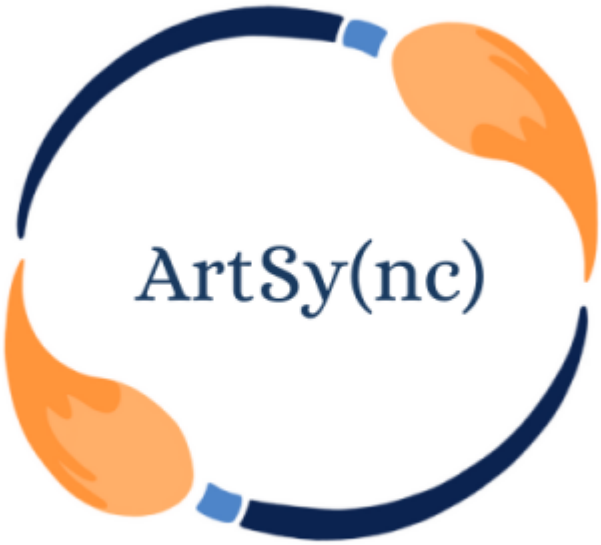
Report



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- Julia Hechtl
- Leevi Oksanen
- Lucas László
- Siebe Van de Voorde

Acknowledgement

Glossary

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

1. Introduction

1.1 Presentation

Table 1: Team

Name	Studies	Location
Elise Lesage-Baur	Packaging Engineering	France
Jule Nähring	Mechanical Engineering	Germany
Julia Hechtl	Creative Computing	Austria
Leevi Oksanen	Computer Sciences	Finland
Lucas László	Applied Mathematics	Netherlands
Siebe Van de Voorde	Software and Web development	Belgium

1.2 Motivation

Personal Motivation:

- Elise: Why did I choose the EPS program? The EPS Program offers an enriching international experience, enabling you to explore new cultures, deepen your academic knowledge, perfect your language skills and develop valuable intercultural competencies. For me, this is an essential part of my academic career and indispensable for my future.
- Jule: I chose the European Project Semester because I thought it would be interesting to work in a multidisciplinary and international group. I think it is a great opportunity to broad my personal horizon and learn more about other cultures and their way of working. Moreover I want to improve my English skills and making new friends all over the world.
- Julia: I love connecting with people from all over the world and working on a bigger project with an international team coming from different universities was really attracting to me. It is really inspring to learn from each other and to broaden my horizon. Porto seemed like the perfect location to do this!
- Leevi: I wanted to break away from my everyday life and step outside my comfort zone. My career goal is to work with international companies and to work abroad. EPS is an excellent opportunity for me to learn how to operate within a group composed of individuals with diverse backgrounds.
- Lucas: My motivation to work on the EPS course is due to my interest in working in interntional environment and on the topic of innovation. Also I think Porto is a nice city with a lot to offer, cultural wise and surfing wise. The combination of working on an real problem in an international group and exploring the city of Porto motivated me to go here.
- Siebe: I’m here to experience a different approach to my studies in a multi-cultural environment.

Motivation for choosing this topic:

- Elise: Why digital art? As an enthusiast of various forms of artistic expression, from music and photography to dance and museum visits, I found digital art a captivating means of expression.

Its versatility and potential for innovation particularly appeal to me. What's more, I feel that my studies in packaging engineering can intersect with the art world, offering unique perspectives and points of view.

- Jule: My motivation to choose this topic is because it is a really broad topic and we can include all skills of every group member. I also love local artists in the city and think it is a great opputunity to give them a chance to show their art and can be seen.
- Julia: I love consuming and creating art. I personally get really passionate about drawing and whenever I am on holiday, I love to visit art museums to get inspired for future projects. Digital art directly stood out to me and is the perfect topic to come up with a creative project as a group.
- Leevi: My studies focus on creating visual materials, such as 3D modeling, UX design, visual effects, and various forms of visual content creation. Because of this, digital arts was a very natural and enjoyable subject for me.
- Lucas: My motivation to choose this topic comes from the fact that I love museums and arts. Especially when it comes to digital art. I believe it is an broad topic that has an lot to offer. Also the city of Porto has an lot of urban street art and my mind was firing ideas what we could do with it. Therefore, I thought this topic might suit me and my enthusiasm.
- Siebe: This project reflects my passion for pushing the boundaries of collaborative artistry and creating a space where diverse talents can seamlessly intertwine.

1.3 Problem

In today´s digitalized world, there are many artists, including a growing number of digital artists. Despite their great commitment, their talents often remain undiscovered. Digital artists in particular face many challenges in presenting their artwork to a wide audience. Platforms such as Instagram offer an opportunity, but often only well-known artists who already have a lot of likes are shown. But there are even more difficulties in showing digital art in technical and logistical. They need projectors to present their works on walls or in other public spaces. Not only the technology plays an important role here, but also the selection of suitable projection locations and the planning of the installation. Another point to consider is the safety of the projectors. Not only do they need to be weatherproof to withstand the challenges of the public space environment, but they also need to be protected against theft. This requires protective devices.
To solve these problems, we at Asrtsy(nc) want to develop a platform where digital artists can upload their art. Art lovers can vote democratically for the art they like the most to be displayed in public spaces. We will also provide a weatherproof, lockable box equipped with necessary technology to ensure that the art can be displayed properly.

1.4 Objectives

The goal of ArtSy(nc) is to give artists, curators and art lovers a combined platform. With a primary focus on showcasing local talent, ArtSy(nc) aims to provide emerging artists with a platform to exhibit their work and gain recognition. By bridging the gap between artists and curators, the platform also offers curators, including sponsors and museums, the opportunity to diversify their offerings by incorporating digital art into their exhibitions. Art enthusiasts have the opportunity to enjoy digital art through a new and innovative way.

How does ArtSy(nc) make this objective possible? ArtSy(nc) wants to connect people and “synchronize” them. This is achieved by offering an app for everyone, which makes the exploration of art as easy as possible. In the app art can be uploaded, shared and explored. Furthermore, it can be spot on a map in your own city. This makes the navigation especially user-friendly and adventurous when following an art route through the streets with the current exhibitions. In addition, ArtSy(nc) comes as a full package, including a projector. This projector includes a full experience through sophisticated packaging design enabling a seamless installation for curators. The objective is to promote digital art in the city and this is guaranteed through the projection of the art and raising awareness for it.

1.5 Requirements

General Requirements

- Use or reuse low cost hardware solutions
- Use open source software
- Adopt the International System of Units (NIST International Guide for the use of the International System of Units)
- Comply with the EMCD, LVD, MD, RED, ROHS EU Directives.

Budget Requirements

- Maximum 100€

User Requirements

- As an artist I want a way to upload art so it can be used by the museum.
- As an artist I want a box that is easy to use and visually appealing to represent my art in an efficient way.
- As a consumer of art I want the packaging design to be as sustainable as possible to respect the planet and save resources.
- As the curator I want the box to be durable and long-lasting to be able to use it for multiple years without having to replace it.
- As the curator I want the pricing of the box to be as affordable as possible to operate cost-effectively.
- As an artist I want clear guidelines and information on the projector to know how to provide my art.
- As a consumer of art I want to know more about digital art to be more educated and learn more about it.
- As an artist I would like the packaging design to be appealing and simple to not take away the focus from the actual work displayed.

App Requirements

- Use of open source software and technologies
- User-centered design
- Ease of use
- Error prevention
- Aspect of security to protect user data

Sustainability Requirements

- Use of sustainable materials
- Reduce waste and use recycling material whenever possible
- Use energy-saving technologies during the production process
- Keep the carbon footprint as minimal as possible

1.6 Functional Tests

A prototype must be created that visualizes the final product as well as possible. This must be subjected to several tests so that it can be clearly demonstrated that the product meets the requirements.
In our case, the app must be tested for all its functionalities. Those are divided in three parts. For the artists it is important that they can upload their art. For the Art lover the art should be divided into categories. Additionally, the app shall have a Tinder swipe. For the art exhibitor it is important that they can easily connect with the local artists Easy registration is important for all groups.
The box is tested for weather resistance by exposing it to heavy rain.

1.7 Project Planning

For our project, having a solid plan is super important. It guides us through all the steps we need to take as a team. With a good plan, everyone knows what we're doing, when we're doing it, and who's responsible for what. This helps with staying organized and working together smoothly towards the goals.
We've chosen an agile workflow and are using Jira to help us manage our tasks. Jira is like our virtual task board where we list out all the things that need to be done, assign them to team members, and keep track of progress. It's a great tool for staying on top of things and making sure everyone knows what they should be working on.
Scrum is a way of working that's all about being flexible and collaborative. It helps breaking the work into smaller chunks, the weekly sprints. During the sprints, daily stand-up meetings are incorporated. These are quick catch-ups where we all get together and talk about what we did yesterday, what we're doing today, and if there's anything getting in our way. It's a way for us to stay connected and help each other out if someone's stuck.
At the end of each sprint, we do a sprint retrospective. This is where we take a step back and reflect on how things went during the sprint. We talk about what went well, what didn't go so well, and what we can do to improve next time. It's a chance for us to learn from our experiences and keep getting better as a team. Having a good plan and using agile methods like Scrum and Jira helps us stay organized, work together effectively, and keep improving as we go along.

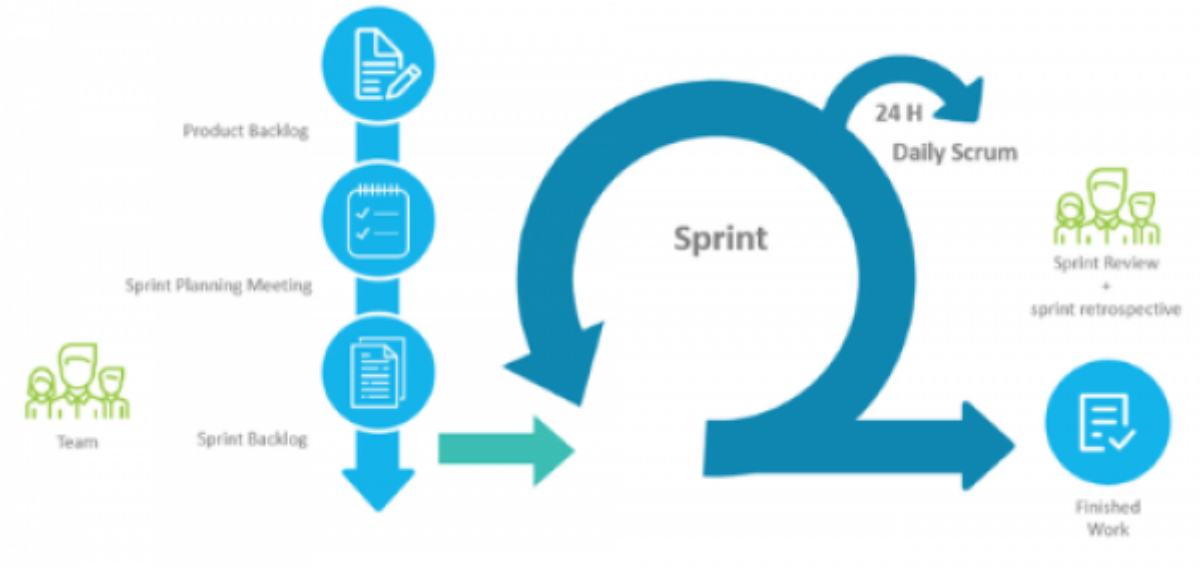

Figure 1: Scrum

1.8 Report Structure

Table 1: Report Structure

Task	Description
1	Introduction
2	State of the Art
3	Project Management
4	Marketing Plan
5	Eco-efficiency Measures for Sustainability
6	Ethical and Deontological Concerns
7	Project Development
8	Conclusions

2. State of the Art

2.1 Introduction

Our team has elected to focus our efforts on the topic of “Digital Art”. We wanted to work on a topic that allows us to increase the visibility of digital art in public places and bring people more together through art. Our goal is to create a digital platform for local artists to share their art throughout our application. With our projectors we aim to display the art shared in our platform to urban spaces.
Through the decision-making process regarding the final goal of our project, we discussed all the necessary technological knowledge required to complete the project and then compared it with the skills within our team. In addition to programming and design, the skills needed for our project include an understanding of digital art and how we want to present digital art in public spaces.
The three topics that we chose to dig deeper were digital art, platform and connections, packaging of projector in urban spaces. These topics are central to our project and together form the entirety of our project's achievement.

2.2 Digital Art

Digital art is a new and exciting way for artists to express themselves using computers and technology. Instead of traditional tools like paint and canvas digital artists use software and digital devices to create their art. This gives them a lot of freedom to be creative and work together with others. These artworks can be experienced online, in galleries or even through virtual reality. In this chapter we'll explore how digital art has changed over time, how it's making an impact and all the different ways artists are coming up with cool new ideas. **[adobe,]**

Figure 2: Abstract Art

In the early 1980s, the term “digital art” emerged alongside the development of a paint program by computer engineers. This pioneering software found its first application in the hands of Harold Cohen, a leading figure in digital art. Named as AARON this program birthed a robotic machine capable of creating large-scale drawings on paper laid out on the floor. In more common use digital art started in the middle of the 20th century when people began to experiment with using computers for making graphics and art. Digital art has been growing enormously after personal computers and software became popular. Artists then started using digital tools to make art that was totally different from traditional art. They mixed the virtual (computer-based) with the traditional skills to create contemporary art. **[ART TERM,]**

Digital art has made it easier for all kinds of artists to create, share and work together worldwide. Websites and social media are great for showing off digital art bringing artists together and letting them talk to their supporters. Also new tech like virtual reality, augmented reality and artificial intelligence are creating exciting new ways for people to experience digital art in a more immersive and interactive way. **[Gabs Art Tips,]**

From digital painting and illustration to 3D modeling, animation and generative art the range of

mediums and techniques within digital art is vast and continually evolving. Artists use an array of software tools and technologies from industry-standard programs like Adobe Photoshop and Blender to experimental platforms and custom-coded algorithms. Digital art can mix old and new ways of creating art resulting in innovative and captivating end results.

Figure 3: Art in rooms

Figure 4: Handmade paintings digitized

As digital technologies continue to evolve at a rapid pace, the future of digital art holds limitless potential. Emerging technologies such as blockchain and non-fungible tokens (NFTs) are revolutionizing the way artists create, distribute and monetize their work while advancements in AI promise to redefine the creative process itself. Furthermore, the intersection of digital art with fields such as gaming, virtual reality and experiential design is giving possibilities to new forms of collaboration and artistic expression.

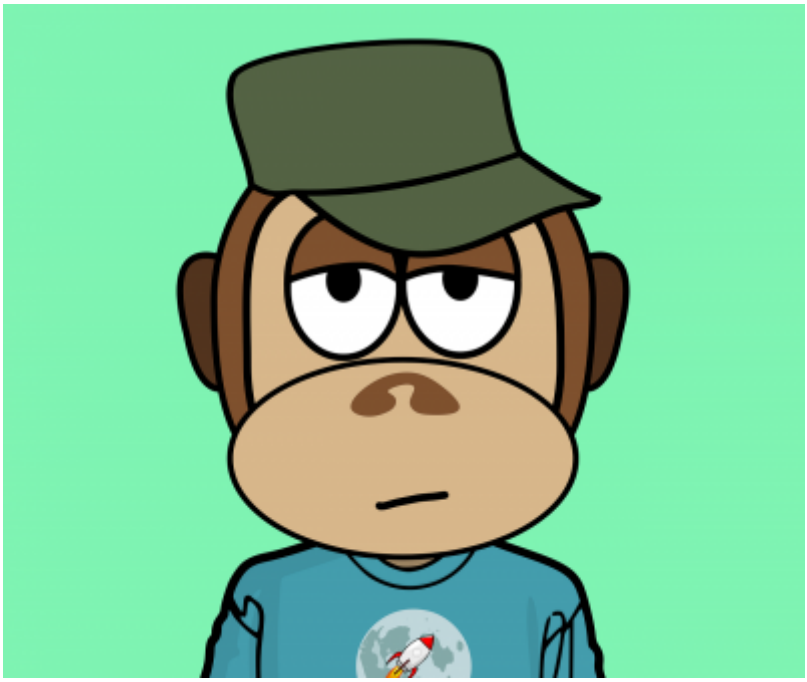

Figure 5: Digital paintings

In an increasingly digitized world digital art stands as a testament to the boundless creativity of human imagination. From its beginnings to its current state of innovation and experimentation, digital art continues to push the boundaries of modern art. As we look to the future one thing is certain: the journey of digital art is far from over, and its evolution promises to shape the landscape of artistic expression for generations to come.

2.3 Platform

Platforms are like marketplaces. In a platform, there are three actors: the consumer, the producer and the platform operator. They have always existed, but no one called them platforms: weekly markets or trade fairs are also platforms according to the definition. Platforms bring together consumers and producers. What is new is the technology that gave rise to digital platforms.
The development of the internet laid the foundation. First the so-called Web 2.0 was developed, which for the first time offered the opportunity to write one´s own contributions. An example is BlaBlaCar, which offers carpooling by bringing passengers and drivers together. On this platform, users can already set preferences and even give feedback later. The entire process between supply and demand only works through Web 2.0.
During the second phase of development, the introduction of applications and the integration of GPS technology became prominent. Shortly afterward cloud-computing was developed. This extends storage space or improves computing power or application software. The last phase brought about data analytics **[H. M. & Krcmar Schreieck A. Hein, 2021]**.
Nowadays, large amounts of data can be analysed to generate insights and decision support. For data analytics artificial intelligence is used, which is also known as machine learning. This wide-ranging development is leading to the emergence of more and larger digital platforms. Digital platforms are divided into five different types. There are advertising platforms (Google or Facebook), cloud platforms (Dropbox), industry platforms (Siemens MindSphere), product platforms (Spotify) and lean platforms (Flixbus).
The world´s largest business models are based on digital platforms: Google, Facebook and Amazon. Platforms themselves cannot manage value creation. Their task is to connect supply and demand sensibly. They do not have their own resources but only act as “matchmakers” between consumers and producers, simplifying or even enabling interactions between them. To enable this, social norms,

rules and framework conditions must be predetermined by the digital platform.
When designing a platform strict attention has to be paid to ethics and data protection guidelines. It is also important to have an easy access for interaction partners, to set business rules and standards and enable achievable matching **[Bundesministerium für Wirtschaft und Klimaschutz, 2024]**.
In relation to our topic of “digital art”, there are also various platforms. On certain digital platforms, artists have the opportunity to showcase their art by uploading it. On others, artists can go a step further and directly sell their work. While social networks also offer avenues for artists to share their art, gaining visibility can prove to be challenging. For example, Instagram only shows those with lots of likes. This is a problem for small artists who don't have enough followers to get likes yet.
We want to create a platform where local artists can show their art. We want to involve everyone interested in art: Artists, citizens and also museums. We want to connect people and create a community for everyone.

