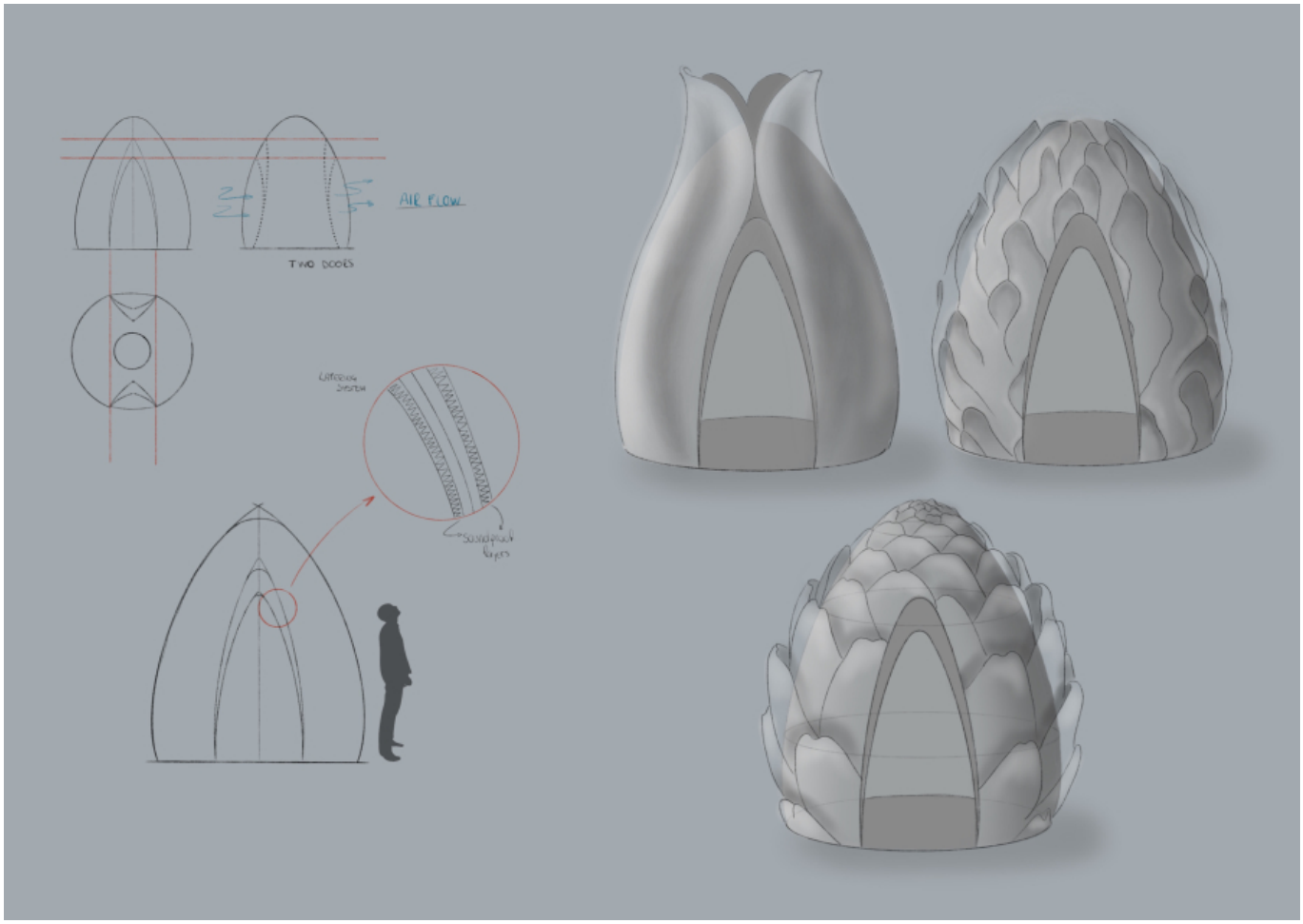

Figure 18: Structural drawings

3D model with load and stress analysis

The 3D modeling and structural stress analysis are scheduled for the next phase of the project's technical development. This stage will involve a digital simulation to verify how the interlocking wooden structure (Figure 17) supports the weight of the hemp and cork insulation layers. By postponing the deep stress testing until the final geometry and materials are fully defined, the analysis can provide more accurate data on the capsule’s durability and safety. This future step will ensure that the organic form is structurally sound and ready for professional manufacturing.

