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3. Project Management

3.1 Introduction

Managing a project that intersects marine ecology, hardware engineering, and software development requires a framework that balances rigid constraints with creative flexibility. This chapter details the management strategy employed by the group, organized across key knowledge areas including scope, risk, and procurement.

Due to the unpredictable nature of environmental hardware testing, we adopted an Agile (Scrum-inspired) methodology. This iterative approach was essential for managing the project’s high-risk components, such as waterproofing and sensor calibration. By prioritizing continuous feedback loops and adaptive planning, the team was able to pivot in response to technical challenges without compromising the project's primary milestones or budgetary limits.

3.1 Scope

The scope of this project is the design and development of a functional prototype of a smart marine habitat intended to support seafloor biodiversity and enable environmental monitoring in underwater conditions. The project focuses on creating a concept that combines an artificial habitat structure with a basic sensor system, while taking into account sustainability, durability, and ecological compatibility.

From a product perspective, the project includes the development of a modular underwater habitat structure designed to provide shelter, attachment surfaces, and spatial complexity for marine organisms. In addition, the product includes an integrated monitoring concept based on selected sensors capable of collecting environmental data relevant to the surrounding habitat, such as temperature, pH, turbidity, or depth, depending on technical feasibility and component availability. The solution also includes a basic embedded electronics system for sensor integration, power management, and data handling, as well as a conceptual approach for transmitting or presenting the collected data. The overall product is intended to demonstrate how habitat restoration and environmental monitoring can be combined into a sustainable solution.

From a project perspective, the scope includes the research and analysis required to understand the environmental problem, existing artificial reef solutions, suitable structural materials, and underwater sensor technologies. It also includes the definition of requirements, concept development, design selection, structural modelling, component selection, and prototype integration. The project covers the testing and validation of the prototype under limited and controlled conditions, together with the assessment of market, sustainability, ethical, and project management aspects. The preparation of all academic deliverables, including the report, presentation, poster, flyer, and supporting documentation, is also part of the project scope.

The main outcome of the project is a functional prototype that demonstrates the technical feasibility and conceptual value of a smart artificial marine habitat. The prototype is intended to serve as a foundation for future development, testing, and scaling in real-world marine applications.

The Work Breakdown Structure (WBS) presented in the figures illustrates how the MARIS HABITATS system is divided into its main components and subsystems. The diagram provides an overview of the product architecture, showing how the habitat structure, sensor system, energy and communication, deployment, and maintenance elements are organized.

Each main component is further broken down into smaller elements, representing the key functionalities required for the system to operate. This visual representation helps clarify the scope of the project by identifying all relevant parts of the system and their relationships.

Figure 1 presents the WBS for the product and Figure 2 the WBS of the project.