2.4 Packaging of projector in urban space

The uploaded art is to be shown in Urban Spaces. But what are urban spaces anyway? Urban Spaces are made for all citizens of a city, regardless of income or personal background. They should serve the public good and lead to social cohesion. In urban spaces, people should meet, interact, do sports and have fun. They are also often used to celebrate public festivals. Every city should offer safe urban spaces because they are very important for social community and inclusion. They also give a sense of a livable environment **[saferspaces, 2014]**.
Projectors are needed to show the uploaded art in Urban Spaces. Projectors are used to project an image onto a screen. To do this, a lamp generates light inside the projector. The lens focuses the light and directs it onto the projection surface, and an image is created when the light hits the projection surface.
Nowadays, there are many different types of projectors. The most important thing to consider is whether it will be used for indoor or outdoor shows. Outdoor projectors need to be much brighter so that they can produce a colorful image even in daylight. The brightness of projectors is specified in ANSI lumens. For indoor projectors, approx. 3000 ANSI lumens are sufficient, whereas for outdoor projectors, approx. 6000 ANSI lumens must be available. In terms of image quality, a distinction is now made between HD (1280 x 720 pixels), Full HD (1920 x 1080 pixels) and 4K (3840 x 2160 pixels) **[visunext, 2022]**.
However, different technologies are also used to project a good image. The best-known technologies are DLP (Digital Light Processing), LCD (Liquid Crystal Display) and LCOS (Liquid Crystal on Silicon) technology. While DLP technology uses a chip with millions of micromirrors to direct the light onto the projection surface, LCD technology uses a chip with liquid crystals to control the light. LCOS technology is a combination of the two. The chip consists of liquid crystals and silicon, resulting in very good image quality with good brightness and contrast **[Heimkinoraum, 2023]**.
Because the projectors are to be used in urban spaces, they need to be protected in many ways. Among other things, they stand outside and must therefore be weatherproof. Boxes of this type are made of weather-resistant materials that are above all waterproof, but also do not rust. This is why metal such as stainless steel or aluminium is used. In addition, the box must be equipped with a ventilation system so that it does not get too hot inside the box, which could otherwise lead to condensation. Due to its use in public spaces, it is necessary to equip the box with a lock so that unauthorized persons cannot operate the projector. In addition, it must be equipped with a simple cable management system and the appropriate electrical connections must be fitted. These in turn need to be fitted with seals to prevent water from entering the box.
Regarding to our topic “Digital Art”, our box should be designed accordingly. It should fulfil all these conditions and also reflect our topic.

2.5 Conclusion

After analyzing the state of the art the team has identified a direction to create a project that includes the categories stated above. The topics the team has chosen lay a solid foundation for our project and provide us with a clear direction to develop our project in the desired direction. In a nutshell the features are the following:
1. Digital art: The most clear topic in our project is Digital art. Understanding the topic of the whole project is essential for the development process towards the final goal of the team.
2. Platform: The project is based on a platform to showcase the digital art of local artists. The team aims to make working platform for different user types (artist, art lover, art exhibitor) to ensure smooth user experience while connecting all the people related to digital arts.
3. Packaging of projector in urban space: The art shared through the platform is planned to be showcased in public spaces to boost the artistic image of the city. By packaging a projector in public spaces the team aims to create sustainable solution to ensure ethical and long lasting life time of the projector.
The team has all the required skills to create working result for the project. By combining different backgrounds and educational knowledge within the team, we will be able to create the wanted outcome.

3. Project Management

3.1 Scope

The scope of the project is useful for both defining its boundaries and specifying its focus. The topic of digital arts is a broad topic, that is why there needs to be limitations to prevent scope creep. From artworks featuring moving LEDs to NFTs in the metaverse, the project requires a clear description to define what will be included in the prototype and what will not. This project scope serves as a foundational framework for defining parameters, objectives, and outcomes. It states the overarching goals and outlines the inclusions and exclusions of the project. Divided into two sections by using the Work breakdown structure (wbs), the scope addresses both the objectives and deliverables for understanding and evaluating the project (as illustrated in figure 6), as well as the specifications necessary for constructing the prototype (as depicted in figure 7).

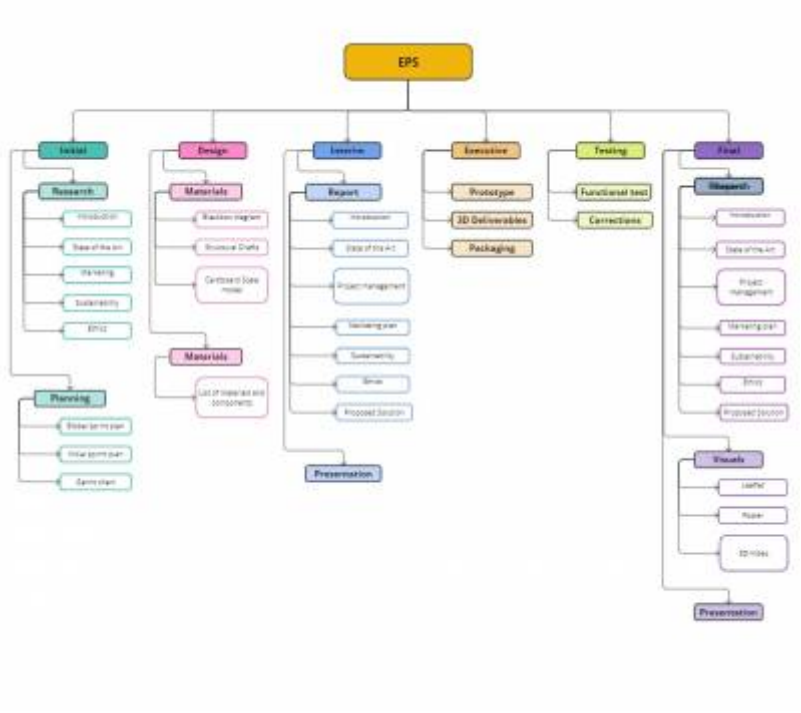

Figure 6: Scope of the EPS.

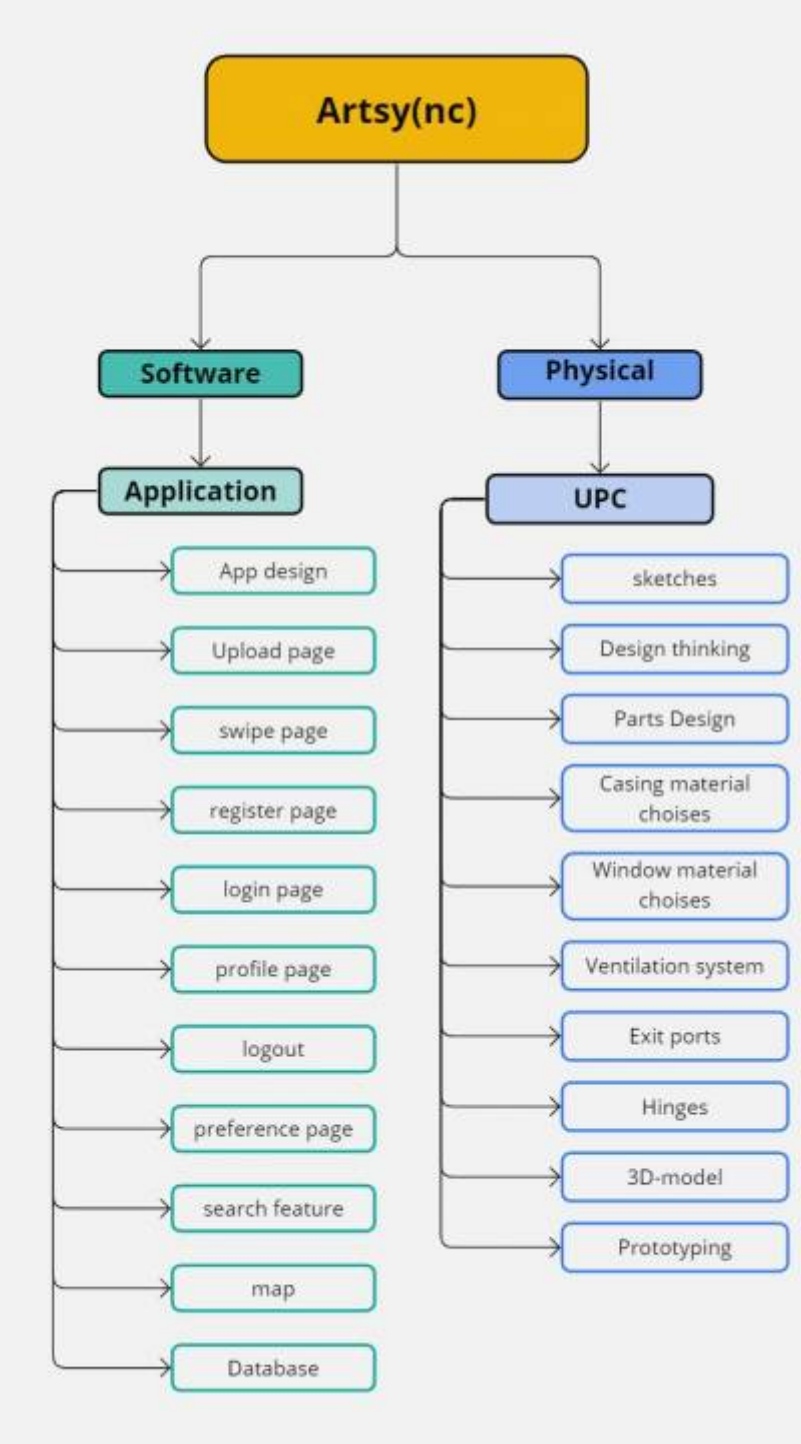

Figure 7: Scope of building the prototype.

Since it is a prototype the project will not incorporate actual sponsorships to roll out the platform. There will be no sort of payment system on the platform for the art. In this prototype the idea of building actual NFT's on the platform will not be incorporated. For the prototype there will be no engagement with government to place the product outside for usage. So what will take place for the prototype is building an initial prototype version of the Urban Projector Casing and building a prototype mobile application. The Projector Casing is a casing that allows the projector to be placed in a changeable urban environment. The app needs to be able to login and upload art so people can vote for the art they most like.

3.2 Time

- 2024-02-24 Choose a project proposal and send your choice via email to epsatisep@gmail.com
- 2024-03-06 Upload the “black box” **System Diagrams** & **Structural Drafts** to the wiki
- 2024-03-08 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 (planning) *
- 2024-03-13 Upload the **List of Components and Materials (what & quantity)** to the wiki
- 2024-03-20 Upload the detailed **System Schematics & Structural Drawings** to the wiki and do the **cardboard scale model** of the structure
- 2024-04-07 Upload the **Interim Report and Presentation** to the wiki. The 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
- 2024-04-11 Interim Presentation, Discussion and Peer, Teacher and Supervisor Feedbacks
- 2024-04-17 Upload **3D model video** to the wiki
- 2024-04-23 Upload the final **List of Materials (local providers & price, including VAT and transportation)**
- 2024-04-30 Upload refined Interim Report (based on Teacher & Supervisor Feedback)
- 2024-05-15 Upload **packaging solution** to Deliverables and Report
- 2024-05-28 Upload the results of the **Functional Tests** to the wiki
- 2024-06-16 Upload the **Final Report, Presentation, Video, Paper, Poster and Manual**
- 2024-06-20 Final Presentation, Individual Discussion and Assessment (reserve the whole day)
- 2024-06-25:
    1. Update the wiki, report, paper with all suggested corrections
    2. Place in the files section of the MS Teams channel of your team a **folder with the refined deliverables (source + PDF) together with all code and drawings produced**
    3. Hand in to the EPS coordinator a **printed copy of the refined report and poster**
- 2024-06-27:
    1. Hand in the **prototype and user manual** to the client
    2. Receive the **EPS@ISEP certificate**
    3. Bring **typical food** from your country

3.3 Cost

Our project budget is 100€. With this money, we must acquire all the necessary materials for implementing the prototype. We aim to use the entire sum efficiently to achieve the best outcome. Our university, ISEP, may also provide the necessary materials for the execution of our project if they have the materials we need. It is very difficult to estimate the final cost of our product as it would require much more resources and research to determine the final budget.

3.4 Quality

To make the project and product a success there needs to be a high quality of work and product. The

quality of work is essential for building the prototype and making the report. A high standard of work quality ensures that the team members work efficiently together in a productive and safe environment to pursue their goal. The quality of the product is also of utmost importance. It is a standard to set a high bar for being a product, which is not only functional but also fulfils the needs of the consumer by being intuitive and give a sense of value and satisfaction for the user. Poor quality can either cases can lead to doing rework, dissatisfaction by consumers, miscommunication and fail to meet expectations. Therefore the quality of work and product need to be set high to reduce risk, increase satisfaction of the customer and overall success.
Quality of work To set high standards for quality of work there are multiple topics that are important. Communication is key, in order to have a clear understanding of what is going on and what someone is saying there needs to be good communication. This will be further explained in chapter communication. Set clear deliverables that are within reach. To maintain a good workflow, the deliverables need to be realistic and aligned with the project's objectives and timeline. This will provide clear direction off work so members won’t feel lost and have to redo work. Resource allocation, In order to have a sense of the manpower for time allocation, during a sprint or the full project there needs to be an overview of time and budget. Otherwise, it can lead to rushed or not completed work.
Quality of product The product quality is of high importance. In order for people to use our platform there will be a need to deliver an application that is intuitive, feels of high quality and reflects our goal. For the urban projector casing, there is a need for a design to integrate the product with the urban environment and also the people who will be looking at it. Having high standards of product quality will also lead to customer loyalty which generates advantages in long-term competitiveness with other businesses (Yusof, 2023). In order to have high-quality standards there needs to be a focus on intuitive UX/UI on the platform as with the monitor to create user satisfaction and adaptation. Focusing on UX/UI enhances the overall user experience but also generates long-term loyalty which contribute to success and sustainability of the product. The integration with the urban environment is essential. It serves the dual purpose of showcasing the product effectively and capturing attention. At the same time, it displays the platform's message and generates engagement with the audience. Here the high quality of urban environment design will generate user engagement which is vital for the platform.

3.5 People

As in any project, there are multiple stakeholders with different levels of importance. In order to make this project succeed there is a need for a clear understanding of who is involved in the project and who is not. In the project, there are several stakeholders. Firstly, there's the project team responsible for building the prototype and driving the project forward. Secondly, the teachers from EPS give feedback and provide a budget. Additionally, there are the consumers and the sponsors of the product. These stakeholders all have a different level of importance in the project and need to be held in good relation in order to bring the project to a success.

3.6 Communications

Inner communication of a team is very important, in order to have a clear understanding of what someone is telling, the goals, work progress and more. The team is a group of 6 different members with different nationalities, from whom English is not the native language. Therefore there is a need to be patient and give room for each other to explain what they are saying. Hereby there will be a clear communication so the ideas, information and feedback will be explained better. Also, there is a

need for digital communication, the current platform for checking up with deliverables and sprints is Jira and there will also be communication through WhatsApp. Hereby there are clear channels of communication to check what people are working on, and what struggles they come across and it will lead to a smoother workflow. All communication mediums and processes are stated in table 2.

Table 2: overview of communication mediums

Method/system	What for?	Type
Jira	It is a backlog system helps divide and keep track of work that needs to be done in order to achieve the goals.	Digital
WhatsApp/Microsoft Teams	Method for digital communication if necessary Teams can be used for meetings and sharing documents. WhatsApp will be used for sharing quick correspondence.	Digital
Daily standups	To keep track what team members did the day before, problems they have encountered, plan for the day and problems they might face.	Physical
General meetings	Weekly meetings to make sure everybody is on the same page, problems that need more thinking, brainstorm sessions and team communication.	Physical
Supervisor meetings	Weekly meetings with the supervisors in order to ask for feedback on the project.	Physical
Agendas	24 hours before the supervisor meetings there needs to be an agenda made by the team so every participant can prepare in advance.	Digital

The way of communication is also important, the team strives to create an environment where there is room for critical thought but also learn from each other. For example, feedback is essential, in order to generate high-quality feedback people need to be honest and critical of their own work and the work of others. They need to be able to give constructive feedback so the other person can learn from it. This will lead to a higher standard of workflow, accountability, learning and positive behavior in the team.

3.7 Risk

Risk analysis involves the systematic identification, assessment, and prioritisation of potential risks that may affect the success of the project **[Tucci, Stedman, 2023]**. This process typically includes:

1. Identify the risk:

- Unordered List ItemIdentifying and cataloging potential risks that could impact project objectives. Including internal and external factors, known and unknown risks. This process can be made through brainstorming, reviewing, SWOT Analysis, expert judgment.

2. Analyse the possible impact of the risk:

- Unordered List ItemTo analyse the potential impact of risk can be solved by various ways. Assessing the potential consequences on the project objectives, budget, timeline and overall success. Quantifying the impact considering financial, schedule and resource factors.