Color palette

The color identity of Bloem has been meticulously curated to foster a state of physiological and mental calm. The palette is composed of desaturated, nature-inspired tones that balance professional elegance with organic tranquility as shoun in the figure 16.

The strategic application of the palette is divided into three functional areas:

- Exterior Surfaces: The shades Plaster (off-white) and Mist (pale blue) are used for the capsule's outer shell. These tones allow the large structure to remain visually light and blend seamlessly into modern office environments without becoming a distraction.
- Interior Environment: The interior utilizes Moss and Eucalyptus greens. These shades are scientifically associated with stress reduction and focus. By surrounding the user with these deeper botanical tones, the capsule creates a “cocoon” effect that psychologically distances the

user from the bright, high-pressure office atmosphere.
- Contrast and Accents: The shade Soot (deep charcoal) is used for structural details, hardware, and typography. This tone provides the necessary professional weight and high-end finish, ensuring that Bloem is perceived as a sophisticated tool for corporate wellness.

The synergy of this palette ensures that every touchpoint reinforces the brand's promise: providing a quiet, restorative space where users can truly “bloom.”

Smart System

Hardware

Figure 19 shows the block diagram of the capsule system. At its core is a microcontroller, which is connected to a RGB LED strip and light sensor. All components are powered by an external power supply. The microcontroller communicates wirelessly with an application via Bluetooth/Wi-Fi. The application acts as the central control hub, managing communication with the ESP32 and thereby controlling the lighting system. In addition, the app connects to a Bluetooth speaker to provide audio within the capsule.

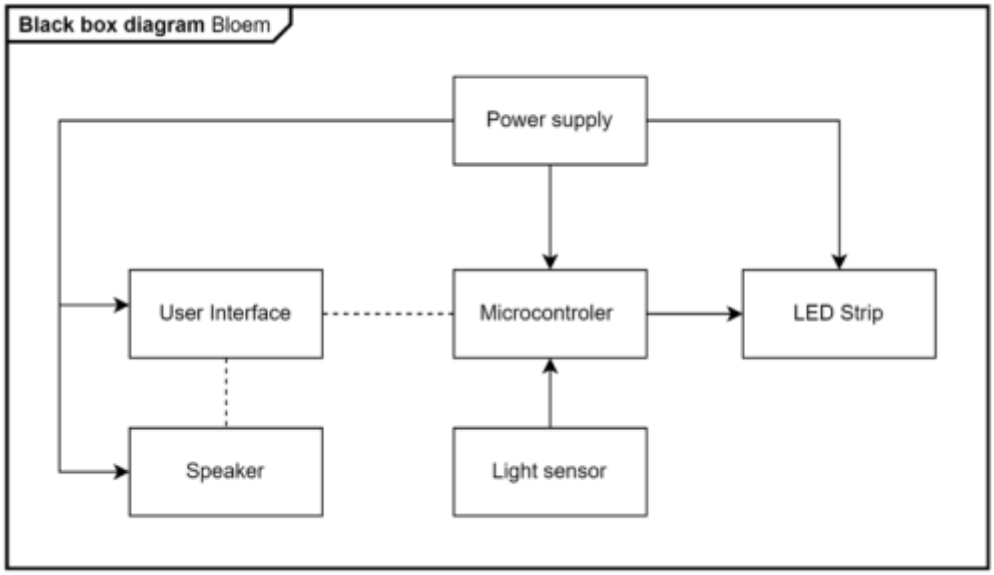

Figure 19: Black Box Diagram

To determine the most suitable components for the system, a comparative analysis was conducted. Multiple components were evaluated based on key parameters such as performance, functionality, and size. The following presents a comparison of microcontrollers (tabel 22) and LED strips (tabel 23). This comparison forms the basis for the final selection of components used in the project.