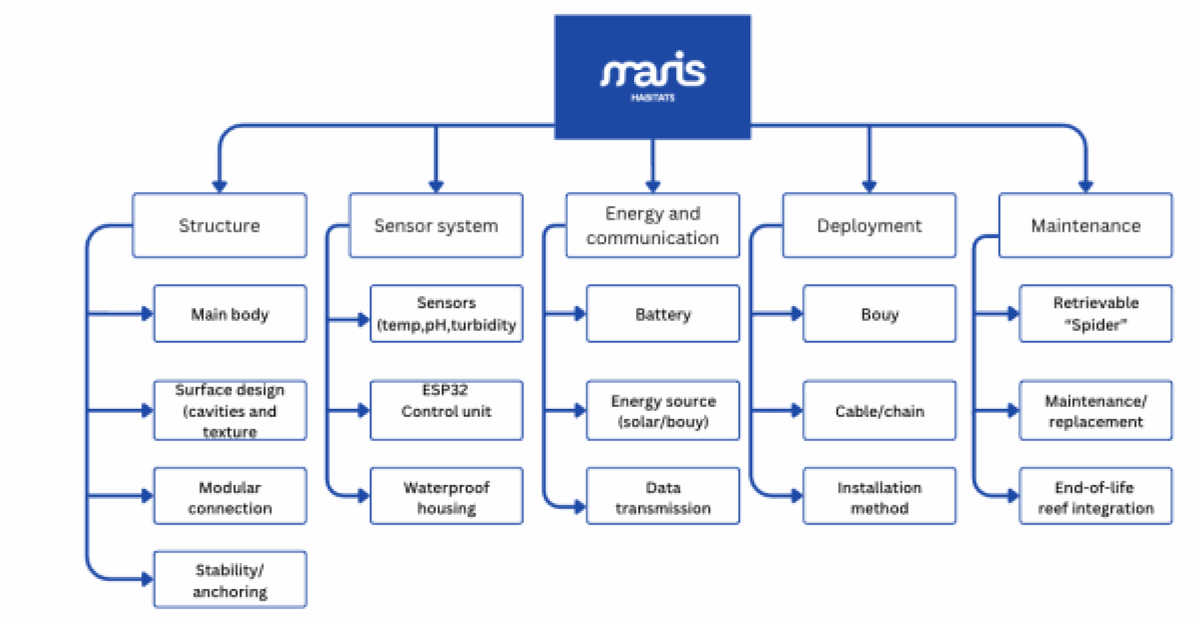


Figure 1: WBS of the product

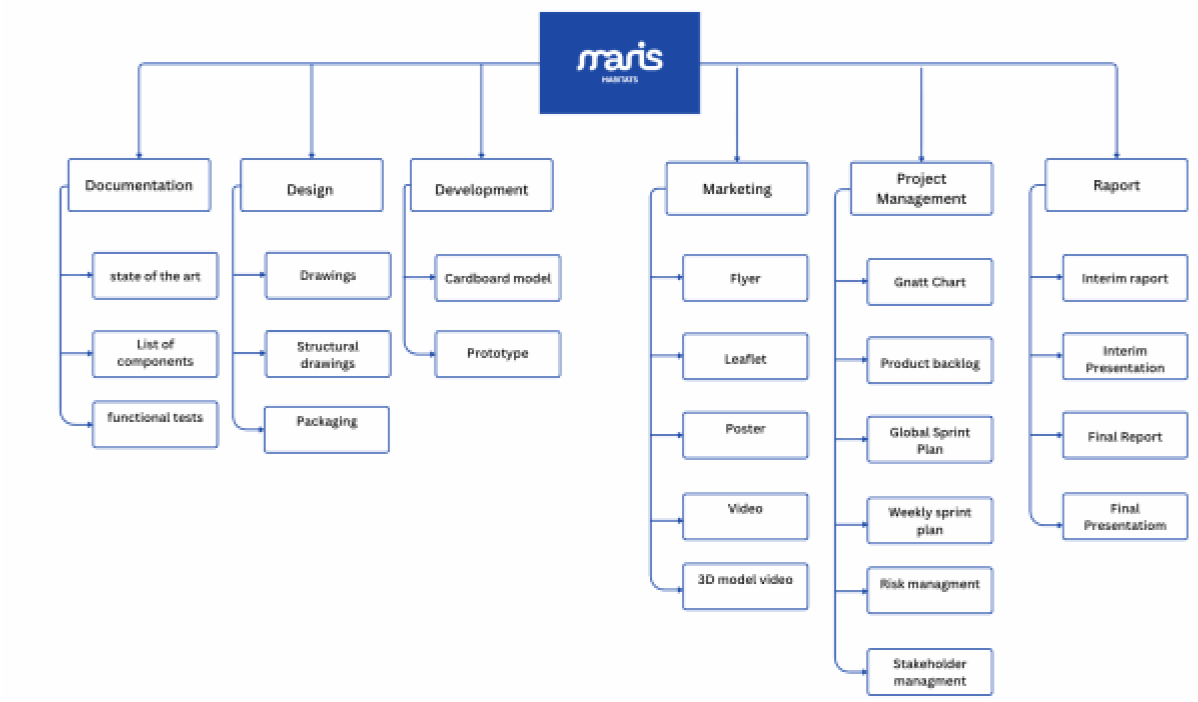


Figure 2: WBS of the project

3.2 Time

To ensure effective time management and the timely completion of the project, the team aimed to complete as much work as possible during school hours and before weekends. This approach helped maintain steady progress and allowed time for review and adjustments when needed.