3. Evaluate and prioritise the risk:

- Unordered List ItemEvaluate and prioritise risks based on their likelihood and potential impact to focus on addressing high-priority risks first for effective risk management.

4. Respond to the risk:

- Unordered List ItemRespond to risks by developing proactive strategies, implementing contingency plans and continuously monitoring and adjusting response efforts as needed.

5. Monitor the results of the risk:

- Unordered List Item Monitor risk outcomes to assess effectiveness and adapt strategies accordingly. Ensuring alignment with project objectives and stakeholder expectations.

The goal of risk analysis is to prevent and minimise the impact of risks.

3.8 Procurement

Procurement is a very important point in any organization. This is where we carefully identify and analyze the essential items we need, drawing on external sources. Once the list is complete, we embark on the procurement of these supplies, which includes everything from sourcing to closing the deal, right through to payment for the goods and services required. Well-organized purchasing management is really crucial to the smooth running of a new concept. It ensures that whatever we need, from outside our organization, is there when we need it. In this specific project, it's vital that all our suppliers are local. We have a very clear vision of what we want: an end product that not only meets our specific requirements, but is also sustainable and local. To achieve this, we have to choose the materials we use intelligently, and their impact on the environment. We want to make sure that we leave as small a footprint as possible on our planet.
But that's not all. We also need a simpler, more efficient system for our suppliers. And to maintain clear communication and well-defined objectives on both sides, it's essential that information is shared and regularly updated.
In short, for us, procurement is much more than just a business transaction. It's a process that ensures we get what we need, in the most efficient and ethical way possible.
When we choose our suppliers, there's one very important factor to consider: lead time. Simply put, lead time is the time it takes a supplier to get everything ready to go. This includes the time it takes to order and receive raw materials, manufacture and ship products, and finally deliver them. Delays can make or break a process in the blink of an eye. Indeed, deadlines that are pushed back can not only cause delays, but also shift an entire schedule.
At Artsy(nc), we believe it's very important to support our local businesses. That's why we've taken great care to select local suppliers for our procurement needs. Not only do we want to support the local economy, we also want to reduce transport costs and keep our expenses as low as possible. After much discussion and reflection within our team, we have chosen the following companies:

- Leroy Merlin
- Farnell

We wanted to work with as few suppliers as possible, to facilitate communication and obviously to reduce the costs, and the impact on the environment cause for the delivery of our raw materials and the different components of our box.

3.9 Stakeholders Management

Defining the stakeholders is a vital part to generate an overview and understand of the different parties involved in the project. By knowing who the stakeholders are and their needs the project goals and priorities can be determined, resources can be allocated and the user's needs can be identified. This helps with the quality of work and quality of product by defining the needs of the stakeholders. The definition of the stakeholder is as stated by the ISO (The International Organization for Standardization) **[International Organization for Standardization, 2010]**: “Individual or group that has an interest in any decision or activity of an organization.” In table 3 the stakeholders, their function, interests and influence is determined.

Table 3: Stakeholder

Stakeholder	Function	interest (1-5)	influence (1-5)
Project team	Developers	5	5
Teachers/supervisors	Controllers	5	3
EPS	Budget	4	3
Consumers	Using the product	4	3
Competitors	Competition	3	2
Sponsors, donors and suporters	Providing financial aid	4	4

The interest and influence is derived from the Institute of Project Management in order to create insights into the type of attention each stakeholder needs. In figure 8 the stakeholder needs is visualized based on the interest and influence (power) of each. The scaling of interest and influence is shown in table 3. With 1 meaning low and 5 meaning high.

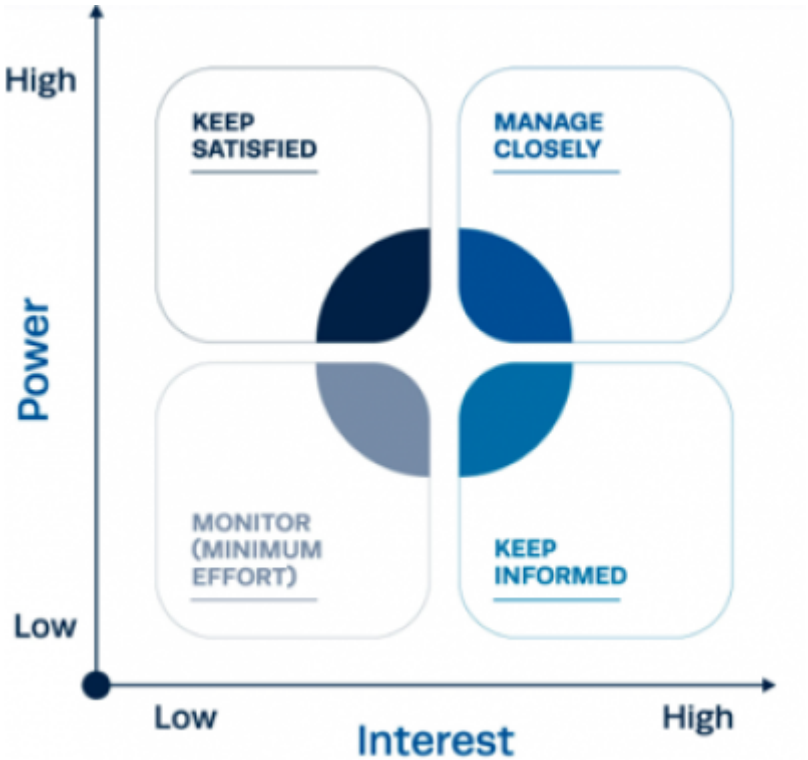

Figure 8: Stakeholders intrest vs power overview **[Institute Project Management, 2022]**

3.10 Project Plan

Define your optimal sprint duration and plan your sprints until project end using Global Sprint Plan Table 1.

Table 4: Global Sprint Plan

Sprint	Start	Finish	Status
1	29/2/2024	07/3/2024	Finished
2	07/3/2024	14/3/2024	Finished
3	14/3/2024	21/3/2024	Finished
4	21/3/2024	04/4/2024	Finished
5	04/4/2024	11/4/2024	To do
6	11/4/2024	18/4/2024	To do
7	18/4/2024	25/4/2024	To do
8	25/4/2024	02/5/2024	To do
9	02/5/2024	09/5/2024	To do
10	09/5/2024	16/5/2024	To do
11	16/5/2024	23/5/2024	To do
12	23/5/2024	30/5/2024	To do
13	30/5/2024	06/6/2024	To do
14	06/6/2024	13/6/2024	To do
15	13/6/2024	20/6/2024	To do
16	20/6/2024	27/6/2024	To do

Build your project backlog, including all relevant tasks/deliverables, using Project Backlog Table 5. Prioritize all backlog items (PBI), keeping higher priority items at the top, and lower priority at the bottom.

Table 5: Project Backlog

PBI	Title	Status
A	Define Project	Done
B	System Diagrams & Structural Drafts	Done
C	Project Backlog	Done
D	Global Sprint Plan	Done
E	Gantt Chart	Done
F	State of the Art	Done
G	First list of componentes and materials	Done
H	System Schematics & Structural Drawings	Done
I	Cardboard scale model	Done
J	Interim Report and Presentation	Done
K	Marketing Plan	Done
L	Eco-efficiency Measures for Sustainability	Done
M	Ethical and Deontological Concerns	Done
N	Proposed Solution and Bibliography	Done

PBI	Title	Status
O	Video of the 3D Model	To do
P	List of Materials	To do
Q	Packaging Solution/Building Plan	To do
R	Functional Test	To do
S	Final Report	To do
T	Presentation	To do
U	Paper	To do
V	Poster	To do
W	Manual	To do
X	Final Delivery	To do

Plan each sprint at its beginning (Sprint Planning session) using the Sprint Plan Table 6.

Table 6: Sprint Plan

Sprint	Task	Duration (d)	Responsible	Involved
1	A	7	Everyone	Everyone
1	B	7	LL	LL, SV
1	C	7	SV	Everyone
2	D	7	LL	Everyone
2	E	7	JN	JN
2	F	7	JN, LO	JN, LO
2	G	7	EL	EL, JN, SV
2	K	7	LL	LL, SV
2	M	7	LL	EL, JN, LL, LO
3	H	7	JH	EL, JH
3	I	7	JH	EL, JH
3	L	7	EL	EL, JN, SV

Review each sprint at its end and update each item status on the Progress Register Table 7.

Table 7: Project Progress Register

Sprint	PBI	Responsible	Involved	Status
1	A	Everyone	Everyone	Done
1	B	LL	LL, SV	Done
1	C	SV	Everyone	Done
2	D	LL	Everyone	Done
2	E	JN	JN	Done
2	F	JN, LO	JN, LO	Done
2	G	EL, JN, SV	EL, JN, SV	Done
2	K	LL	LL, SV	Done
2	M	LL	EL, LL, JN, LO	Done
3	H	JH	JH, EL	Done

Sprint	PBI	Responsible	Involved	Status
3	I	JH	EL, JN, SV	Done
3	L	EL, JN, SV	EL, JN, SV	Done
4, 5	N	Everyone	Everyone	In progress
6	J	Everyone	Everyone	In progress

Identify key project deliverables (when they will be started and completed) and build a release Gantt chart. See Figure 5 for inspiration.

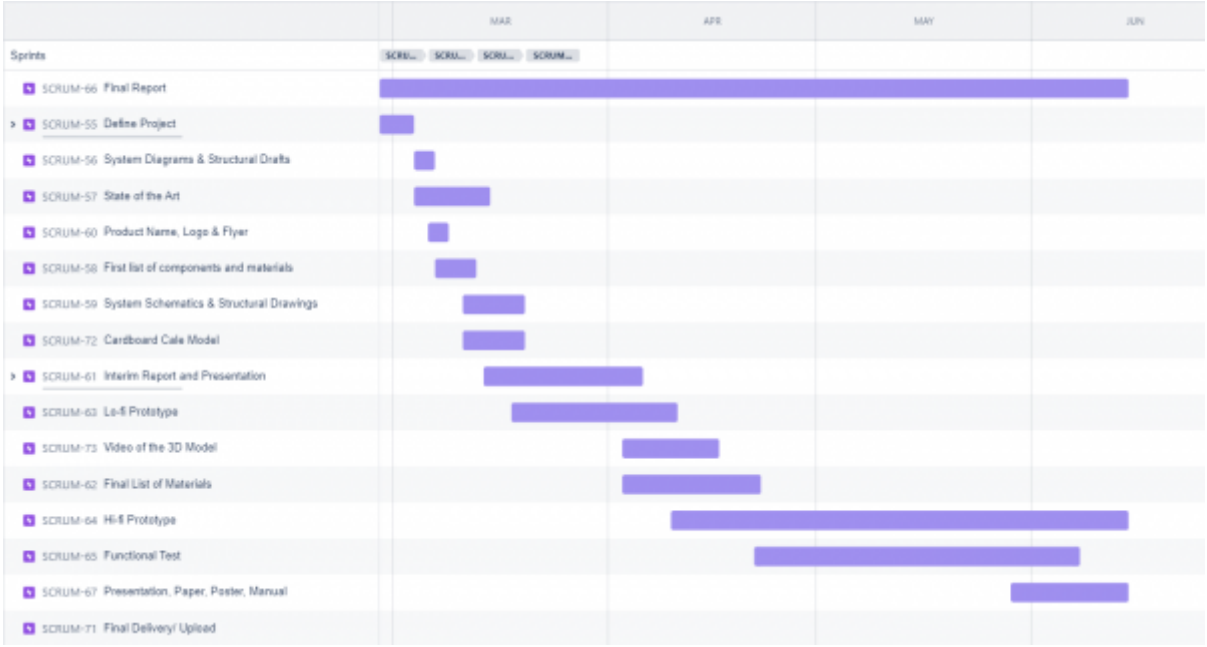

Figure 9: Release Gantt chart

3.11 Sprint Outcomes

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

Table 8: Sprint 1: 29/2/2024 - 06/3/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
1	Classes	25	25	Everyone	Done
	Define Project	6	6	Everyone	Done
	System Diagrams & Structural Drafts	2	2	LL, SV	Done
	Project Backlog	4	5	Everyone	Done

Table 9: Sprint 2: 07/3/2024 - 14/3/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
2	Classes	18	18	Everyone	Done

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
	Global Sprint Plan	4	6	Everyone	Done
	Gantt Chart	2	2	JN	Done
	State of the Art	6	7	JN, LO	Done
	First list of components and materials	4	4	EL, JN, SV	Done
	Marketing Plan	4	7	LL,SV	Done
	Ethical and Deontological Concerns	5	1	JN, LL, LO	in progress
	Flyer and Logo	4	3	EL, JH	Done

Table 10: Sprint 3: 14/3/2024 - 21/3/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
3	Classes	16	16	Everyone	Done
	System schematics & structural drawings	4	4	EL, JN, JH	Done
	Cardboard scale model	3	1	EL, JN	Done
	Eco-effeciency Measures for Sustainibility	3	4,5	EL	Done
	Redo State of the Art	4	6	LO, JN	Done
	Ethical and Deontological Concerns	6	10,25	LL, JN	in progress
	LoFi Wireframes of App	8	11	JH	in progress

Table 11: Sprint 4: 21/3/2024 - 04/4/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
4	Classes	6	6	Everyone	done
	Project Management	6	7,25	EL, LL, LO	done
	Marketing Analysis	16,5	19,5	LL, LO	done
	Ethical and Deontological Concerns	3	2,5	JN	done

Table 12: Sprint 5: 04/4/2024 - 11/4/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
5	Classes	6,5	6,5	Everyone	To do
	Interim Presentation	7		Everyone	
	3D-Model	10			

Table 13: Sprint 6: 11/4/2024 - 18/4/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
6	Classes	10	10	Everyone	

Table 14: Sprint 7: 18/4/2024 - 25/4/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
7	Classes	7	7	Everyone	

Table 15: Sprint 8: 25/4/2024 - 02/5/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
8	Classes	0	0	Everyone	

Table 16: Sprint 9: 02/5/2024 - 09/5/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
9	Classes	2	2	Everyone	

Table 17: Sprint 10: 09/5/2024 - 16/5/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
10	Classes	4	4	Everyone	

Table 18: Sprint 11: 16/5/2024 - 23/5/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
11	Classes	12	12	Everyone	

Table 19: Sprint 12: 23/5/2024 - 30/5/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
12	Classes	6	6	Everyone	

Table 20: Sprint 13: 30/5/2024 - 06/6/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
13	Classes	6	6	Everyone	

Table 21: Sprint 14: 06/6/2024 - 13/6/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
14	Classes	4	4	Everyone	

Table 22: Sprint 15: 13/6/2024 - 20/6/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
15	Define Project				

Table 23: Sprint 16: 20/6/2024 - 27/6/2024

Sprint	Task	Planned duration (h)	Real duration (h)	Involved Members	Status
16	Define Project				

3.12 Sprint Evaluations

Include the summary of all the sprint retrospectives, including any actions implemented as part of the team's continuous improvement strategy.

Table 24: Sprint reviews

Sprint	Positive	Negative	Start doing	Keep doing	Stop doing
3	communication in time and working, organizing tasks, feeling of reliability	Logging of the worktime, Trouble with predicting the amount of time spend on work, There were some different views of the project, so we needed to discuss and get on the same page	People need to log directly after any work there time in the jira, Creating more sub-tasks in order to estimate better time spend on a task, We need the general meeting ones a week, to see what everybody has been writing with a small stand up	communication, keep talking what problems you face and if you need help, To keep your word and be reliable, organization based on skills	not logging time
4	Communication and workload balance good, every body worked hard	Ranking the tasks, more attention to weekly report, more active working on Jira, make the agenda in time, better time estimation sprint tasks	More attention to the weekly report, Agendas in time, More interaction in Jira, Better time estimation sprint tasks	communication, workload balance	nothing for now
5					
6					
7					
8					

Sprint	Positive	Negative	Start doing	Keep doing	Stop doing
9					
10					
11					
12					
13					
14					
15					
16					

3.13 Conclusion

Provide here the conclusions of this chapter and introduce the next chapter.

4. Marketing Plan

4.1 Introduction

Chapter 4 will give insights in the market Artsy(nc) wants to enter, the strengths, the weaknesses and show possible opportunities and threats off the market. In general it shows the strategic roadmap the platform will use in order to become a success.
Firstly there will be a market analysis in order to view the size of the market and shows macro economic factors. After this there will be Swot analysis and the strategy will show Artsy(nc)’s objectives, audience’s and positioning in the market.

4.2 Market Analysis

4.2.1 Audience types

To achieve the goal of creating awareness of local digital artists, there are three key audience groups involved. Not all target groups can be clearly defined, as it is the case with our product. There is a big subjective view on art, and you can not state with certainty who will like it or not. Also, it is not exclusively a collaboration between a producer and a customer. First of all, there are the local digital artists who produce the art that is to be shown. The platform is made specifically for them and so they are in the first idea the main target group, but because we want to create a platform to showcase art so they achieve recognition, we also need to focus on the art lovers and sponsors.
The local digital artists themselves are the content creators and essential participants in the process. Interaction with them is necessary to deliver art to the platform and produce the final product. For artists, it is hard to generate a reputation and recognition, to be seen in front of the general public and therefore, Artsy(nc) can provide them with a platform. Everybody can be an artist and because there is no clear definition of art due to its broad interpretability the platform will be looking for a wide audience. The main focus will be on local artists of the city, in which they live in and want to become more visible. They need to be able to generate digital art and want to work on this theme of art. The

age can vary from young to old, rich to poor, it is an inclusive platform where everyone that needs a medium to showcase their art can have a chance.
Secondly, art lovers, which include museums, collectors, and the general public. They play a crucial role in promoting and sharing the work of local artists. They contribute to spreading the word about the artists and their creations, thereby increasing awareness within the community. This target group includes anyone who wants to watch art and helps us with the curator process, regardless of age group, nation or personal background. Income also plays no role for platform users because it is a freely accessible platform without any costs. The only requirement is that the person can only vote within a district where they are located at that specific moment.
Sponsors are of crucial importance and therefore the third target group. They are especially very relevant for the provision of financial support and resources for the presentation of artists' works in public spaces. These organizations contribute to the visibility and exposure of local artists, while also benefiting from positive branding and community impact. The positive branding is generated due to the sponsor helping the city to develop as a smart city. Currently, in the case of Porto, it is a smart city by the European Commission because of its sustainability goals. Now the sponsors can help the city and artists to become a smart city also in the field of digital art. There are requirements for these organisations before they can collaborate with the platform, this will also be discussed in the ethical concerns. But the organisations can be any, philanthropist, company or government who shares our values and vision.
These three audiences operate in a collaborative circle, with each group dependent on the others. The artists create the pieces, requiring interaction to produce the final product. Sponsors provide the necessary funding and resources to showcase the art in public spaces. The public audience then spreads the word about the created art, raising awareness for local artists.
In this cycle, everyone benefits from the platform and it can be said that anyone can be part of one of our target groups. The platform is intended for everyone and involves anyone who shares our vision or just likes our concept.