Table 22: Comparison of microcontrollers. We have chosen to work with the ESP32 because of its compact size, high performance, and built-in Wi-Fi/Bluetooth connectivity.

Microprocessor	**Arduino UNO R4 [19]**	**ESP32 Dev Module [20]**	**Raspberry Pi 4 [21]**
Processor	48 MHz	Up to 240 MHz	1.8 GHz
Wi-Fi	IEEE 802.11 b/g/n (Wi-Fi 4)	IEEE 802.11 b/g/n (Wi-Fi 4)	IEEE 802.11ac (Wi-Fi 5)
Bluetooth	Bluetooth 5	Bluetooth 4.2 / BLE	Bluetooth 5

Microprocessor	Arduino UNO R4 [19]	ESP32 Dev Module [20]	Raspberry Pi 4 [21]
Power	5V DC via USB	3.3V DC via USB	5V DC via USB
Form factor	68.6 × 53.3 mm	51 × 28 mm	85.6 × 56.5 mm

Table 23: Comparison of LED Strips. We have chosen RGB LED strips because they offer full color control and flexibility for creating immersive lighting effects.

Feature	RGB LED Strip [22]	Single Color LED Strip [23]	Tunable White LED Strip [24]
Color Options	Color changing	Fixed	Adjustable white
Control	App / Microcontroller	On-off / Direct power	App / Microcontroller
Voltage	5–12V DC	5–12V DC	5–12V DC
Connections	4 (R/G/B + V/GND)	2 (+V / GND)	3 (Warm / Cool + V/GND)
Notes	Can produce millions of colors	Simple and low cost	Mood adjustment with white tones

Based on this analysis, we have chosen the ESP32 Dev Module. It offers a high processor speed and provides excellent flexibility for connecting sensors while still being compatible with the Arduino platform. Likewise, we want to give ourselves the option to use multiple colors of lighting in the capsule, which is why we have selected RGB LED strips. Below, we present a summary of all the electrical hardware components that will be part of the capsule.

Electrical Components Overview:

1. 12V Power Supply: Supplies power to the system and LED strip.
2. Buck Converter: Steps down voltage for low-power components.
3. RGB LED Strip: Enables flexible and dynamic lighting.
4. Light Sensor: Adjusts lighting based on ambient conditions.
5. ESP32 Dev Module: Provides control and wireless communication.
6. 3× Resistors (1 kΩ): Protects components and limits current.
7. 3× Transistors (IRLZ44N): Controls higher current to the LED strip.
8. Speaker (Bluetooth): Provides audio output.
9. Tablet: Acts as the user interface.

This section describes the schematic design of the system shown in 20. The diagram illustrates the integration of the main components and their interactions. The ESP32 functions as the central controller and is responsible for controlling the lighting of the capsule. A light sensor is included to detect ambient light levels and determine when a session should begin. The capsule uses a 12V RGB LED strip with four connections: a 12V supply line and three control lines for red, green, and blue. The color and brightness are controlled using pulse-width modulation (PWM). Each control signal is generated by a digital output pin on the ESP32 and passes through a resistor and a logic-level N-channel MOSFET. This setup allows the low-voltage ESP32 to safely control the higher voltage and current required by the LED strip. Power is provided by a 12V power supply. Since the ESP32 and sensor require a stable 3.3V supply, a buck converter is used to step down the voltage accordingly. Additionally, the ESP32 communicates with a mobile application via Bluetooth Low Energy (BLE), enabling configuration and control of the system. It is important to note that this design represents an initial draft, developed to explore component selection and overall system integration.