The team followed the milestone schedule defined by the project supervisors. These milestones provided a structured framework to monitor progress and ensure alignment with the overall project timeline. Table 1 presents the defined milestones.

Table 1: Milestones for the project

Date	Description
2026-02-28	Choose and share your top-3 preferred project proposals via email to epsatisep@gmail.com
2026-03-11	Upload the “black box” **System Diagrams** & **Structural Drafts** to the wiki (Deliverables)
2026-03-18	Upload the **List of Components and Materials (what & quantity)** to the wiki (Deliverables)
2026-03-21	Define the **Project Backlog** (what must be done and key deliverables - every member should preferably participate in every task), **Global Sprint Plan**, **Initial Sprint Plan** (which tasks should be included, who does what) and **Release Gantt Chart** of the project and insert them on the wiki (Report)
2026-03-25	Upload the detailed **System Schematics & Structural Drawings** to the wiki (Deliverables) and do the **cardboard scale model** of the structure
2026-04-12	Upload the **Interim Report and Presentation** to the wiki (Deliverables) **[1]**
2026-04-16	Interim Presentation, Discussion and Peer, Teacher and Supervisor feedbacks
2026-04-22	Upload **3D model video** to Deliverables
2026-04-29	Upload the final **List of Materials (local providers & price, including VAT and transportation)** to Deliverables
2026-05-02	Upload refined Interim Report (based on Teacher & Supervisor Feedback)
2026-05-13	Upload **packaging solution** to Deliverables and Report
2026-05-27	Upload the results of the **Functional Tests** to the Report
2026-06-13	Upload the **Final Report, Presentation, Video, Paper, Poster and Manual** to Deliverables
2026-06-18	Final Presentation, Individual Discussion and Assessment (reserve the whole day)
2026-06-23	Update the wiki, report, paper with all suggested corrections
	Place in the Shared section of the MS Teams channel of your team a **folder with the refined deliverables (source + PDF) together with all code and drawings produced**
	Hand in to the EPS coordinator a **printed copy of the poster, brochure and leaflet**
2026-06-25	Demonstration of the **operation of the prototype**
	Hand in the **prototype and user manual** to the client
	Receive the **EPS@ISEP certificate**
	Bring **typical food** from your country

3.3 Cost

Describe your project budget and its key components. Explain how your budget was managed throughout the project. Document the planned vs. effective costs of your project.

3.4 Quality

Quality in this project is ensured by defining clear quality metrics for both the system and the documentation, together with acceptable thresholds and review procedures.

For the product, key quality metrics include system functionality, structural stability, and sensor reliability. The system is considered acceptable when all core functions operate as intended, the structure remains stable under expected conditions, and the sensors provide consistent and reasonable data. These aspects are reviewed through testing in controlled environments and validation of system performance.

For the documentation, quality is measured in terms of clarity, structure, consistency, and completeness. The report must clearly explain the project, follow a logical structure, and include all required sections. The acceptable threshold is that the documentation is understandable, coherent, and meets the academic guidelines provided. This is reviewed through internal checks within the team and feedback from supervisors.

Regular reviews during sprint meetings are used to monitor progress and identify issues early. Corrections are made continuously to ensure that both the system and the documentation meet the expected quality standards.

People & Stakeholder Management

Human factors represent a significant source of uncertainty in project development, as team members may exhibit varying levels of engagement, performance, and responsibility. For this reason, it is essential to establish clear roles and responsibilities within the team, ensuring that each member understands their tasks and contributions to the overall project. This helps reduce the risk of unequal workload distribution and lack of participation.