4.2.2 Market overview

To sketch the market environment, a market overview can be a valuable tool. The overview provides some insights into possible opportunities, new business endeavours, size of the market and shows competition. To research the market, there first needs to be an idea of what the market contains. ArtSy(nc) is a provider of recognition and awareness of local digital artists, the used method is by using art lovers in the curator process through the voting platform to showcase the art in public spaces. This is a niche which contains multiple subgroups; Digital art creation, art curating and public exhibitions. These all fall under the banner of digital arts and therefore the focus of the market overview will be on the digital arts market in general.
The global art market is a massive market, with a value estimated at USD 520.05 billion in 2023 and a compound annual growth rate (CAGR) of 6.15% for the period 2024-2032 **[Straits Research, 2020]**. Digital art is still a small portion of the total art market with USD 4 billion **[Coherent Market Insights, 2024]**. Nevertheless, this might sound a small portion, it does have an estimated CAGR of 17.1% for the period 2023-2030 **[Coherent Market Insights, 2024]**. This shows that the art market has a lot of potential to grow big in the next 6 to 8 years and digital arts will have massive growth opportunities. There is one problem and it is that the digital art market does not have widespread acceptance yet. This could be helpful for ArtSy(nc) to jump in and raise more awareness for local artists and digital art.
In order to understand how the market moves, there is a need to understand the key drivers of the art market. There is an increase of accessibility. By the use of online platforms, the entry level to upload and sell art just as buying the art is more accessible. Since for digital art there is no need for expensive materials, everyone can partake and upload their art. For art buyers, this is also a great

opportunity to see and discover a bigger set of art that is way more accessible than the traditional art markets. This means that the digital market platforms can showcase more artworks for different prices which creates big art galleries for all interested collectors for all income levels. Also by using digital platforms, buyers and sellers don't have to be at the same place but can be at different positions all over the world and still interact with each other. This creates even more accessibility on a global scale. The only problem these artists face is being seen through all the other digital works on the platform.
Digital art is the newest form of art at the moment, here there is a crossing between the physical and digital realm where artists have the opportunity to create more and share more types of art. This can happen through different platforms and methods. Through advancements in technologies, there are digital galleries like "The Collection-gallery", "OpenSea" and "MakersPlace". Art galleries, but also digital content platforms or social media platforms like "Instagram" and "DeviantArt". The way of sharing can have borderless opportunities which generates more involvement that is not based on a fixed location. Also, the methods of creating art are still developing in the digital art sector, there are: 2D and 3D pictures and renders, the use of AR/VR, machine learning and AI art **[Coherent Market Insights, 2024]**. These are still in development and generating new types of art which will keep advancing over the upcoming years. These methods and platforms create new ways for artists to share and generate new ways of art which is a driver of the market.

4.2.3 Pestel analysis

PESTEL analysis is a strategic tool used by organisations to assess and understand the external factors that may impact their business environment. The acronym stands for Political, Economic, Social, Technological, Environmental and Legal factors. By examining these key elements businesses can gain insights into the landscape in which they operate. This analysis helps organisations identify potential opportunities and threats to anticipate changes in the market and adapt their strategies accordingly. PESTEL analysis serves as a valuable framework for strategic planning, risk management and decision-making processes enabling businesses to stay agile and responsive in a changing business environment.
Political: In navigating Porto's political landscape for our art-sharing project, securing city permissions for displaying art and aligning our app's rules with regulations and cultural norms are key considerations. For example there may be an established norm in Porto that city decision-making and politics should consider the views and needs of various stakeholders. The regulations must be clear between all the stakeholders. This approach ensures legal compliance while fostering a positive and culturally respectful user experience.
Economic: In the project to promote art in Porto's urban spaces, economic factors are critical. We carefully consider market demand, operational costs, funding opportunities, tourism impact, competition, digital infrastructure and economic trends to ensure financial viability and success. By addressing these aspects thoughtfully, we aim to create a sustainable platform that enriches the city's cultural landscape.
Social: The way of distributing the artwork and giving curatorship to art lovers is a completely new way of digital art in a city to gain more visibility for the artist. This in combination with the rise of digital arts on social media and online communities, can create big user engagement. However, ensuring diversity in the presented art and promoting user engagement through interactive features is crucial for long-term success. The platform also becomes a bridge, connecting the innovative world of digital art with the public spaces.
Technological: Because of the digital nature of the platform, there will be marketing opportunities with the projectors. It can be for promoting sponsors and local businesses in a new way by projecting brand names in public spaces or the app. Also in this platform structure, there is a democratisation of the curation process. This is an innovative way of promoting and curating, by using technology which

can be explored further.
By using the platform, the public spaces will become the exhibition spot. When using multiple monitors at different public spaces the city will become indirectly the exhibitor, which fosters the smart city. This is possible through the innovation of the projector system and the application. There will be technological advancements in digital art, currently, the digital art scene explores: AR/VR, Machine learning, Artificial intelligence, 2D/3D pictures and animations. In the upcoming years, these scenes will be explored even further and push technological innovation. Due to technological advancements by competition, features of the product can become obsolete, which means there is a need for constant innovation. **Legal:** To develop an application for local artists in Porto to share their art and showcase it in urban places using projectors, several legal considerations must be addressed. Ensuring compliance with copyright laws, data protection regulations, obtaining necessary permits for public display, drafting clear contractual agreements, clarifying liability provisions and adhering to consumer protection laws are imperative to mitigate legal risks and establish a legally sound foundation for the project.
Environment: In our project to develop an application for local artists in Porto to share their art and showcase it in urban places using projectors, environmental considerations are following. We assess energy consumption, waste management practices, outdoor exhibition spaces' ecological impact, transportation logistics' carbon emissions and community engagement for environmental awareness. By prioritising sustainability initiatives and minimising environmental impact we aim to promote artistic expression while preserving Porto's urban and natural environments.

4.2.4 Competitive marketing analysis

The project aims to provide a platform for local artists in Porto to share their artwork digitally and have it showcased in urban spaces using projectors. To ensure the success of this project, it's vital to conduct a competitive marketing analysis. The project faces more indirect competition than actual direct competition. Here is an overview: 1. Competitors: ArtFinder: ArtFinder is a global online marketplace for art where artists can sell their artwork directly to buyers. While it doesn't specifically focus on local artists in Porto, it represents a potential competitor due to its broad reach and artist-centric approach. ArtStation: ArtStation is a platform primarily used by digital artists to showcase their work. While it doesn't offer physical projection opportunities, it's a significant player in the digital art community and may attract some of the same artists. Street Art Project: This is an initiative that focuses on bringing art to urban spaces worldwide. While not a digital platform, it shares the goal of utilising urban spaces for art, which aligns with the proposed application's concept. 2. Strengths of Competitors: Established user base: Competitors like ArtFinder and ArtStation already have a significant user base of artists and art enthusiasts. Global reach: Platforms like ArtFinder and ArtStation cater to artists and art lovers worldwide, providing exposure beyond local markets. Diverse offerings: Competitors may offer a wide range of art styles and mediums appealing to various tastes. 3. Weaknesses of Competitors: Lack of focus on local artists: While competitors may have local artists on their platforms, they may not prioritise or specifically cater to them. Limited physical presence: Digital platforms like ArtStation lack the capability to showcase artwork in physical urban spaces, potentially limiting their appeal to artists seeking exposure in such environments. 4. Opportunities for the Proposed Application: Niche focus: By specifically targeting local artists in Porto, the application can fill a gap in the market and provide a dedicated platform for these artists to gain exposure. Community engagement: The application can foster a sense of community among local artists and art enthusiasts in Porto, enhancing user engagement and unity. Unique value proposition: The combination of digital art sharing and physical projection in urban spaces offers a unique and innovative way for artists to showcase their work, setting the application apart from competitors. 5. Threats to the Proposed Application: Competition from established players: Competing with established platforms like ArtFinder and ArtStation may pose a challenge in terms of attracting users

and artists. Technological barriers: Implementing the projection aspect of the application requires technical infrastructure and partnerships with urban spaces, which may be challenging to establish and maintain. Limited scalability: The application's focus on local artists in Porto may limit its scalability compared to global platforms like ArtFinder and ArtStation. Conclusion: While there are challenges and competition in the market, the proposed application has the potential to succeed by offering a unique value proposition tailored to the needs of local artists in Porto. By leveraging technology and community engagement, the application can carve out its niche in the art-sharing market and establish itself as a valuable platform for artists and art lovers alike.

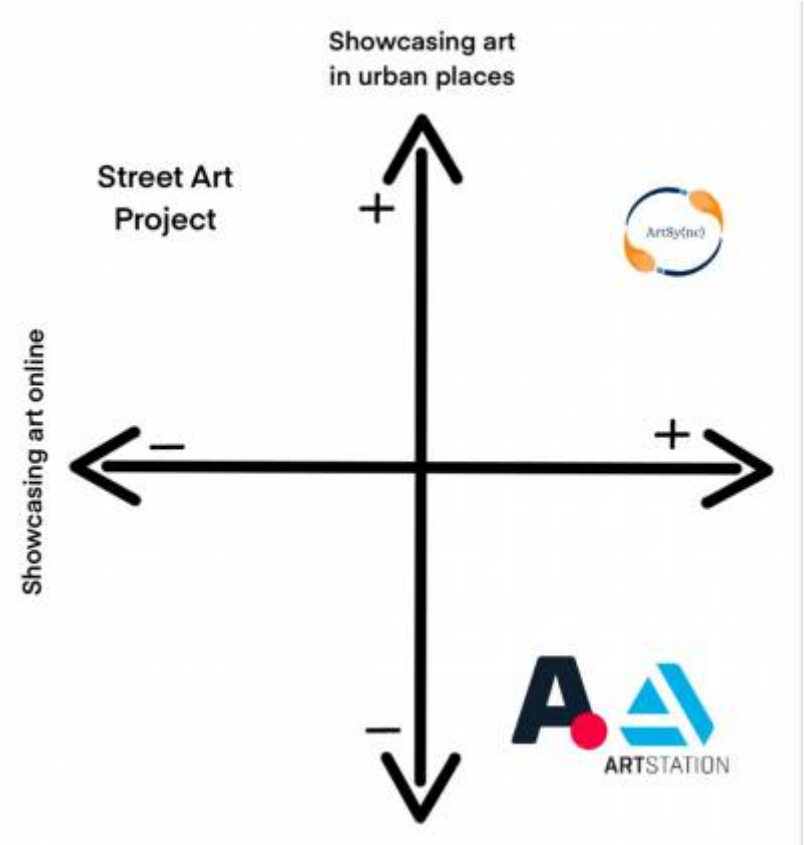

Figure 10: Competition

4.3 SWOT Analysis

To better understand the strengths and weaknesses of Artsy(nc) we used the swot analysis. The swot analysis is a method for identifying strengths, weaknesses, opportunities and threats. It is an effective tool used by many companies and project managers to identify possible strengths and weaknesses of projects or businesses.

Strengths:

- **Innovative Concept:** The integration of visual art in real-time is a unique and innovative concept, setting the platform apart in the digital art space.
- **Engagement and Interaction:** The real-time sync and collaborative aspects improve the engagement, providing users with an interactive and dynamic experience.
- **Smart city:** The usage of local artists to create digital art and showcase it on public displays, will foster the smart city. This integration improves the city's cultural identity. By promoting local talent and providing an innovative platform for local artistic expression, community engagement and enhancing the city's reputation. The reputation will align with the city as a forward-thinking hub for creativity and culture to become a smarter city.

- **Diverse Audience Reach:** With the potential to showcase digital art in public spaces, the platform has the opportunity to reach a diverse audience beyond traditional art spaces, including tourists, commuters, and people who pass by.
- **Collaborative Partnerships:** Collaborating with local governments, businesses, and cultural institutions to showcase digital art in public spaces can lead to mutually beneficial partnerships and increased visibility for the platform.
- **Collaborative Community Growth:** The platform presents an opportunity to build a vibrant community of artists, improving collaboration, sharing, and cross-promotion.
- **Replicating:** The platform is easy to replicate in other city’s and public places due to its robustness.

Weaknesses:

- **Technical Challenges:** Achieving seamless real-time synchronization and ensuring a smooth user experience may pose technical challenges, requiring continuous development and optimization.
- **Learning Curve:** Users may face a learning curve in mastering the platform's features and tools, potentially limiting initial user adoption.
- **Content Moderation:** Managing collaborative spaces may require effective content moderation to prevent misuse or inappropriate content from impacting the community.
- **User Engagement:** The platform's success hinges on active participation from a diverse range of local artists and engagement from the general audience. Currently, there may be a challenge in attracting and retaining a sufficient number of artists to diversify and celebrate their work effectively. Additionally, interaction with the general audience to generate feedback on preferred art styles and preferences is crucial for creating a vibrant and engaging platform. Without robust user engagement strategies in place, there's a risk of limited content variety and decreased user interest over time.
- **Sponsor Dependency:** As an organization, we rely heavily on sponsorships to fund and mantain its operations. The platform's ability to showcase local digital art in public spaces is contingent upon securing consistent financial support from sponsors. However, reliance on sponsors introduces vulnerability to changes in funding availability, sponsorship preferences, or economic conditions, which may impact the platform's stability and growth potential.

Opportunities:

- **Artist recognition:** The platform presents an opportunity for artist who need and look for recognition for their work.
- **Partnerships with Artists:** : Established artists who want to help local artist to become more recognized and to enhance visibility can work together with the platform to reach a wider audience.
- **Technological Innovation:** Leveraging advancements in technology such as augmented reality (AR), virtual reality (VR), or blockchain could enhance the platform's features and user experience, attracting tech-savvy users and fostering greater engagement.
- **Partnerships:** People and organizations who want local artist to be more visible can help them by sponsoring the platform.
- **Smart city’s:** City’s who’s goals are to become more digital and want to become a smart city could use the platform for their goals.

Threats:

- **Competition:** The digital art and collaboration space is competitive; staying ahead of or differentiating from similar platforms is crucial.

- **Technological Advancements:** Rapid technological advancements could make certain features obsolete or necessitate continuous updates to remain relevant.
- **Adoption by the artworld:** The adoption of our platform by the traditional art world can be hard, particularly if it disrupts existing power structures or challenges entrenched notions of exclusivity. The art world has historically been resistant to change, and our platform's emphasis on democratization and collaboration may be met with skepticism or resistance from certain quarters. Additionally, established institutions and gatekeepers within the art world may perceive our platform as a threat to their authority or control over the artistic narrative.
- **Economic Instability:** Changes in economic conditions, such as recessions or budget cuts, could impact sponsorships and funding on cultural initiatives, posing a threat to the platform's financial sustainability.
- **Technological Risks:** Dependence on technology for real-time collaboration, public display, and platform functionality introduces risks such as technical glitches, cybersecurity threats, or compatibility issues, which could disrupt operations or damage the platform's reputation.
- **Regulatory Challenges:** Compliance with local regulations, permits, and permissions for showcasing digital art in public spaces may pose logistical challenges and bureaucratic hurdles, potentially limiting the platform's ability to expand or innovate.

4.4 Strategy

4.4.1 Strategic Objectives

To achieve the goal of becoming a leading platform, there is a need for a set of strategic objectives with measurable targets. These objectives focus on four areas; Artist Engagement, Art Lover Engagement, Sponsorships and Expansion. These objectives are SMART (Specific, Measurable, Achievable, Relevant, and Time-bound) this will help ensure the continued growth and success.
For artist:

- Of all users, 10% to 15% must be artists by one year
- Get 1 to 2 artworks per artist every two weeks
- Continuously 20 of visible artists per public space in 3 years

For art lovers:

- Per enrolled city between 0.5% to 1% of the population engaging with the platform.

Sponsors:

- get at least 2 – 4 local sponsors per city where the platform is deployed.