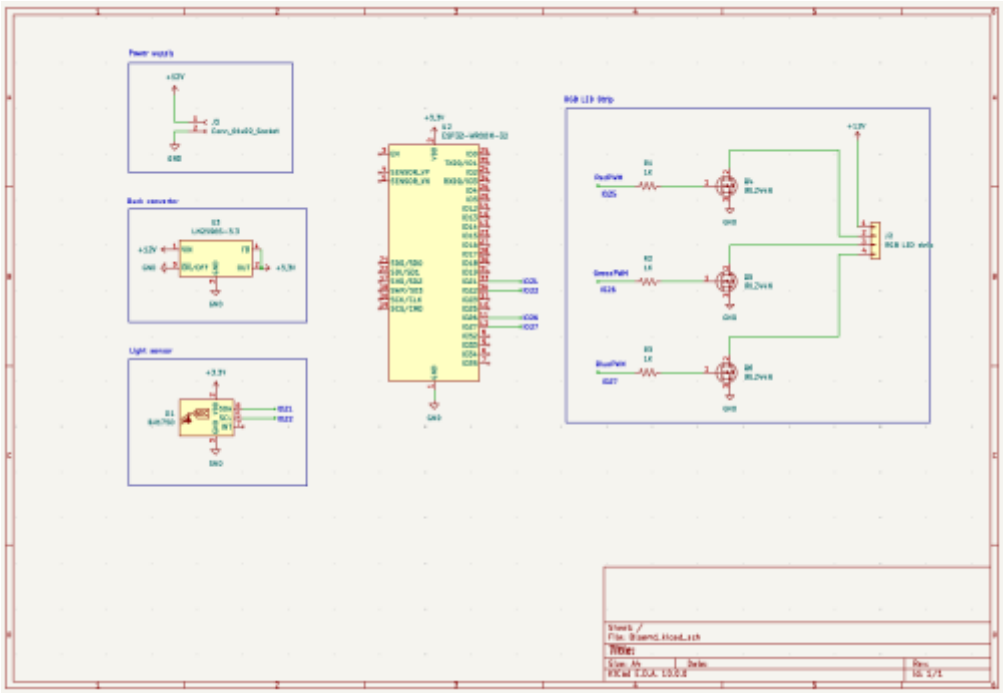

Figure 20: Schematic drawing **[25]**

To ensure the system operates reliably, a power budget was established for all electronic components. Table 24 below outlines the voltage, maximum current draw, and resulting power consumption for each component. The data is based on the datasheets of each component.

Table 24: Total Power Budget for the System.

Component	**Rail**	**Max Current**	**Power (W)**	**Note**
ESP32-WROOM-32	3.3V	500 mA	1.65 W	During Wi-Fi activity
BH1750 Sensor	3.3V	< 1 mA	~0.01 W	I2C communication
LM2596 Loss	12V	~50 mA	~0.6 W	Based on ~80% efficiency
RGB LED Strip (3m)	12V	3.6 A	43.2 W	Full white brightness
Total System	12V	~3.8 A	~45 W	Input requirement for J3

The power budget analysis shows that the system has an estimated total power consumption of approximately 45 W, where the RGB LED strip constitutes the primary load. In comparison, the ESP32 and connected sensors contribute only a minor portion of the overall consumption, while losses in the voltage regulation stage are relatively small but included in the calculation. Based on this analysis, the system requires a 12 V power supply capable of delivering at least 3.8 A. To ensure stable operation under varying load conditions, a safety margin should be applied. Therefore, a power supply in the range of 5–6 A (60–72 W) is recommended. Overall, the power budget confirms that the system design is r well-justified in terms of power requirements.

Software

The software component of the Bloem project is responsible for enabling the interaction between the user and the capsule environment. It consists of a mobile application installed on a tablet and an embedded control system running on a microcontroller. Together, these elements allow the user to book sessions, control environmental settings, and experience a guided relaxation process.