To achieve effective task allocation and maximize project outcomes, responsibilities are assigned based on each team member’s skills, field of study, and previous experience. This approach ensures that tasks are aligned with individual competencies, promoting efficiency, accountability, and overall team performance.

Academic supervisors from ISEP act as a key stakeholder by providing guidance, feedback and evaluation trouhgout the project. Their role is essential in ensuring that the project meets academic and technical standards.
External stakeholders include research intsitutions, NGOs and governmental organizations intressted in marine conservation and environmental monitoring. These stakeholders are potential future users or partners, as they can benefit from the data collected and the ecological impact of the solution.

Although marine life cannot be considered a traditional stakeholder, it is the primary beneficiary of the project. Therefore, its needs are considered throughout the design process to ensure that the solution is environmentally safe and supportive of biodiversity

Communications

Effective communication was essential to ensure coordination and steady progress throughout the project. Communication within the team was primarily facilitated through daily Scrum meetings, where members discussed completed tasks, ongoing work, and upcoming activities. These meetings helped maintain alignment, identify challenges early, and ensure continuous progress.

In addition, regular communication with key stakeholders, particularly project supervisors, was maintained through weekly meetings held on Thursdays. These sessions provided valuable feedback

and guidance, supporting informed decision-making throughout the project. Furthermore, collaborative tools such as Microsoft Teams were used to support documentation, information sharing, and quick communication among team members.
Altogether, this structured communication approach contributed to efficient collaboration, transparency, and timely problem-solving.

Risk

The project involves several potential risks related to both technical and organizational aspects. One of the main risks is technical failure, particularly in the integration of sensors, electronics, and structural components in a marine-like environment. To reduce this risk, the system is tested in controlled conditions and components are selected based on reliability and compatibility.

Another significant risk is project delays due to time constraints and task dependencies. This is managed through sprint planning, regular meetings, and the use of buffer time to accommodate unforeseen issues.

There is also a risk related to limited resources, including budget constraints and access to specialized equipment or testing environments. This is addressed by prioritizing essential features and selecting cost-effective solutions.

Team-related risks such as miscommunication or uneven workload distribution may affect progress. These risks are mitigated through regular Scrum meetings, clear task allocation, and continuous collaboration among team members. (See Table 2).

Table 2: Table of different risks

Risk	**Description**	**Probability**	**Impact**	**Risk Level**	**Mitigation Strategy**
Technical failure (sensors/electronics)	Failure in integration of sensors, electronics, and structure in marine conditions	Medium	High	High	Test components and validate system
Power system failure (battery/solar)	Unstable or insufficient energy supply affecting system performance	Medium	High	High	Optimize energy use and include backup
Integration issues (hardware/software)	Difficulties combining system components effectively	Medium	High	High	Modular design and incremental testing
Project delays	Delays caused by time constraints and task dependencies	Medium	High	High	Sprint planning, regular meetings, and buffer time
Limited resources	Budget constraints and limited access to equipment or testing environments	Medium	Medium	Medium	Prioritize essential features and use cost-effective solutions
Team miscommunication	Lack of coordination or unclear communication within the team	Low	Medium	Low	Regular Scrum meetings and clear communication

Risk	**Description**	**Probability**	**Impact**	**Risk Level**	**Mitigation Strategy**
Uneven workload distribution	Some team members contribute less, affecting progress	Low	Medium	Low	Clear task allocation and team collaboration
Loss of buoy connection (data/power cable failure)	Interruption of data or power transfer between buoy and system	Low	High	Medium	Reinforced cables and redundancy
Corrosion of metallic components	Degradation due to exposure to saltwater	Medium	Medium	Medium	Use corrosion-resistant materials (BFRP, coatings)
Extreme weather (storms, currents)	Harsh conditions affecting stability and performance	Low	High	Medium	Stable structure and secure anchoring
Waterproofing failure (IP68 breach)	Water entering electronic components causing malfunction	Low	High	Medium	Seal testing and proper enclosure
Data transmission failure	Loss or interruption of data communication	Medium	Medium	Medium	Local data storage and redundancy