Expansion:

- Expand to 10 different cities in 5 years
- Have between 5 – 15 public spaces in use per city depending on its size

4.4.2 Segmentation and Targeting

In Chapter 4.2.1 there is already a general analysis of the target audience. In this chapter, there will be a more in depth segmentation and targeting of these three audiences. **Segmentation:** By

segmenting the audience, we can generate a better overview of who Artsy(nc) is interested in. Therefore we will describe the three types of audiences more in depth with which the targeting will be more precise.
Artists: For artists, we are looking for people between the ages of 15 and 90, as long as you can make actual art you are welcome to join the platform. The artist must be local to the place they live in. We do not look for artists who live in different cities than where the art will be showcased. The style of the artist can be really broad as long as they incorporate digital art. They can be post-modern, Avant Garde or something else. As long as their art is combined with digital art. The artist can also be of every level, they can be beginner to advanced. The upload frequency can be approximately 2-4 times a month. Artists are also allowed to help in the curating process as long as they follow the platform's guidelines.
Art Lovers: The demographic of art lovers is quite brought. The ages vary from 10 to 90. As long as a person, local or tourist likes to watch art or wants to learn more about it, the person will be welcome to join the platform. The only requirement is that they have a basic sense of digital applications in order to use the platform. It will be our job to make the platform as intuitive as possible to make it easy to use for most people. We do want the users and viewers to be regular users and not one-time engagement, they need to use the platform at least twice a week to swipe genuine 10 pieces of art each time. They can be identified as casual viewers all the way up to art collectors. The art interest can be very brought as long as they like the combination of different types of digital art.
Sponsors: For sponsors we prefer organizations that already work in, sponsor art projects or have a link with our platform. Think of tech companies, museums or socially aware companies. But this is not mandatory. They do not need to come from a specific industry as long as they share our views and beliefs of the platform they are welcome. The size of the sponsor is preferably a big company with budgets in order to sponsor fully or for a big part.
Targeting: To specify the audience even more they will be addressed as the target audience and get a more specific and narrow description.
The primary target: The primary target is the local digital artist between 15 to 90 years old. This person is passionate about their digital work but lacks the resources for more exposure. We provide them a platform where they can showcase their work to be seen by art lovers to gain recognition.
The second target group: The second target group is the engaged art lovers between 10 to 90 years old. They need to be active on our platform and want to seek and discover new digital art. They want to spend time voting and viewing the artworks on the platform and at the local exhibitions.
Sponsors: Companies that already have worked with or are currently in the art, technological or digital art industry. And align with the norms, values and goals of ArtSy(nc) would be ideal partners.

4.4.3 Positioning

Our project ArtSy(nc) stands out in the market as a unique platform dedicated to empowering local artists in Porto by providing them with a digital space to share their artwork and the opportunity to showcase it in urban places through innovative projection technology. Unlike generic art marketplaces or digital platforms ArtSy(nc) focuses specifically on the vibrant artistic community of Porto offering a tailored solution to meet their needs.
Key Elements of Positioning:
Local Empowerment: ArtSy(nc) prioritises the local artistic talent of Porto providing a dedicated platform for artists to gain exposure within their own community and beyond. By focusing on local artists we foster a sense of belonging and support within the Porto art scene.
Innovative Projection Technology: What sets ArtSy(nc) apart is its integration of projection technology to showcase artwork in urban spaces. This unique feature transforms ordinary cityscapes into dynamic art galleries providing artists with a captivating way to display their work and engage with audiences in public settings.

Community-Centric Approach: Beyond being a mere platform ArtSy(nc) cultivates a thriving artistic community within Porto. Through features such as artist profiles, interactive discussions and local places we foster connections and collaboration among artists and art enthusiasts enriching the cultural landscape of the city.
Value Proposition: By combining digital art sharing with physical urban projection ArtSy(nc) offers a one-of-a-kind experience for both artists and viewers. Artists benefit from increased visibility and opportunities for recognition while audiences are treated to an immersive art experience that transforms ordinary spaces into dynamic showcases of creativity.
Overall, ArtSy(nc) positions itself as not just a platform for art sharing but as a catalyst for artistic expression, community engagement and urban revitalisation in Porto. With its focus on local empowerment, innovative technology and vibrant community, ArtSy(nc) aims to redefine the way art is experienced and appreciated in the city.

4.4.4 Marketing-Mix

The marketing-mix is a tool for companies to promote their product on the market. Marketing-mix includes four P's which are following **[Alexandra Twin, 2024]**:
1. Product Our product is a digital platform that serves as a platform for local artists to share their art and for art lovers to discover and engage with diverse artworks. We focus on creating a user-friendly interface with intuitive features for art sharing and seamless integration with projectors for showcasing art in urban spaces.
2. Price Our goal is to create an application where registration would be free. We aim to sustain our business through various sponsorship funding.
3. Place Our app will be available for download on major app stores, ensuring accessibility to a wide audience of artists and art lovers in Porto. The projectors will take place all over the city of Porto. Additionally we will promote the app through online channels, social media platforms and local art communities to maximise visibility and user adoption.
4. Promotion We will promote the app through online channels, social media platforms and local art communities to maximise visibility and user adoption. Also different collaborations with museums and public factors in the city would boost our business.
By carefully considering each element of the marketing mix the team aims to develop a comprehensive marketing strategy that effectively promotes local art, drives user engagement and fosters a sense of community around our app in Porto's urban spaces.
As our primary goal is to promote local art and foster community engagement, we aim to keep the app accessible to both artists and users. We may offer a free-to-use basic version of the app with optional premium features for artists seeking enhanced visibility or promotional opportunities.

4.4.5 Brand

Our project is called ArtSy(nc). The name refers to art, connection and unity which perfectly reflects the primary purpose of our project: bringing together artists and art lovers through digital art. The first part of the name "Art" refers to the content of our application which is art. The additional part "Sy(nc)" at the end completes the name and brings an idea of community and uniting the users. The true meaning of the name can be summed up in the phrase "Art syncs people together".
The logo consists of two brushes. The tips of the brushes form an arrow-like shape and as the brush tips connect they create a synchronisation symbol representing unity. The mix of calm and popping colors create a positive atmosphere around the logo.

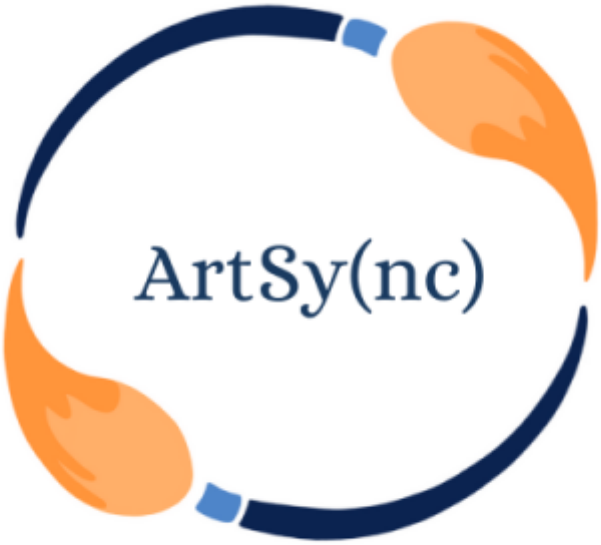

Figure 11: Logo

4.5 Marketing Programmes

4.5.1 Programmes

4.5.2 Budget

4.5.3 Control

4.6 Conclusion

Provide here the conclusions of this chapter and introduce the next chapter. Based on this market/economic analysis, the team decided to create <*specify the type of product*> intended for <*specify the market niche*> because … Consequently, the team decided to create a product with <*specify the features*>.

5. Eco-efficiency Measures for Sustainability

5.1 Introduction

This chapter deals with the sustainable aspect of our project. First, we'll introduce the chapter with a few definitions of key terms such as sustainable development and eco-efficiency. Then we'll explore the three pillars of sustainability, and finish with a life-cycle analysis of our product.
Geological resources have been used throughout history to provide food, shelter, and transportation

for humans. Unfortunately, our ecosystem has suffered greatly from this overconsumption, which has led to pollution and resource depletion. Sustainable engineering offers itself as a solution to this worrying situation, by attempting to balance the requirements of environmental preservation and economic growth. Sustainable engineering is based on the three pillars of sustainable development: the environment, the social and the economy, a concept formalized in 1992 by the Earth Summit in Rio. The concept of sustainable development aims to *"meet the needs of the present without compromising the ability of future generations to meet their own needs"*, quote from Ms. Gro Harlem Brundtland, Norwegian Prime Minister (1987). Indicators such as the Happy Planet Index, which measures human well-being in terms of ecological impact and standard of living, are used to assess this balance.
Therefore, in line with sustainable engineering, the management strategy of doing more with less is called eco-efficiency. It is based on the concept of creating more goods and services while using fewer resources and creating less waste and pollution. A definition given by Koskela and Vehmas, 2012 is *"A relationship between environmental impact and economic performance"*. Tools such as life cycle analysis make it possible to assess the environmental impact of a product or system from its design to its end of life. A useful method for evaluating the environmental impact of a process or product from design to end-of-life is life-cycle analysis.
Sustainability reports show a company's or organization's dedication to sustainable development by providing a comprehensive analysis of their social, economic, and environmental performance.
In conclusion, a carefully considered energy policy is necessary to steer our shift toward a more sustainable future. It entails controlling greenhouse gas emissions, cutting energy use, and boosting renewable energy sources.

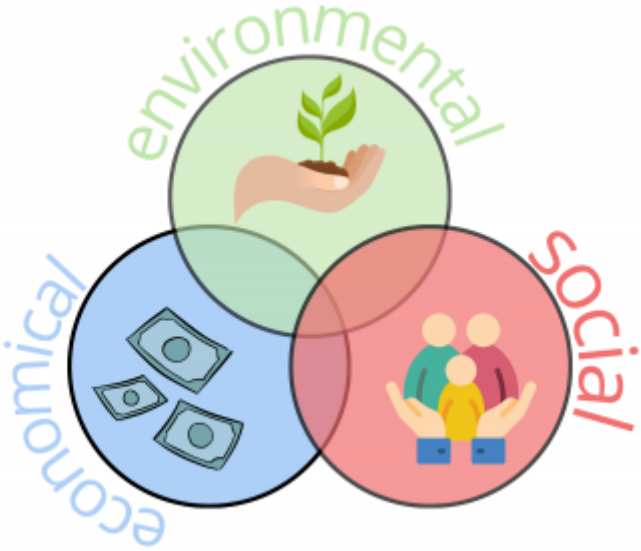

Figure 12: The 3 pillars of sustainability

5.2 Environmental

In a world where technology is constantly evolving, digital art is emerging as an innovative avenue for creative expression. Our project is part of this dynamic, launching an innovative application while developing and renting outdoor projection boxes to facilitate this artistic experience.
But our ambition goes beyond simple technological innovation. We understand that environmental sustainability is essential. That's why we thought from the outset: how can we make this project more sustainable?
Our aim is to combine creativity, technology and sustainability to deliver an innovative artistic experience that is both environmentally friendly and inclusive.

5.2.1 Outdoor spotlight housing

What environmental aspects should be considered for the outdoor spotlight housing?
1. Choice of materials: Our goal is to opt for durable, recyclable materials with a low carbon footprint for the manufacture of housing in order to minimize its impact on the environment.
2. Energy consumption: We want to choose an energy-efficient projector and integrate efficient cooling systems to reduce energy consumption and limit CO2 emissions.
3. Transport and logistics: Reduce the carbon footprint of transport by favoring local suppliers and optimizing delivery routes.
4. Waste management: Implement a collection and recycling system for end-of-life projector housings to minimize waste and promote the reuse of materials.
5. Impact on public spaces: Ensure that artistic projections do not disrupt local ecosystems or generate excessive light pollution. We know that we need to think about choosing appropriate locations that minimize the impact of light pollution.
6. Environmental Awareness: We considered integrating environmental awareness elements into our app platform, encouraging artists and users to reduce their carbon footprint and adopt eco-friendly practices environment.

5.2.2 ArtSy(nc) Application

1. Hosting and Infrastructure: We will use hosting providers that use data centers powered by renewable energy and have strict energy efficiency policies. Use shared servers and cloud computing solutions to optimize resource utilization.
2. Code Optimization: We develop the application with optimized and lightweight code to reduce bandwidth consumption and server load. We want to avoid unnecessary features that could increase the energy demand of users' devices.
3. Efficient user interface: We want an intuitive user interface that minimizes the need for frequent reloads or unnecessary data downloads. We also want to encourage users to turn off notifications and automatic updates to save power on their devices.
4. Encourage ecological practices: We integrate features into the application that encourage users to adopt environmentally friendly behaviors, such as promoting artistic works on environmental themes or highlighting artists engaged in sustainable practices.

5.3 Economical

The sustainable economy focuses on the responsible management of economic, social and environmental resources to support the well-being of current and future generations. As part of your project aimed at propelling digital art, here are some initiatives aligned with the principles of the sustainable economy:
1. Local Sourcing: We will choose local material suppliers. The objective is to reduce carbon emissions linked to the transport of materials, while stimulating the local economy.
2. Equipment rental: By offering a complete rental package including a protective case for the projector and a projector itself, we aim to encourage more responsible consumption by offering an alternative to purchasing new equipment, thus reducing waste and costs for users.

5.4 Social

The UN Global Compact defines social sustainability as follows: “Social sustainability is about identifying and managing business impacts, both positive and negative, on people. The quality of a company's relationships and engagement with its stakeholders is essential. Directly or indirectly, companies affect what happens to employees, value chain workers, customers and local communities, and it's important to manage impacts proactively.”
“Sustainable sociability” refers to the ability of a project or initiative to foster positive and inclusive social interactions, while taking into account the long-term effects on society. As part of your project to promote digital art, here are a few elements we want to incorporate to promote sustainable sociability:
1. Social inclusion: We want our platform to offer fair and accessible opportunities to local artists from all backgrounds. And encourage the diversity of perspectives and voices represented in the local art community.
2. Local partnerships: We would like to collaborate with local organizations, art schools, cultural associations and other community players to promote digital art and create opportunities for local residents to participate and learn.
3. Encouraging intercultural exchange: We want to encourage intercultural exchange by showcasing works and artists that reflect the cultural diversity of your community. This can help strengthen ties between different communities and foster mutual understanding.

5.5 Life Cycle Analysis

5.5.1 A simple definition of life cycle analysis

Life Cycle Analysis is a method for evaluating the environmental impact of a service or product throughout its life cycle, from design to end-of-life management. It makes it possible to identify and quantify the energy and material flows involved, and to draw conclusions based on the objectives that motivated the study. It is therefore an ideal tool for an eco-design approach. The principles, requirements and procedures of Life Cycle Analysis are defined by international standards ISO 14040 and ISO 14044.
ISO 14040 Outlines the principles and framework for LCA, including goal and scope definition, inventory analysis, impact assessment, and interpretation. It provides the guidelines for conducting an LCA study but does not dictate specific methods.
ISO 14044 Building on ISO 14040, ISO 14044 provides detailed requirements for conducting an LCA. It includes specifications for choosing impact categories, category indicators, and characterization models. This standard ensures that LCA studies are conducted with rigor and consistency.
Life Cycle Analysis is an approach characterized by 3 objectives:

- Reduce environmental impacts throughout the life cycle (there is no such thing as zero impact)
- Maintain and improve functional qualities, as environmental improvement cannot be achieved by degrading product quality or functions.
- Combat the displacement of pollution (from one stage to another or from one impact to another).

5.5.2 Definition of the product life cycle

The life cycle of a product is divided into 5 phases:

- Raw materials (extraction, transformation, supply)
- Manufacturing
- Packaging
- Release (distribution, marketing)
- Use
- End-of-life management (recovery, recycling, waste treatment, etc.)

Transport-related environmental impacts are considered for each phase.

Figure 13: Life Cycle

5.5.3 Life cycle analysis of the main materials of the product

Stainless steel

1. Extraction of raw materials:

1. Stainless steel is mainly composed of iron, chromium and nickel, with other elements in smaller quantities. Iron ore mining can involve mining, which can have significant environmental impacts, such as deforestation, biodiversity loss, and soil and water pollution.
2. The extraction of chromium and nickel can also cause environmental damage, including water and soil pollution, and health risks to workers.

2. Manufacture:

1. The manufacture of stainless steel generally involves the melting of raw materials in an electric arc furnace, followed by casting, rolling and heat treatment to obtain the desired properties.
2. This step can consume a lot of energy and water, which can result in greenhouse gas emissions and air pollutants.

3. Processing and Shaping:

1. Once stainless steel is produced, it is often processed into different forms and finished products, such as sheets, bars, tubes or machined parts.
2. This step may also require energy and water, as well as chemical and mechanical treatment processes, which can generate waste and emissions.

4. Use:

1. Stainless steel is widely used in many industries including construction, automotive, aerospace, home appliances, etc.
2. Stainless steel is valued for its durability, corrosion resistance and recyclability, which can extend its life and reduce its environmental impact compared to other less sustainable materials.

5. End of life:

1. At the end of its useful life, stainless steel can be recycled almost indefinitely without losing its properties. Recycling stainless steel requires less energy than primary production and helps to save natural resources.
2. However, if stainless steel is disposed of inappropriately, it can become a waste that requires special management, although it is less of a concern than other materials containing hazardous substances.

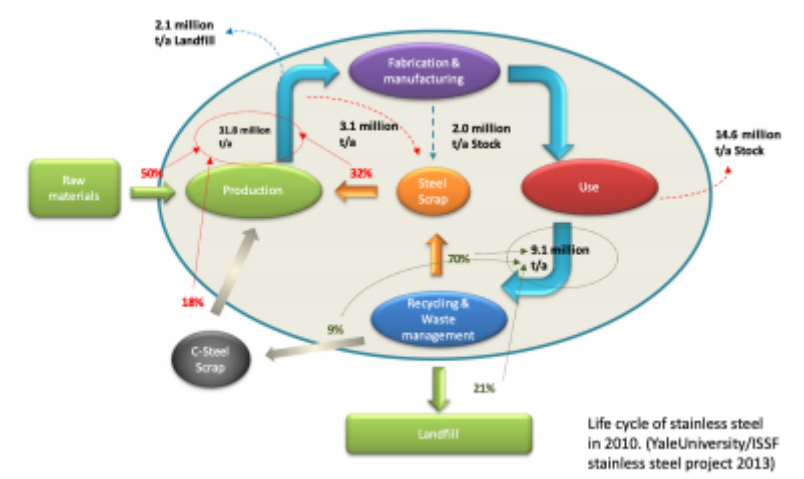

Figure 14: Lifecycle of stainless steel

5.5.4 Life cycle analysis of the box

For the life cycle analysis of the external housing for the projector, we considered the main materials used (stainless steel, plexiglass, aluminum)
1. Extraction of raw materials:

Stainless steel: Stainless steel is mainly composed of iron, chromium and nickel. The raw materials necessary for its manufacture can be extracted locally in Portugal or imported. The extraction of iron ore, chromium and nickel can lead to environmental impacts.
Plexiglass: The raw materials needed to make plexiglass, such as methyl methacrylate, can be derived from petroleum products or natural gas, and are often produced abroad. This can result in greenhouse gas emissions associated with the transportation and processing of raw materials.
Aluminium: Aluminium is mainly extracted from bauxite, which is not a resource available in Portugal. Therefore, the aluminum used in the housing must be imported. Bauxite extraction and aluminum production can have significant environmental impacts, including deforestation, biodiversity loss and water pollution.
2. Manufacture:
The manufacture of stainless steel, plexiglass and aluminium components may require industrial processes such as melting, moulding, rolling and heat treatment. These processes consume energy and can generate greenhouse gas emissions, as well as waste and pollutant releases. It is important

to note that greenhouse gas emissions associated with manufacturing depend largely on the energy mix used in production facilities.
3. Assembly and use:
Once the components are manufactured, they will be assembled to form the external housing of the projector. This process may also require energy and resources. The housing will be used locally in Portugal, which reduces emissions associated with international transport.
4. End of life:
Recycling: At the end of its useful life, the case can be disassembled and recyclable materials such as stainless steel, plexiglass and aluminum can be recovered for reuse in new products. Disposal: Non-recyclable components can be disposed of responsibly in accordance with local environmental regulations.
Regarding the packaging will be composed mainly of recycled cardboard, this will contribute to reduce the overall environmental footprint of the product by promoting the use of recycled and recyclable materials.