The tablet application acts as the main interface between the user and the system. It is designed with a calm and minimal user interface, using simple navigation, large touch elements, and soft visual feedback to align with the relaxing purpose of the capsule. The application allows users to quickly book a session, select a time slot, and adjust lighting and sound settings without unnecessary complexity.

The embedded system, implemented using a microcontroller (ESP32), is responsible for executing commands received from the tablet application. It controls the lighting system, manages audio triggers, and processes sensor data when necessary. This separation between interface and control ensures modularity and simplifies both development and maintenance.

Use Cases and User Stories

The Bloem system supports a set of focused interactions that define the user experience.

Table 25: Main Use Cases of the Bloem System

Use Case	Description	Main Actor
Book a session	The user selects a session duration and an available time slot	User
Start session	The user initiates the relaxation session	User
Adjust lighting	The user changes brightness or selects a predefined lighting mode	User
Adjust sound	The user selects a sound environment or silence	User
Run session	The system maintains the selected environment during the session	System
End session	The session ends automatically or is stopped manually	User / System

Table 26: User Stories

ID	User Story
US1	As a user, I want to quickly book a session so that I can relax without waiting
US2	As a user, I want to choose a time slot so that I know when the capsule is available
US3	As a user, I want to control lighting so that I can create a comfortable environment
US4	As a user, I want to select sounds or silence so that I can personalize the experience
US5	As a user, I want a simple interface so that I can use the system without confusion
US6	As a system, I want to automatically end sessions so that the capsule is available for the next user

Selection of Development Platforms and Software Components

The Bloem system requires both a front-end application and an embedded control system. Different options were considered for the tablet application.

Table 27: Comparison of Tablet Application Development Options

Option	Advantages	Disadvantages	Suitability
Native Android application	Full access to device features, high performance, stable user experience	Platform-specific development	High
Cross-platform mobile framework	Faster development and shared codebase	Additional abstraction layer, possible performance trade-offs	Medium
Hybrid application	Easier UI development, flexible design	Limited hardware integration, less optimized	Medium

For Bloem, a **native Android application** is considered the most suitable option. It allows direct integration with the tablet hardware, ensures smooth performance, and provides better control over the user interface and device communication.

The selected software components are summarized below.

Table 28: Selected Software Components

Component	Technology	Purpose
Tablet application	Native Android app	User interaction and session control
UI design	Custom interface (Bloem design system)	Calm and intuitive experience
Embedded firmware	ESP32 (Arduino framework)	Hardware control and system logic
Communication	Wi-Fi and Bluetooth local communication	Data exchange between tablet and ESP32
Session management	Internal app logic	Controls timing and session flow

Software Architecture

The software architecture is divided into two main layers: the user interface layer and the hardware control layer.

The tablet application manages all user interactions, including session booking, environment configuration, and session control. Once the user selects a session and its parameters, the application sends commands to the embedded system.

The ESP32 receives these commands and applies them to the physical lightning component. During the session, the system maintains the selected environment and ensures that the session duration is respected through a timer mechanism.

This architecture ensures a clear separation between user interaction and hardware control, making the system easier to develop, test, and extend.

Interaction Diagram

The following diagram illustrates the interaction between the user, the tablet application, and the hardware components of the Bloem system.