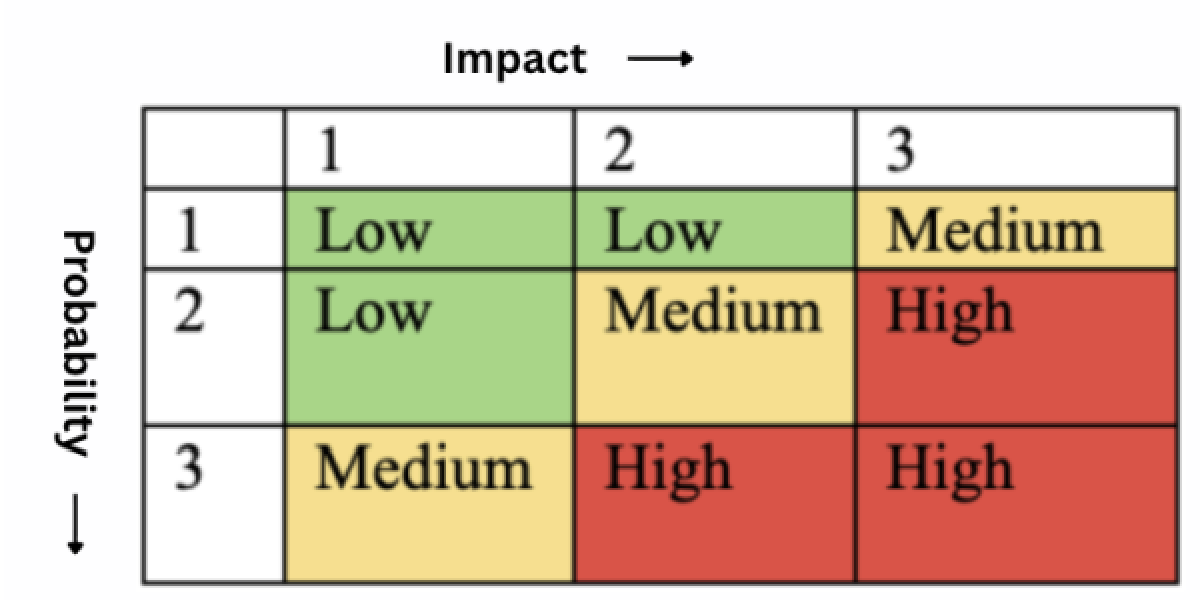
To further support the risk assessment, a risk matrix based on probability and impact was used (see Figure 3 figur). The matrix classifies risks into three categories: low, medium, and high, depending on their likelihood of occurrence and potential impact on the project.

Based on this matrix, risks such as technical failure, power system failure, integration issues, and project delays are classified as high risk, as they combine medium to high probability with high impact. These risks require priority attention and mitigation.

Risks such as limited resources, corrosion, extreme weather conditions, and data transmission failure fall into the medium-risk category. These are monitored and addressed through preventive design measures and planning.

Lower-risk factors, including team miscommunication and uneven workload distribution, are classified as low risk, as they have limited impact and can be managed through regular communication and task organization.

The use of this risk matrix provides a clear and structured way to prioritize risks and supports more effective decision-making throughout the project.



Probability ↓ / Impact →	1	2	3
1	Low	Low	Medium
2	Low	Medium	High
3	Medium	High	High

Figure 3: Risk matrix

Procurement

Document your procurement management strategy including make vs buy decisions, materials/services to be acquired, sources, costs, timings, etc.

Project Plan

Gantt Chart

The project schedule was visualized using a Gantt chart to illustrate the timeline and key phases of the project.

As shown in Figure 4, the project timeline spans from March to June and includes overlapping phases such as research, prototype development, and documentation.