5.6 Conclusion

Digital art opens a new era of creativity and expression, but it also appears in a period of environmental awareness. We recognize the importance of a responsible and sustainable approach to our project. Aware of the challenges that shape our society, we have made a commitment to conduct our concept with an environmental and social conscience.
With this in mind, we have integrated effective methods such as life cycle analysis of our product. This approach allowed us to concretely assess the environmental and societal impact of each stage of the life of our product, from its design to its end of life. And to find solutions to minimize our impacts. Among these solutions, we have adopted a sustainable approach. This results in the use of sustainable materials in the design of our product, thus promoting a significant reduction in our ecological impact. In addition, by opting for monomaterial materials, we simplify the recycling process, reinforcing our commitment to the circularity and preservation of natural resources.
In short, our project aspires to be more than just a showcase for digital art. It aims to be a model of excellence in sustainability and social responsibility, embodying the progressive values of our time while contributing significantly to the evolution of the digital art scene. Continuing our reflection in the ethical part, we will address issues related to equity, diversity and inclusiveness in our approach to digital art.

6. Ethical and Deontological Concerns

6.1 Introduction

Deontology comes from the Greek and translates roughly as “the study or science of duty”. It is part of ethics and includes duties that people have to fulfil towards others. From a deontological perspective, there are actions that are morally right or wrong. Deontology does not judge actions by their consequences but follows moral rules and standards **[openstax, 2024]**.

6.2 Engineering Ethics

Engineers have a major impact on the lives of all people and the environment. They develop systems

and products in all areas: Medicine, bridges, electronics, buildings, machinery. Engineers have a responsibility to ensure that everything they design is safe for everyone who uses it. In addition, they must pay attention to sustainability in their design in order to act ethically in relation to the environment. To fulfill all this, there are guidelines developed by the NSPE that we will refer to in this project. These guidelines are used by many companies, which is why we have decided to work according to them.
The code of ethics developed by the NSPE is divided into fundamental canons, rules of practice and professional obligations. Engineers have to fulfil professional duties. The most important duty is to ensure the health, safety, and welfare of the public. As an engineer they should only work in their field of expertise. It is important to be honest and truthful. In situations where their judgement is overridden, posing a risk to life or property, engineers must notify their employer, client, and relevant authorities. They should never disclose information without the permission of the client or employer. Besides that they shall do everything by the highest standards. Engineers shall not be influenced by conflicting interests but rather they should act objectively and refrain from making uncertain statements. In addition, they should want to serve the public well. There are many duties engineers have to fulfil and this entails a lot of responsibility for everybody **[NSPE, 2019]**.

6.3 Sales and Marketing Ethics

In the business domain ethics constitute the fundamental foundation. This is particularly pronounced in the realms of marketing and sales, where ethical principles are not only favorable but indispensable for enduring success. In an era marked by heightened consumer consciousness and social awareness, companies that prioritize ethical conduct in their marketing and sales strategies stand to gain not only short-term profits but also enduring customer loyalty and positive reputation in the long run.
Marketing ethics is an important component of contemporary business because it determines how a company executes its marketing strategies and how it interacts with customers, employees, and other stakeholders in terms of honesty, fairness, transparency, and responsibility **[studysmarter,]**.
Honest companies use marketing communications to provide factual and unexaggerated information about their products and services. They also advertise without attempting to mislead. Additionally, marketing ethics included to make fair prices, better wages and sustainable development. Companies have to be transparent to the public about the production of their products and their way treating the employees and also the sustainability and environmental impact of their products and services **[Masterclass, 2022]**.

6.4 Environmental Ethics

Environmental ethics are a philosophical discipline that examines the intricate relationship between humanity and the natural world. It offers a comprehensive perspective on our ethical responsibilities towards safeguarding and conserving the environment. This field aims to reconcile the interests of both humans and nature, recognizing their interdependence and inherent worth. Drawing from various ethical frameworks such as consequentialism, utilitarianism, and virtue ethics, environmental ethics provides a theoretical foundation for understanding our moral duties towards the environment and guiding our actions accordingly. Additionally, it incorporates insights from philosophy, economics, ecology, and law, offering a multidisciplinary approach to assessing the ethical dimensions of human conduct in relation to nature.
Environmental Ethics are very important to protect the environment, species and resources. Humans depend on nature and natural systems. So they are responsible for their action and decisions and their consequences for the environment **[Geeksforgeeks, 2023]**.

Environmental ethics remind us of our duty to care for the planet and its biodiversity. They urge us to recognize our dependence on nature and advocate for sustainable practices. Despite our dominance, we must responsibly steward the environment. Through ethical considerations, we can address environmental imbalances and promote harmonious coexistence with all elements of nature **[Conserve Energy Future,]**.

6.5 Liability

ArtSy(nc) is committed to ensuring that the content shared on our platform aligns with ethical guidelines and legal requirements. We have implemented a section for copyright compliance and to prevent the upload of inappropriate material. Additionally, we provide users with tools to report any content that may violate our policies, enabling us to take quick action when necessary. This involves not only safeguarding against unauthorized reproduction or distribution of copyrighted material but also considering the ethical implications of derivative works within the art community.
Protecting user privacy and data is important to ArtSy(nc). Data protection regulations are followed, such as the General Data Protection Regulation (GDPR). Practices are clearly communicated with users regarding data collection and usage. ArtSy(nc) acknowledges its responsibilities to users, stakeholders, and the wider community. Transparency is prioritized in the operations, maintaining open lines of communication with users, and upholding principles of accountability and trustworthiness.
Furthermore, clear guidelines for acceptable behavior must be defined, addressing instances of harassment or discrimination, and providing channels for users to report violations or seek support. By prioritizing user safety and accountability, ArtSy(nc) can cultivate a welcoming environment where creativity can be explored without fear.
ArtSy(nc) is committed to managing liability in ethical and deontological concerns through responsible content moderation, privacy protection, and compliance to ethical principles. By maintaining a professional and ethical framework, we aim to provide a safe and respectful environment for artistic engagement and expression.

6.6 Conclusion

Provide here the conclusions of this chapter and introduce the next chapter. Based on this ethical and deontological analysis, the team chose *<specify here the design, technique(s) material(s), component(s)>* for the following ethical reasons...

7. Project Development

7.1 Introduction

Provide here the summary of this chapter.

7.2 Ideation

7.2.1 Choice of subject

After the amphitheater presentation, we quickly got together to discuss the project proposals, conscious of the need to reach a consensus quickly. Our approach was to examine each topic individually and conduct an express brainstorming session to explore the first ideas that came to mind. We also assessed how the skills and knowledge of each group member could be brought to bear on each topic. Surprisingly, all group members quickly rallied around our first choice of topic: digital art. This unanimous decision was taken after carefully examining each proposal and determining that digital art aroused the most interest and passion among us.

7.2.2 Brainstorming

After selecting our topic, digital art, we held our first brainstorming session. Since our topic is vast and offers many possibilities, many ideas emerged naturally. To make it easier to capture and organize these ideas, we used Miro, as shown in the image below, to record all our ideas. This enabled us to efficiently track our thoughts and develop a solid set of concepts and proposals for our digital art project.

Figure 15: Impact-Effort

7.2.3 Design Thinking

Evaluating each idea with positive and negative points

- **competition:** some people could see a competition as not being able to fully express themselves, it can also generate a possible revenue stream though, more visibility, more inspiration, a challenge to implement your skills as an artist.
- **projector/ public spaces:** the lights can be nuisance, on the contrary it can also bring more life and beauty to the city, creates more awareness for digital art and artists, adding creativity

to people and their daily life.

- **advertisements:** more publicity for public spaces and curators, revenue stream, information about the local art scene, finding the balance between ads and displaying art.
- **Swiping art:** the swipe system can come across as unpersonal but it helps with diversifying your taste, a posibility to see more art in a short amount of time, it helps lowering the bar for competing and opening the door for small artist to participate.

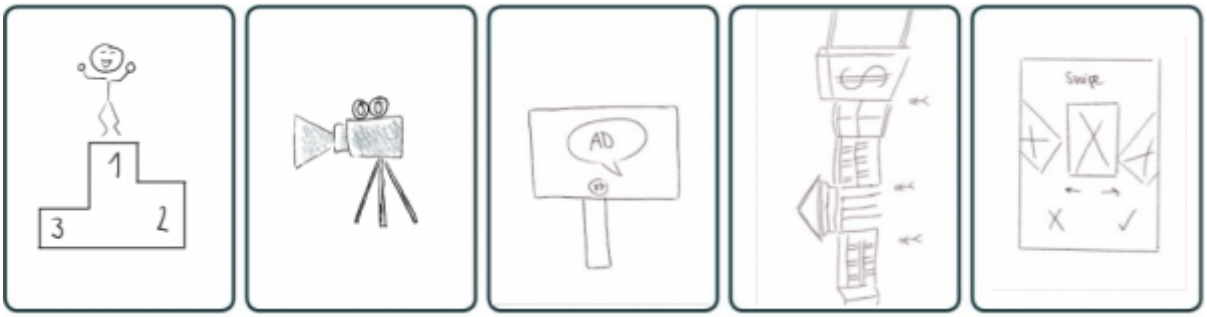

Figure 16: User-Needs

7.2.4 The Idea

After in-depth discussions and intensive research, we came up with our main idea: “Our aim is to raise awareness of digital art by introducing an innovative application. This platform will serve as a showcase for local artists, offering them an opportunity to share their creations and gain visibility. At the same time, it will offer museum directors and managers of public spaces the possibility of selecting works for projection, thus renewing the cultural offering and attracting a more diverse audience, while modernizing their establishments. What's more, we'll be offering a complete rental package including a protective box for the projector and a quality projector, guaranteeing simple and secure installation for an unforgettable immersive art experience.”
This global vision combines technological innovation, the promotion of local creativity and the modernization of the cultural experience, with the ultimate aim of enriching the artistic and cultural landscape of our communities.

7.3 Concept

Logo Design ArtSy(nc) is connecting public spaces with artists, so synchronizing them. The name also includes the word “artsy”, which stands for creativeness and showing artistic talent. The logo of ArtSy(nc) incorporate a sync illustration and displays it by using two paint brushes. Since we are really passionate about art, we included a little flame as the top of the paint brush to showcase this excitement and also liked orange as a popping color for the logo. We want our logo to be simple and easily visible on our final solution. It should be easily recognized and we also want to include it into possible exhibitions and put it onto the packaging design.

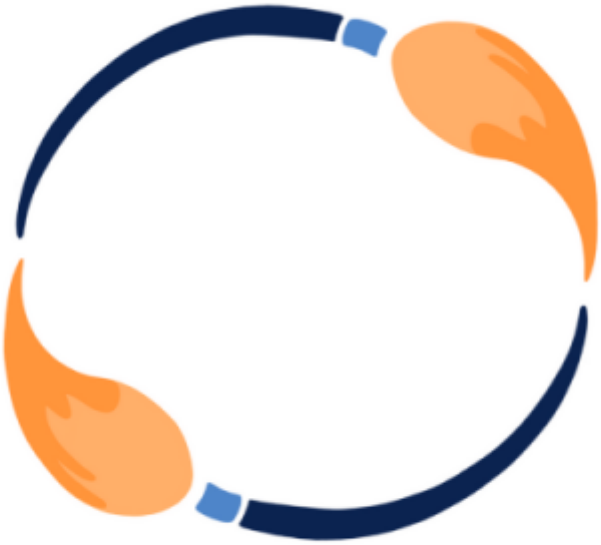

Figure 17: Logo

Color Palette The color palette for ArtSy(nc) embodies a harmonious blend of professionalism, creativity, and energy. Deep navy blue (#11224D) signifies stability and trustworthiness, reflecting the platform's commitment to providing a solid foundation for artistic expression. Royal blue (#193A6F) and cerulean blue (#5B84C4) are connected with sophistication and clarity, highlighting ArtSy(nc)'s vibrant community engagement. Warm apricot (#FFB375) and dynamic orange (#FB9B50) infuse the palette with creativity and excitement, inviting users to explore and engage with the platform's innovative features. Finally, light taupe (#EBD8C5) provides a neutral backdrop, grounding the palette and giving a taste of the timeless elegance to ArtSy(nc)'s visual identity.

Figure 18: color palatte

LoFi Wireframes Furthermore, the concept is further defined through LoFi wireframes, which give an idea of the components and features of our app. We started with simple sketches to visualize our ideas, which will later on lead to an improved HiFi prototype. The wireframes were made using Figma, a digital design tool. These sketches show the basic layout and where things go in our app, like buttons and menus. They help us see how the app will work without worrying about details.