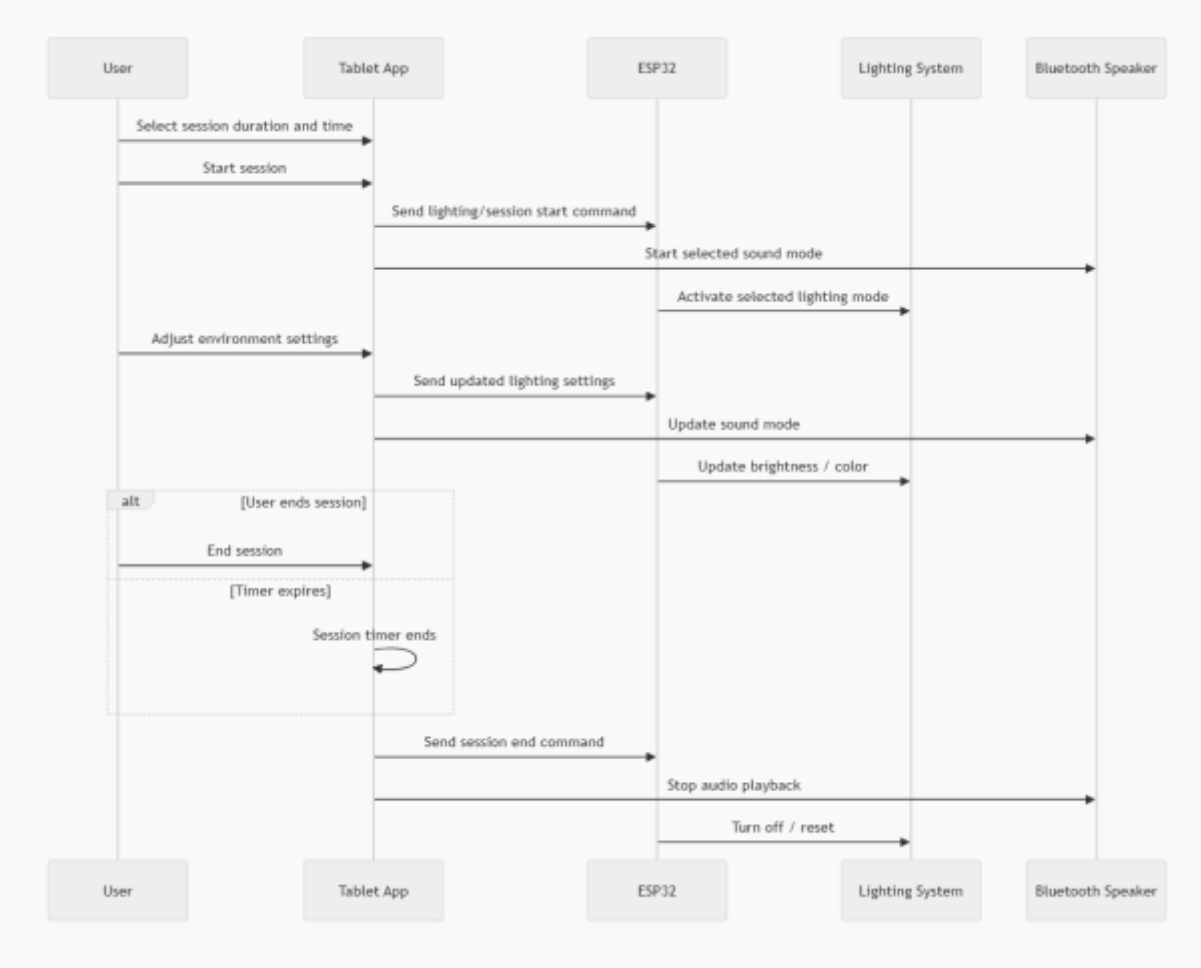

Figure 21: Interaction flow between user, tablet application, and capsule control system

Packaging

Given the significant scale of Bloem and its commitment to sustainable logistics, the packaging is designed as a high-end, industrial Flat-Pack System. Instead of shipping a voluminous, pre-assembled structure, the capsule is divided into modular components that optimize transport space and significantly reduce the carbon footprint of delivery. This system is specifically engineered for professional B2B handling, ensuring that all large-scale vertical ribs and delicate acoustic layers are protected during transit to corporate environments. The packaging utilizes heavy-duty, reinforced recycled kraft liners with a structural internal framework that mimics the protection of traditional wooden crates used for fine furniture, yet remains entirely plastic-free and recyclable.