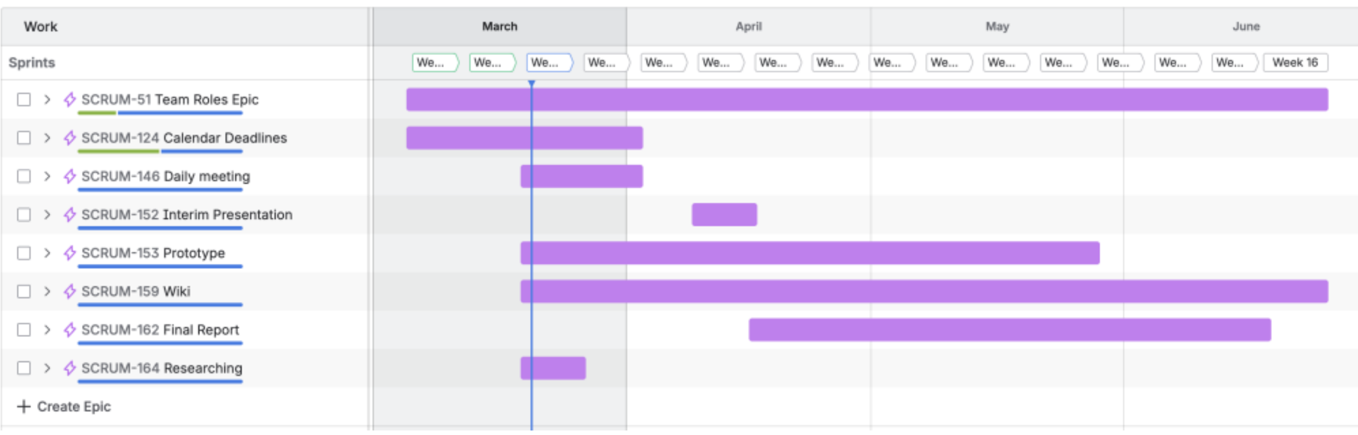


Figure 4: Gantt chart showing the project timeline from March to June.

Global Sprint

The global sprint plan provides an overview of the project timeline, including the duration of each sprint, start and end dates, and the number of available working days. Its main purpose is to ensure a realistic distribution of workload based on the team's availability throughout the project period. (See Table 3 for the global sprint plan)

By defining how long each sprint lasts and how many working days are available, the team can better plan tasks and avoid overloading specific periods. Variations in working days reflect differences in availability, such as holidays or other commitments, which allows for more accurate and achievable planning.

Sprint	Start	Finish	Working Days	Status
1	5 Mar	12 Mar	5 days	Done
2	12 Mar	19 Mar	5 days	Done
3	19 Mar	26 Mar	5 days	Done
4	26 Mar	2 Apr	5 days	Done
5	2 Apr	9 Apr	0 days	Started
6	9 Apr	16 Apr	3 days	To do
7	16 Apr	23 Apr	5 days	To do
8	23 Apr	30 Apr	5 days	To do
9	30 Apr	7 May	3 days	To do
10	7 May	14 May	3 days	To do
11	14 May	21 May	5 days	To do
12	21 May	28 May	5 days	To do
13	28 May	4 Jun	5 days	To do
14	4 Jun	11 Jun	5 days	To do
15	11 Jun	18 Jun	5 days	To do
16	18 Jun	25 Jun	5 days	To do

Table 3: Table of Global Sprint Plan.

Backlog

The project backlog contains all identified tasks required to complete the project.

Tasks are continuously updated and prioritized based on project needs, deadlines, and dependencies.

Completed tasks are marked as "Done", while ongoing and future tasks are labeled accordingly.

(See Table 4 for the backlog).