Figure 19: Onboarding

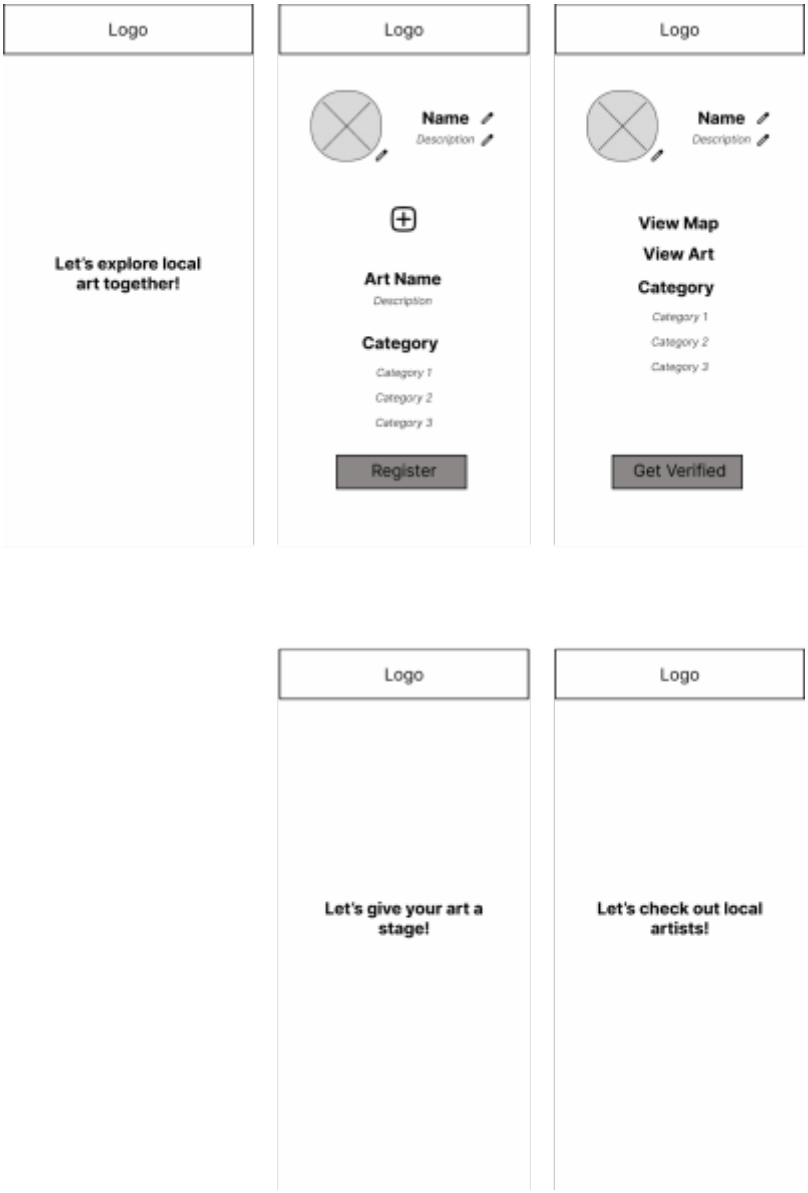

Figure 20: Register/ Login

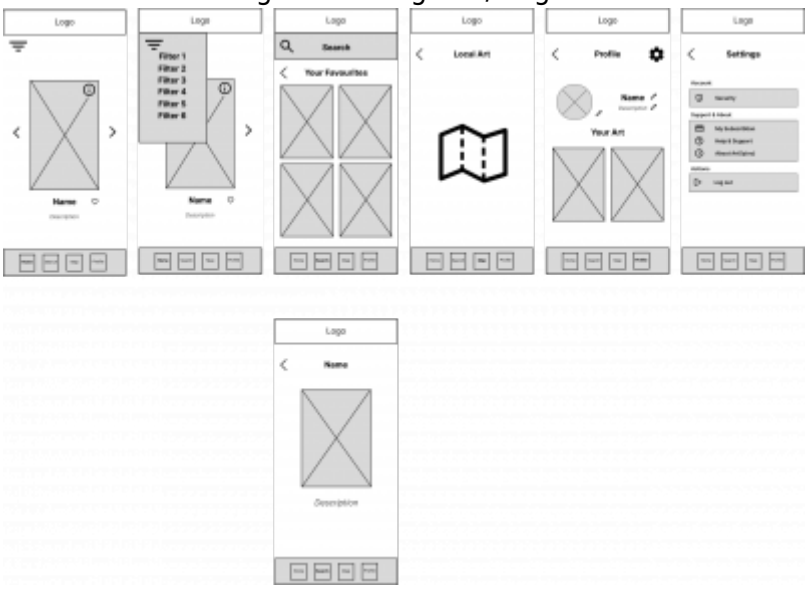

Figure 21: Mainpages

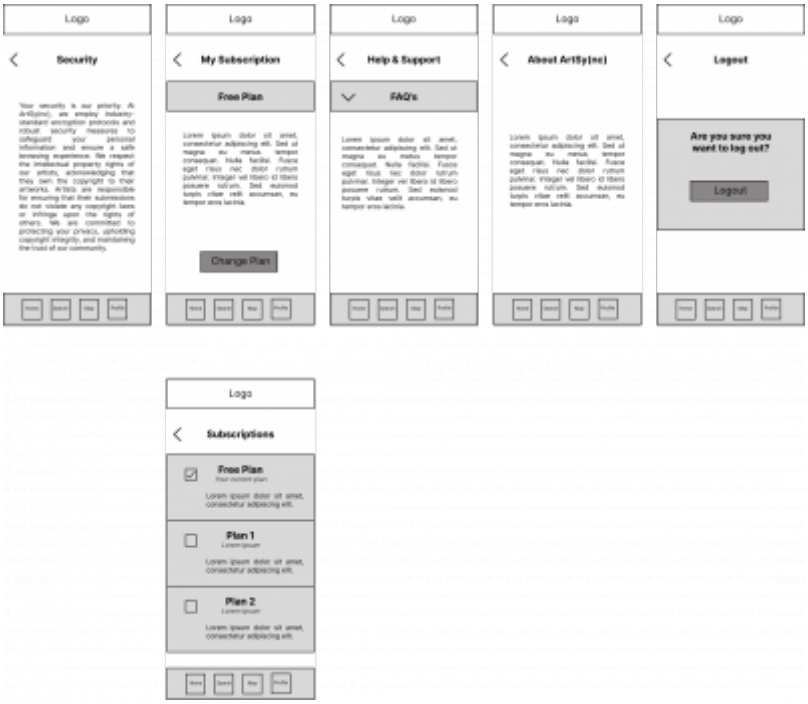

Figure 22: Mainpages

7.3.1 Outdoor spotlight housing

Our project aims to create an outdoor projector housing for rental by public venue owners wishing to present digital art. This housing will offer protection against weather and damage, ensure optimal projector operating conditions, enable versatile use and guarantee projector safety. In short, our concept will provide a turnkey solution for the projection of digital art outdoors, facilitating the creation of immersive artistic experiences in a variety of public spaces.

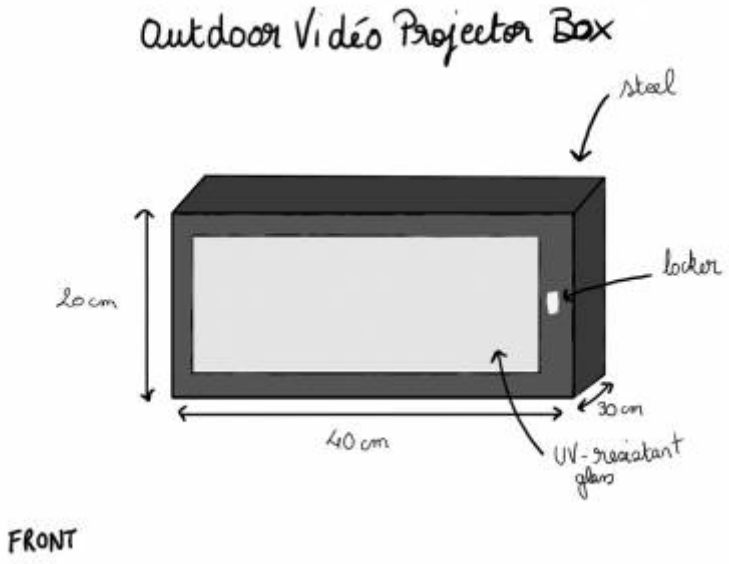

Figure 23: Box Drawing Front

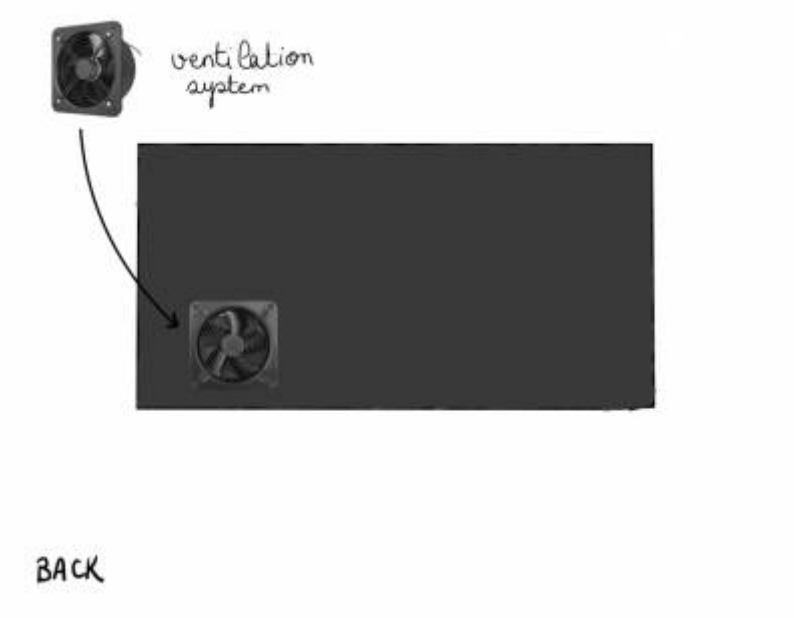

Figure 24: Box Drawing Back

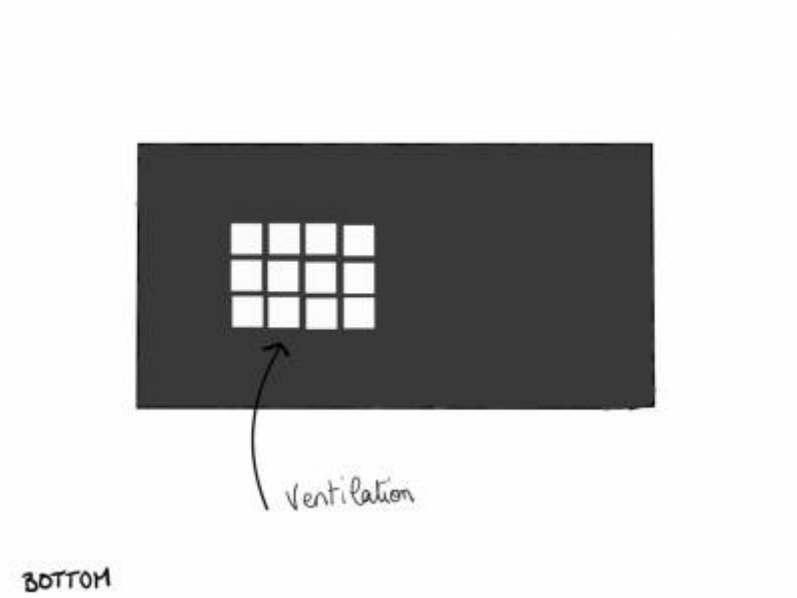

Figure 25: Box Drawing Bottom

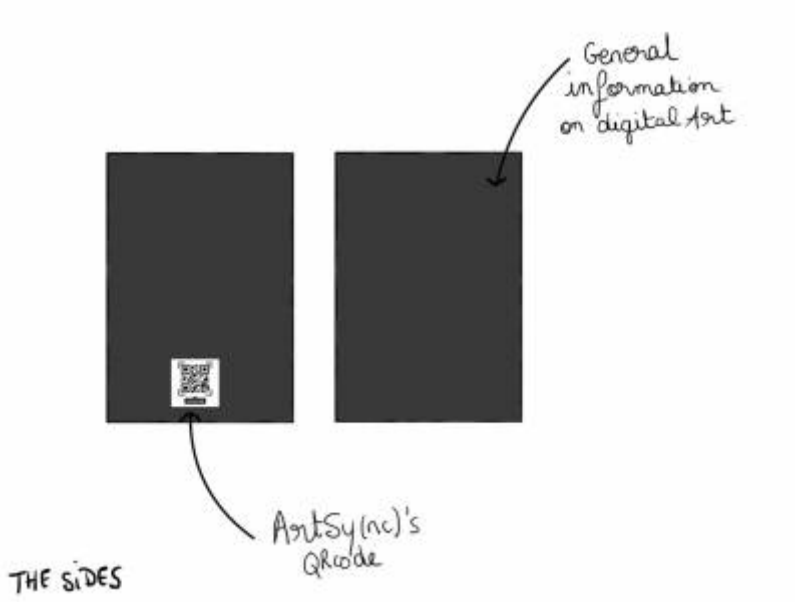

Figure 26: Box Drawing The Sides

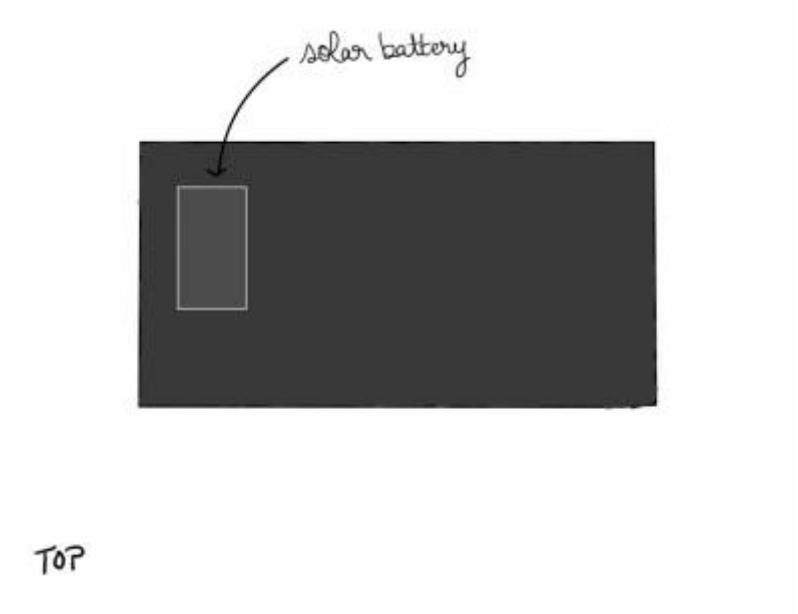

Figure 27: Box Drawing Top

We improved our box according to technical parts. Now the box is divided into three parts. In the lowest part of the box is the cable management. Additionally, there must be some space to create a good airflow. That’s why we use to fans, one on the left on the bottom to get cold air from outside and one on the right side to get the warm air out of the box. Our panels also have wholes for an easy airflow. The door is now on the back. The lower panel is like a lawer so you can pull it out and can use the laptop while showing art.

Figure 28: Improved Box Drawing

7.4 Design

7.4.1 Structure

Add and explain thoroughly the: (*i*) initial structural drafts;

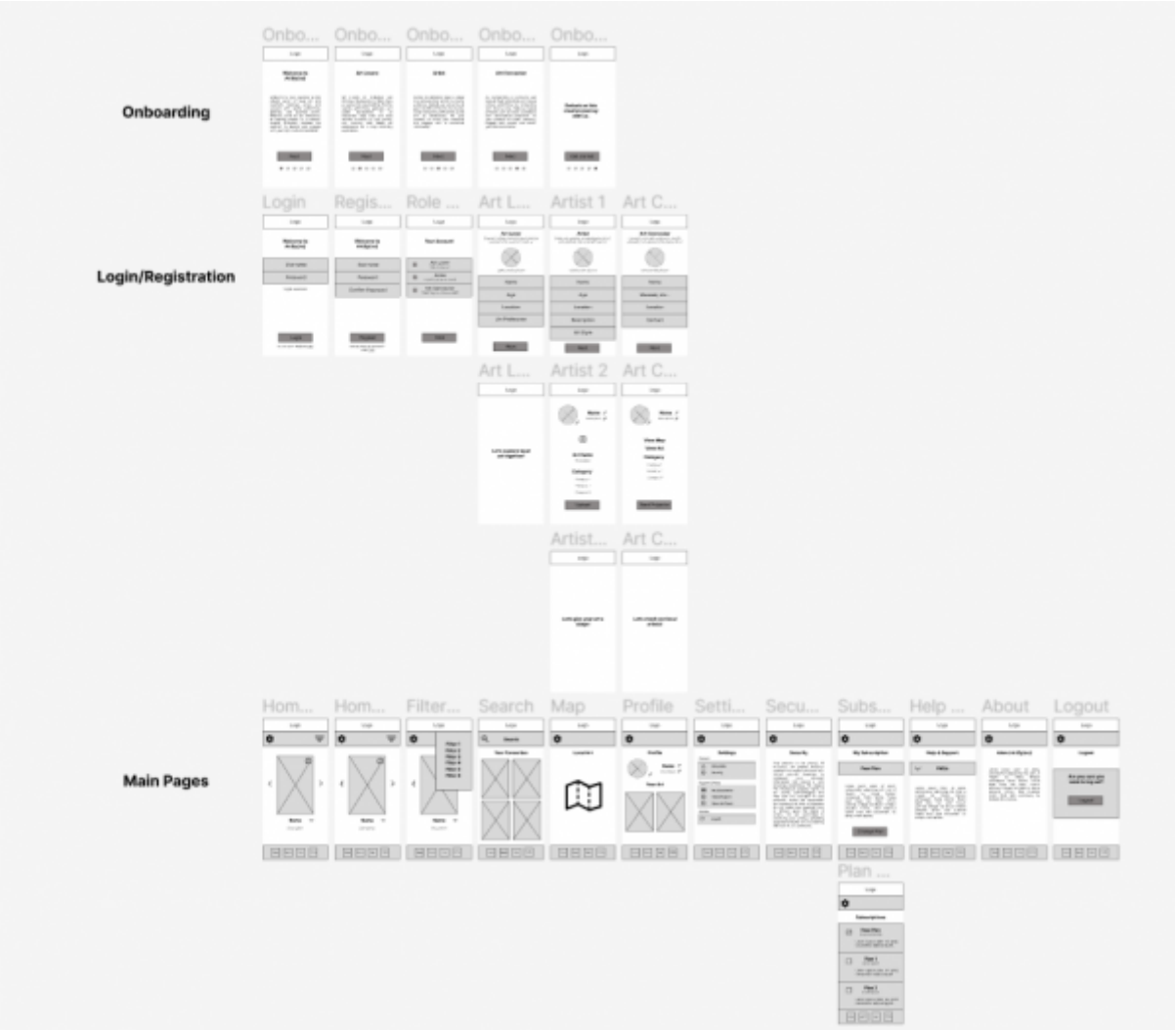

Figure 29: LoFi Wireframes

(*ii*) material selection; (*iii*) detailed drawings; (*iv*) 3D model with load and stress analysis; (*v*) colour palette.

7.4.2 Smart System

7.4.2.1 Hardware

Include and explain in detail the: (*i*) black box diagram; (*ii*) hardware component selection (use tables to compare the different options for each component; (*iii*) detailed schematics; (*iv*) power budget. The black box diagram (Refer to Figure 30), gives a schematic overview of the inputs and outputs of the hardware and software system that will be used in the construction of the product.

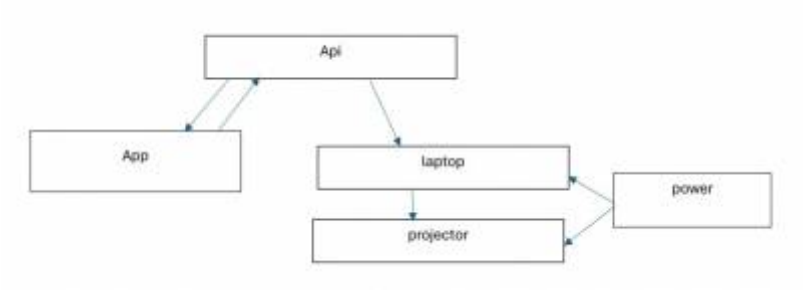

Figure 30: Black box Diagram

7.4.2.2 Software

Describe in detail the: (*i*) use cases or user stories for the smart device and app; (*ii*) selection of development platforms and software components (use tables to compare the different options); (*iii*) component diagram.