Each component is nested within custom-molded pulp inserts that secure the cork tiles and hemp blocks, while the exterior of the crate serves as both a technical manual and a brand statement. Using monochromatic, eco-friendly inks, the surface displays the assembly hierarchy and the structural logic of the project, providing immediate visual guidance for the professional installation team. Centered prominently on the main face of the packaging is the brand’s core promise: “Space to breathe, room to bloom.” This serves as the final touchpoint of the delivery process, signaling that once the industrial protection is removed, what remains is a sanctuary designed for professional clarity and personal growth.

Prototype

Refer main changes in relation to the designed solution.

Structure

Detail and explain any changes made in relation to the designed solution, including structural downscaling, different materials, parts, etc.

Hardware

Detail and explain any change made in relation to the designed solution. In case there are changes regarding the hardware, present the detailed schematics of the prototype.

Software

Detail and explain any changes made in relation to the designed solution, including different software components, tools, platforms, etc.

The code developed for the prototype (smart device and apps) is described here using code flowcharts.

Tests & Results

Hardware tests

Perform the hardware tests specified in Tests. These results are usually presented in the form of tables with two columns: Functionality and Test Result (Pass/Fail).

Software tests

Software tests comprise: (i) functional tests regarding the identified use cases / user stories; (ii) performance tests regarding exchanged data volume, load and runtime (these tests are usually repeated 10 times to determine the average and standard deviation results); (iii) usability tests according to the System Usability Scale.

Summary

Provide here the conclusions of this chapter and make the bridge to the next chapter.

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Conclusions

Achievements

Discuss here what was achieved (wrt the initial objectives) and what is missing (wrt the initial objectives) of the project.

Limitations

Identify here the limitations of the solution and prototype.

Future Development

Provide here your recommendations for future work.

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Acknowledgements

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Bibliography

Will be added automatically by citing, in the body of the report, entries specified in BibTeX format and stored in the https://www.eps2026-wiki2.dee.isep.ipp.pt/doku.php?id=refnotes:bib file

PS - *If you have doubts on how to make citations, create captions, insert formulas, etc. visit this page with examples and select "Show pagesource" to see the source code.*

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[4] P. Albulescu, I. Macsinga, A. Rusu, C. Sulea, A. Bodnaru, B. T. Tulbure, 2022. Give me a break! A systematic review and meta-analysis on the efficacy of micro-breaks for increasing well-being and performance. *Journal of Occupational Health Psychology*.
[5] Framery, n.d.. *Framery Four – Office pods and booths.*
[6] Breehealth, n.d.. *BreePod – High-tech relaxation pod.*
[7] WellnessSpace Brands, n.d.. *RelaxSpace Wellness Pods – Immersive Relaxation and Meditation Pods.*
[8] Inhere Studio, n.d.. *Meditation Pod – Relaxation Pods for Sale.*
[9] OpenSeed, n.d.. *OpenSeed – Immersive Wellness and Meditation Pods.*
[15] Sustainable Development Goals. *UNDP*, 2025.
[16] Eco-Friendly Insulation Materials. *GreenMatch*, 2025.
[17] Joinery Timber Price List (3–40m3). *Timberlot*, 2025.

[18] life cycle analysis reference. *ISO*, 2025.
[19] Arduino, 2025. *Arduino UNO R4 WiFi Datasheet (ABX00087).*
[20] Espressif Systems, 2024. *ESP32 Series Datasheet.*
[21] Raspberry Pi (Trading) Ltd., 2024. *Raspberry Pi 4 Model B Datasheet.*
[22] Worten / LEDKIA LIGHTING, n.d.. *Fita LED RGB 12V DC SMD5050 60 LED/m 5m IP20, Width 10 mm, Cut every 5 cm – LEDKIA.*
[23] Amazon.es / Seller, n.d.. *LED Strip Lights Kit – RGB LED Tape (12 V, with Remote / Controller).*
[24] Amazon.es / Seller, n.d.. *LED Strip Lights – Multicolor RGB LED Tape (12 V, with Remote / Controller).*
[25]

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