PBI	Title	Status
A	Define project	Done
B	System diagrams and structural plans	In progress
C	Project backlog	Done
D	State of the Art	In progress
E	Gantt chart	Done
F	System diagrams and drafts	To do
G	Global sprint plan	Done
H	List of components and materials	In progress

PBI	Title	Status
I	Schematics and structural drawings	In progress
J	Design development	In progress
K	Interim deliverables	In progress
L	3D model and video	To do
M	Interim report and presentation	To do
N	Functional testing	To do
O	Packaging solution	To do
P	Poster	To do
Q	Folder and manual	To do
R	Brochure and leaflet	In progress
S	Prototype	To do
T	Video	To do
V	Final report	To do
W	Upload final deliverables	To do
X	Final presentation	To do
Y	Final review and submission	To do

Table 4: Table of Backlog.

Initial Sprint Plan

Sprint 1 (Week 3: 19 Mar – 26 Mar)

Sprint Goal: Establish the project foundation by defining roles, conducting initial research, and setting up key project documentation (see Table 5).

Sprint	Period	Sprint Goal	Task
1	19 Mar – 26 Mar	Establish project foundation	Selection of materials
1	19 Mar – 26 Mar	Establish project foundation	Backlog, global & initial sprint plan, Gantt chart
1	19 Mar – 26 Mar	Establish project foundation	Detailed schematics)
1	19 Mar – 26 Mar	Establish project foundation	Researching information
1	19 Mar – 26 Mar	Establish project foundation	Define project roles)
1	19 Mar – 26 Mar	Establish project foundation	Flyer & logo presentation
1	19 Mar – 26 Mar	Establish project foundation	Cardboard model
1	19 Mar – 26 Mar	Establish project foundation	Wiki updates
1	19 Mar – 26 Mar	Establish project foundation	Daily scrum meetings
1	19 Mar – 26 Mar	Establish project foundation	Selection of components
1	19 Mar – 26 Mar	Establish project foundation	Structural drawing

Table 5: Initial Sprint Plan.

The tasks in the sprint were divided into smaller activities, including research, documentation, design, and planning, in order to ensure efficient progress. Responsibilities were distributed among team members based on their respective roles, with a focus on areas such as research, documentation, and design. By the end of the sprint, key project elements such as clearly defined team roles, initial research, and planning documents had been completed, providing a solid foundation for the subsequent sprints.

Sprint Outcomes

The sprints officially started from 19 March to 26 March, as the previous weeks were mainly used to become familiar with Jira and project tools.

However, the initial work began earlier, and the first weeks were structured as follows:

An overview of the outcomes from the initial sprints is presented in Table 6 and Table 7.

Sprint	Period	Objective	Activities	Outcome
1	Week 1	Define project scope and direction	Brainstorming of project ideas, discussion of possible approaches, evaluation of feasibility	Selection of project concept and initial understanding of project scope

Table 6: Week 1 outcome

Sprint	Period	Objective	Activities	Outcome
2	12 Mar – 19 Mar	Develop system concept and research state of the art	Continued research on artificial reefs and sensors, worked on the state of the art chapter, explored materials and structural ideas, started defining system components, followed milestone plan	Clearer understanding of technical solutions and initial system concept defined

Table 7: Week 2 outcome

The burndown chart for sprint 3 shows that additional tasks were identified and added at the beginning of the sprint, resulting in an increase in the total amount of work. This reflects a better understanding of the project requirements as the team moved from concept to design.

During the middle of the sprint, progress remained relatively stable, indicating that fewer tasks were completed in that period. Towards the end of the sprint, a significant decrease in remaining work can be observed, showing that most tasks were completed close to the deadline.

This pattern indicates that the team made substantial progress during sprint 3, particularly in the final phase, where key design elements and system components were defined. It also highlights the need for improved task distribution to ensure more consistent progress throughout the sprint (See Figure 5).

Figure 5: Week 3 burndown chart

Sprint Evaluations

Second week retrospective

What went good During this week, the team worked well together and showed good coordination in roles and responsibilities. The wiki and Jira were kept relatively updated, and the team made solid progress in research and design. There were also strong ideas developed for the project's features, structure, and overall concept, along with progress on the ethics work. Overall, the team showed improvement in both collaboration and organization.