Table 25: User Stories

As A(n)	I Want	So That
Artist	A way to upload art	It can be displayed by a Museum
Exhibitor	A way to show the art	I can get more integration with local artists
Artist	A way to register an artist account	I have the right credentials to upload art
Admin	To register a projector	I can link a public space to a projector
Exhibitor	A rental agreement	The details of the lease are clear
Exhibitor	A quick way to check the classical art on the platform	I can see if I'm interested

The architecture of the webservice system, depicted in Figure 31, is supported by a variety of design technologies. For an in-depth analysis of the comparative features and capabilities of different design technologies utilized within the system, please refer to the comprehensive comparison tables provided below **[23]**. Additionally, the database design is illustrated in Figure 32.":

1. **Frontend Design Technologies**: Table 26
2. **App Design Technologies**: Table 27
3. **Backend Design Technologies**: Table 28
4. **Backend Database Technologies**: Table 29

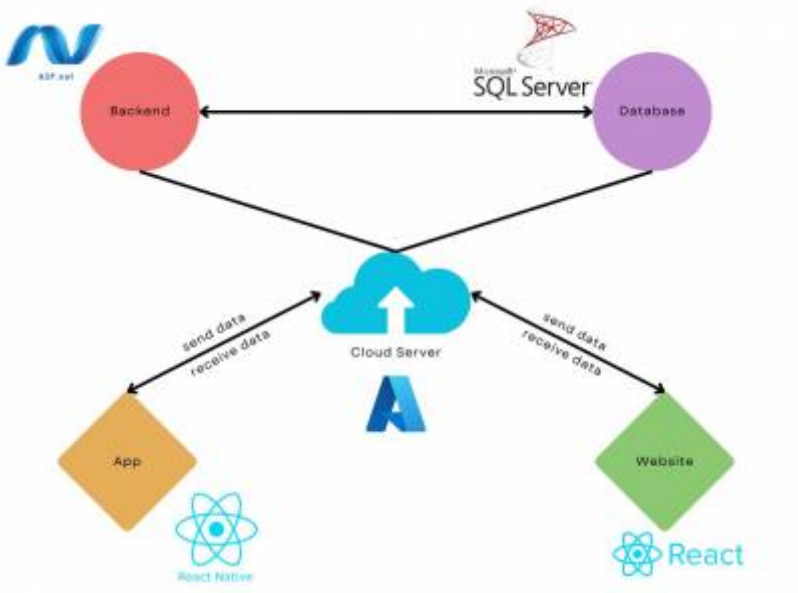

Figure 31: Webservice system

Table 26: Frontend framework and design technologies comparison

Technology	Language	Performance	Ease of use	Community support	Cost	UX
AJAX	JavaScript, HTML, CSS, XML	Can be fast and efficient for basic data retrieval, but can become slow with larger datasets and complex queries	Relatively easy to use for basic tasks, but may require more advanced skills for complex interactions and optimization	Large and active community support, with many resources available online	Free and open source, with no additional costs	Can provide a good user experience, but may require additional effort for complex interactions and data manipulation
React	JavaScript, HTML	Very strong performance and scalability, optimized for complex applications with large datasets	Can be complex and difficult to use for beginners, but offers advanced features and customization options	Large and active community support, with many resources available online	Free and open source, with no additional costs	Can provide a highly interactive and dynamic user experience, but may require more development time and effort
Angular	TypeScript, JavaScript	Fast and efficient, with a virtual DOM for optimized rendering	Relatively easy to use for basic tasks, but may require more advanced skills for complex interactions and optimization	Large and active community support, with many resources available online	Free and open source, with no additional costs	Can provide a highly responsive and interactive user experience, with a focus on component-based architecture

Technology	Language	Performance	Ease of use	Community support	Cost	UX
VueJS	JavaScript,HTML,CSS	Very fast and efficient, with a virtual DOM for optimized rendering	Easy to use, with a simple and intuitive syntax and structure	Large and active community support, with many resources available online	Free and open source, with no additional costs	Can provide a highly interactive and dynamic user experience, with a focus on simplicity and flexibility
Bootstrap	CSS	Fast and efficient, optimized for mobile and responsive design	Very easy to use, with a user-friendly interface and streamlined development process	Large and active community support, with many resources available online	Free and open source, with no additional costs	Can provide a good user experience, with a focus on design consistency and flexibility

Table 27: App development languages and frameworks comparison

Technology	Language	Performance	Ease of use	Community Support	Cost	Cross-platform Development	UX
React Native	JavaScript	Offers native performance on mobile devices, comparable to native development	Can be complex due to its bridge architecture, but provides extensive documentation and community resources	Large and active community support from both React and mobile development communities	Free and open source, with no additional costs	Yes, allows for development of iOS and Android apps with a single codebase	Can provide a highly interactive and dynamic user experience, with access to native device features
Flutter	Dart	Very fast and efficient, with performance comparable to native apps	Provides a simple and intuitive framework with a declarative UI approach	Large and growing community support from Google and the developer community	Free and open source, with no additional costs	Yes, allows for development of iOS and Android apps with a single codebase	Offers customizable and smooth UI experience, with a focus on Material Design principles
Xamarin	C#, .NET	Offers native-like performance and access to native APIs	Familiar for developers with C# and .NET experience, but may have a learning curve for others	Large community support from Microsoft and .NET developers	Free and open source, with options for enterprise licensing	Yes, allows for development of iOS and Android apps with shared C# code	Provides a native-like user experience with access to platform-specific APIs and UI components
NativeScript	JavaScript, TypeScript	Offers native performance with direct access to native APIs	Easy to use for web developers familiar with JavaScript or TypeScript	Active community support from Progress and JavaScript communities	Free and open source, with enterprise licensing options	Yes, allows for development of iOS and Android apps with shared code	Provides a truly native user experience with direct access to native APIs and UI components

Technology	Language	Performance	Ease of use	Community Support	Cost	Cross-platform Development	UX
Kotlin	Kotlin	Offers high performance and compatibility with Java ecosystem	Easy to learn for developers with Java experience, with modern language features	Growing community support from Kotlin and Android developer communities	Free and open source, with no additional costs	Yes, allows for development of Android apps, with interoperability with Java	Provides a modern and concise syntax for improved developer productivity and maintainability
Swift	Swift	Offers high performance and compatibility with Apple's ecosystem	Designed to be easy to learn and use, with modern language features	Large and active community support from Apple and Swift developer communities	Free and open source, with no additional costs	Primarily for iOS and macOS development, with limited cross-platform capabilities	Provides a highly interactive and native user experience tailored for iOS and macOS devices

Table 28: Backend framework comparison

Name	Language	Performance	Ease of use	Scalability	Flexibility	Cost	Security	Compatibility	Community Support
Django	Python	Fast and efficient, optimized for high-level abstraction and rapid development	Easy to use with a user-friendly interface and robust documentation	Can scale horizontally and vertically with built-in support for caching, load balancing, and clustering	Flexible, with support for many libraries and frameworks	Free and open source, with no additional costs	Strong security features, including automatic protection against common vulnerabilities	Compatible with many programming languages and platforms, with a focus on Python	Large and active community support, with many resources available online
Flask	Python	Fast and efficient, optimized for small to medium-sized applications and microservices	Easy to use with a simple and intuitive syntax and structure	Can scale horizontally and vertically with support for extensions and plugins	Highly flexible, with support for many libraries and frameworks	Free and open source, with no additional costs	Strong security features, including protection against common vulnerabilities	Compatible with many programming languages and platforms, with a focus on Python	Active and growing community support, with many resources available online
Express	Node.js, JavaScript	Fast and efficient, optimized for Node.js applications and microservices	Easy to use with a simple and intuitive syntax and structure	Can scale horizontally and vertically with support for middleware and plugins	Highly flexible, with support for many libraries and frameworks	Free and open source, with no additional costs	Strong security features, including protection against common vulnerabilities	Compatible with many programming languages and platforms, with a focus on JavaScript	Large and active community support, with many resources available online
.NET Identity	C#, .NET	Offers robust authentication and identity management features with high performance	Well-integrated with the .NET ecosystem and provides extensive documentation	Scales effectively for large-scale applications with support for distributed architecture	Provides flexibility through customization and integration with other .NET components	Free and part of the .NET ecosystem	Provides comprehensive security features, including protection against common security threats	Compatible with the .NET ecosystem and integrates seamlessly with other .NET components	Strong community support within the .NET development community and Microsoft resources available online

Name	Language	Performance	Ease of use	Scalability	Flexibility	Cost	Security	Compatibility	Community Support
Laravel	PHP	Provides efficient performance with features optimized for PHP development	Offers a well-structured and intuitive framework with comprehensive documentation	Scales efficiently for projects of various sizes with support for caching and queuing systems	Offers high flexibility through a modular architecture and extensive ecosystem of packages	Free and open-source, with optional premium features available through Laravel Forge	Implements robust security measures including protection against common web vulnerabilities	Compatible with PHP-based applications and integrates seamlessly with other PHP frameworks	Large and active community support within the PHP development community, with extensive online resources

Table 29: Database comparison

Name	Type	Performance	Ease of use	Scalability	Flexibility	Cost	Security	Compatibility	Community Support
MySQL	SQL	Fast and efficient, optimized for relational databases	Relatively easy to use for basic tasks, but can be complex for advanced features	Can scale horizontally with sharding, but limited vertical scalability	Good for structured data, but limited flexibility for unstructured data	Open source with community and enterprise editions available, can be costly for large-scale use	Strong security features, but may require additional configuration for optimal protection	Compatible with many programming languages and platforms	Large and active community support
MariaDB	SQL	Similar performance to MySQL, with added features and optimizations	Easy to use with similar syntax and structure to MySQL	Can scale horizontally with sharding, but limited vertical scalability	Good for structured data, but limited flexibility for unstructured data	Open source with community and enterprise editions available, can be costly for large-scale use	Strong security features, but may require additional configuration for optimal protection	Compatible with many programming languages and platforms, with additional features and optimizations over MySQL	Large and active community support
PostgreSQL	SQL	Very strong performance and scalability, optimized for complex queries and large datasets	Can be complex and difficult to use for beginners, but offers advanced features and customization options	Can scale horizontally and vertically, with support for clustering and replication	Very flexible, supports both structured and unstructured data	Open source with enterprise support available, can be costly for large-scale use	Very strong security features, with options for encryption and advanced access control	Compatible with many programming languages and platforms	Large and active community support
SQL Server	SQL	High performance and scalability, particularly optimized for Windows environments	Integrates seamlessly with ASP.NET Identity, providing built-in support for authentication and authorization	Can scale horizontally and vertically, with options for clustering and replication	Offers flexibility and extensive features for managing structured data	Proprietary software with various licensing options, including free Express edition and enterprise editions	Provides robust security features, including encryption, auditing, and access control	Compatible with .NET ecosystem, primarily used in Windows environments	Supported by a large community and Microsoft resources

Name	Type	Performance	Ease of use	Scalability	Flexibility	Cost	Security	Compatibility	Community Support
MongoDB	NoSQL	Very fast and efficient for unstructured data, optimized for horizontal scalability	Easy to use for basic tasks, but may require more advanced skills for complex queries and optimization	Can scale horizontally with sharding, but limited vertical scalability	Very flexible, supports unstructured and semi-structured data	Open source with enterprise editions available, can be costly for large-scale use	Strong security features, but may require additional configuration for optimal protection	Compatible with many programming languages and platforms	Large and active community support
Firebase	NoSQL	Fast and efficient, optimized for real-time data synchronization and mobile applications	Very easy to use, with a user-friendly interface and streamlined development process	Can scale horizontally and vertically with cloud functions and real-time database	Flexible, supports both structured and unstructured data	Free for basic usage, with pricing plans available for larger scale use	Strong security features, with automatic SSL encryption and access control	Compatible with many programming languages and platforms, with added features for mobile development	Large and active community support, with a focus on mobile development

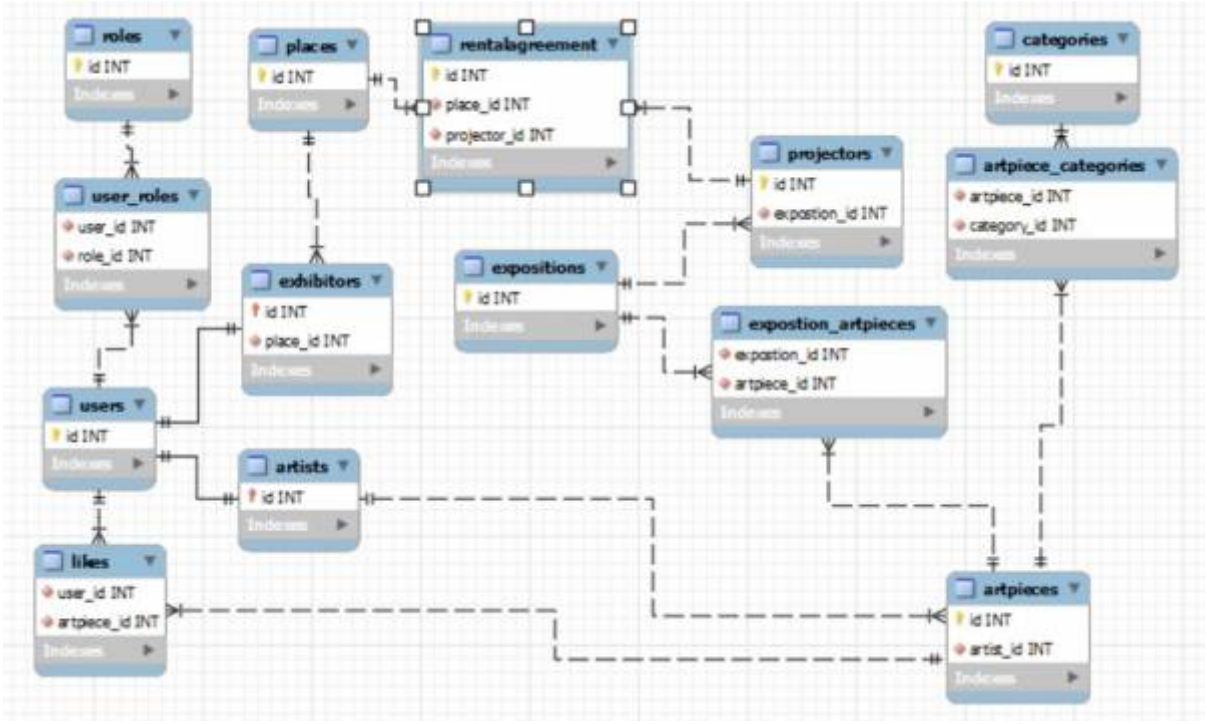

Figure 32: Database Design

7.4.3 Packaging

Present and explain the: (*i*) initial packaging drafts; (*ii*) detailed drawings; (*iii*) 3D model with load and stress analysis, if applicable.

7.5 Prototype

Refer main changes in relation to the designed solution.

7.5.1 Structure

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

7.5.2 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.

7.5.3 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.

7.5.4 Tests & Results

7.5.4.1 Hardware tests

Perform the hardware tests specified in **1.6 Functional Tests**. These results are usually presented in the form of tables with two columns: Functionality and Test Result (Pass/Fail).

7.5.4.2 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.

7.6 Conclusion

Provide here the conclusions of this chapter and introduce the next chapter.

8. Conclusions

8.1 Discussion

Provide here what was achieved (related with the initial objectives) and what is missing (related with the initial objectives) of the project.

8.2 Future Development

Provide here your recommendations for future work.

9. Bibliography

Will be added automatically by citing, in the body of the report, entries specified in BibTeX format and stored in the https://www.eps.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.*

[adobe,] adobe. *What is digital art?.* [Accessed in March 2024].
[ART TERM,] ART TERM. *Digital Art?.* [Accessed in March 2024].
[Gabs Art Tips,] Gabs Art Tips. *The Advantages of Digital Art.* [Accessed in March 2024].
[H. M. & Krcmar Schreieck A. Hein, 2021] H. M. & Krcmar Schreieck A. Hein, 2021. *Wirtschaftsinformatik & Management 13.* Berlin, Germany: Springer, ISBN s35764-021-00329-8.
[Bundesministerium für Wirtschaft und Klimaschutz, 2024] Bundesministerium für Wirtschaft und Klimaschutz, 2024. *Digital platforms.* [Accessed in March 2024].
[saferspaces, 2014] saferspaces, 2014. *Public spaces: More than ´just a space´.* [Accessed in March 2024].
[visunext, 2022] visunext, 2022. *Indoor and outdoor projections: How many lumens are needed?.* [Accessed in March 2024].
[Heimkinoraum, 2023] Heimkinoraum, 2023. *How does a projector work - What is LCD, DLP, LCoS, SXRD?.* [Accessed in March 2024].
[Tucci, Stedman, 2023] Tucci, Stedman, 2023. *What is risk management and why is it important?.* [Accessed in April 2024].
[International Organization for Standardization, 2010] International Organization for Standardization, 2010. *Guidance on docial responsibility.* [Accessed in April 2024].
[Institute Project Management, 2022] Institute Project Management, 2022. *Stakeholder Analysis Process.* [Accessed in April 2024].
[Straits Research, 2020] Straits Research, 2020. *Art Market.* [Accessed in March 2024].
[Coherent Market Insights, 2024] Coherent Market Insights, 2024. *DIGITAL ARTWORK MARKET SIZE AND SHARE ANALYSIS - GROWTH TRENDS AND FORECASTS (2023 - 2030).* [Accessed in March 2024].
[Coherent Market Insights, 2024] Coherent Market Insights, 2024. *DIGITAL ARTWORK MARKET SIZE AND SHARE ANALYSIS - GROWTH TRENDS AND FORECASTS (2023 - 2030).* [Accessed in March 2024].
[Coherent Market Insights, 2024] Coherent Market Insights, 2024. *DIGITAL ARTWORK MARKET SIZE AND SHARE ANALYSIS - GROWTH TRENDS AND FORECASTS (2023 - 2030).* [Accessed in March 2024].
[Alexandra Twin, 2024] Alexandra Twin, 2024. *4 Ps of Marketing: What They Are & How to Use Them Successfully.* [Accessed in March 2024].
[openstax, 2024] openstax, 2024. *Deontology.* [Accessed in March 2024].
[NSPE, 2019] NSPE, 2019. *NSPE Code of Ethics for Engineers.* [Accessed in March 2024].
[studysmarter,] studysmarter. *Marketingehtics.* [Accessed in March 2024].
[Masterclass, 2022] Masterclass, 2022. *Ethical Marketing Explained: 4 Principles of Ethical Marketing.* [Accessed in April 2024].

[Geeksforgeeks, 2023] Geeksforgeeks, 2023. *Environmental Ethics: Types, Importance, Examples.* [Accessed in April 2024].
[Conserve Energy Future,] Conserve Energy Future. *What are Environmental Ethics? Types and Principles.* [Accessed in April 2024].
[23] Jan Lennard Hinzpeter, Astrid Prończuk Prończuk, Julie Smeets, Clément Mertz-Revol, Mario Konstanty Kochan Chmielik