What went bad During this week, the team faced several challenges. There was a lack of clear discussion about project expectations, which led to some uncertainty. Task division was not always effective, and deadlines were not used efficiently. The wiki and report structure were somewhat disorganized, with resources not properly organized or uploaded. Additionally, the team could have shown more initiative and been more critical of their work. Overall, better structure, clarity, and efficiency are needed moving forward.

Ideas During this week, the team developed ideas to improve the project by focusing on one main “smartblock” with simpler supporting blocks. They also explored sustainable materials, clearer separation between prototype and final product, and ways to improve functionality, such as adding sensors and using 3D printing.

Actions For the next week, the team should focus on finalizing the structure and deciding on the materials for the project. It is important to continue and complete the necessary research while also developing the product design. The team should create a few sketches and present them for feedback. Additionally, roles and tasks need to be clearly defined, and the wiki should be properly updated with sources and kept organized. Work on communication materials such as a flyer, key facts, and an elevator pitch should also be continued.

Summary The team developed ideas to simplify the concept by focusing on one main solution, while also exploring sustainable materials and improving both design and functionality. They also considered ways to make the system more practical and efficient.

Third week retrospective

What went good During this week, the team made strong overall progress and showed improved organization. The wiki was well maintained, and Jira was used effectively to keep track of tasks. The product design became clearer, supported by good structural drawings and a successful cardboard model. There was also progress in marketing, and the team had good planning for the upcoming weeks. Overall, collaboration was strong, with everyone showing up on time and contributing to steady progress.

What went bad During this week, the team faced challenges due to missing components, which slowed progress and led to some waiting time. There were still uncertainties regarding materials, sensors, and electronics, and decisions about these were not finalized. Parts of the wiki were disorganized, and project management could have been more structured. Additionally, the team had not clearly defined a target customer and needed to improve consistency in updating and sharing progress.

Ideas During this week, the team developed ideas to improve planning and analysis. This included visualizing the market analysis more clearly and creating a risk matrix to better understand potential challenges. The team also focused on preparing for the interim presentation in order to improve communication and confidence.

Actions For the next week, the team should focus on deciding on materials and further developing the technical aspects, such as weight and water flow. Each member should take clear responsibility for specific parts of the project and break tasks into smaller subtasks if needed. The team should also create a plan for the upcoming period to stay organized and maintain steady progress.

Summary Overall, the team made good progress in design, organization, and collaboration. However, some uncertainties and planning issues remain, and the team needs to focus on clearer decisions and more structured work moving forward.

Fourth week retrospective

What went good The presentations went good, and the components were selected.

What went bad The communication presentation did not go that well

Ideas No ideas

Actions For the next week, the team need to finish the interim report, and deliver it.

Fifth week retrospective

What went good The interim report was delivered

What went bad Should have done the report finish before the sunday.

Ideas No ideas

Actions For the next week, the team are prepering for the interim presentation.

Sixth week retrospective

What went good The prep for the presentation

What went bad …

Ideas Some of the feedback from the supervisors were to have fish in the flyer/brand. The team will look in to it.

Actions For nexts week, the team are going to research more of the smart box, to check if there are different batteries to use and how to design it in the best way. Also to create a 3D-model video of the product.

Summary

The project has been managed using an iterative and structured approach, allowing the team to balance technical challenges with continuous development. Through defined scope, milestone planning, and Agile methods, the team has made steady progress in both design and implementation. While some challenges remain, particularly related to decision-making and organization, the project is moving forward with a clearer direction and improved collaboration.

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[1] The interim report must contain the the following chapters: Introduction, Project Management, State of the Art, Marketing Plan, Eco-efficiency Measures for Sustainability, Ethical and Deontological Concerns, Proposed Solution and Bibliography. In particular, the Project Management chapter includes the updated project progress register, the sprint report for completed sprints (tasks that were included, statuses, assignees, allocations) and the updated release Gantt chart.

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