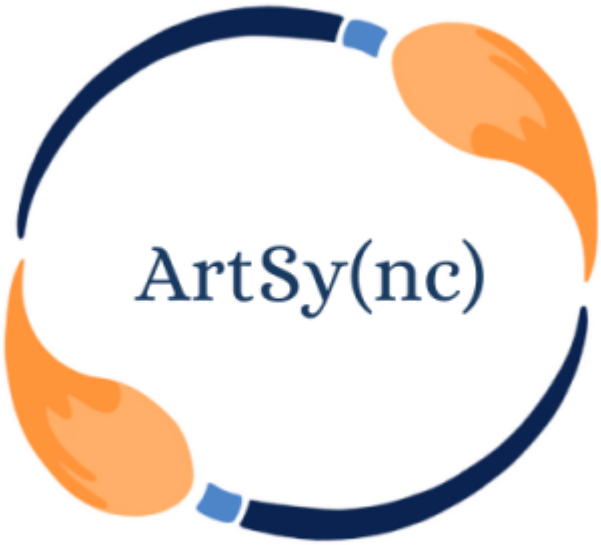
Report



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Acknowledgement

Glossary

Table 1: Glossary

Abbreviation	Description
EPS	European Project Semester
ISEP	Instituto Superior de Engenharia do Porto
EL	Elise Lesage-Baur
JH	Julia Hechtl
JN	Jule Nähring
LL	Lucas László
LO	Leevi Oksanen

Abbreviation	Description
SV	Siebe Van de Voorde
DLP	Digital Light Processing
LCD	Liquid Crystal Display
LCOS	Liquid Crystal on Silicon
ANSI	American National Standards Institute
IOS	The International Organization for Standardization
NSPE	National Society of Professional Engineers
HD	High Definition
4K	Resolution with approximately 4000 pixels horizontally
USB	Universal Serial Bus
SWOT	Strengths Weaknesses Opportunities Threats
AI	Artificial Intelligence
ISO	The International Organization for Standardization
PESTEL	Political Economic Social Technological Environmental Legal
3D	3 Dimensions
2D	2 Dimensions
Ar	Augmented reality
Vr	Virtual reality
WBS	Work Breakdown Structure
LED	Light Emitting Diode
NFT	Non-fungible token
CAGR	Compound Annual Growth Rate
LCA	Life Cycle Analysis
LoFi	Low Fidelity
HiFi	High Fidelity

1. Introduction

Our team, Team 3, embarked on the ArtSy(nc) project with the ambition of radically transforming the world of digital art. ArtSy(nc) embodies an innovative platform designed to bridge the gap between digital artists, art enthusiasts and public space managers, providing a vibrant space for creativity, engagement and appreciation.

In this first chapter, we will explore various aspects of the ArtSy(nc) project, including the composition of our team, motivations, problem statement, objectives, requirements. Our approach aims to provide insights into the vision, objectives and implementation strategies of our project.

Our report begins with a presentation of our team, each of whom brings unique skills, backgrounds and motivations to the project. We then delve into the personal motivations behind our participation in the European Semester Project (EPS) and our specific choice of the ArtSy(nc) project.

Understanding these individual motivations provides an essential insight into our shared aspirations and goals.

We will then address the problem statement, highlighting the challenges digital artists face in presenting their work to a wider audience, as well as the logistical obstacles associated with displaying digital art in public spaces. Through ArtSy(nc), we aim to address these challenges by developing a platform that allows artists to share their creations and facilitates the selection of works for public display.

In summary, this report provides an overview of the ArtSy(nc) project, highlighting our team's motivations, objectives, approach and progress toward our vision of shining a light on the digital art world. We invite you to join us in this adventure and in reading this report.

1.1 Presentation

Table 2: Team

Name	Field of 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 broaden my personal horizon and learn more about other cultures and their way of working. Moreover, I want to improve my English skills and make 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 attractive to me. It is inspiring to learn from each other and to broaden my horizons. 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

international environment and on the topic of innovation. Also, I think Porto is a nice city with a lot to offer, culturally wise and surfing-wise. The combination of working on a 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 the skills of every group member. I also love local artists in the city and think it is a great opportunity to give them a chance to show their art and can be seen.
- **Julia:** I love consuming and creating art. I get 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 (user experience 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 my love of museums and art. Especially when it comes to digital art, I believe it is a broad topic that has a lot to offer. Also, the city of Porto has a lot of urban street art and my mind was firing ideas about 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.

Technology plays an important role here, as well as 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 ArtSy(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 the necessary technology to ensure that the art can be displayed properly.

1.4 Objectives

In the realm of contemporary art, the digital medium has emerged as a dynamic frontier, offering artists unprecedented avenues for expression and engagement. In response to this evolving landscape, ArtSy(nc) was born, an innovative platform that converges digital art with community interaction, redefining the boundaries of artistic appreciation.

How does ArtSy(nc) make this objective possible?

ArtSy(nc) is purpose-built to address a fundamental challenge: how to bring digital art to a broader audience while fostering meaningful connections between creators and enthusiasts. At its core, the platform serves as a conduit for artists to showcase their work and for users to engage with, appreciate, and contribute to the vibrant world of digital creativity.

The primary objective of ArtSy(nc) is twofold: to provide artists with a platform for exposure and recognition, and to offer users an immersive experience that transcends traditional boundaries of art appreciation. Through a seamless interface, artists can upload their digital creations to the platform, inviting feedback and evaluation from a diverse community of peers and enthusiasts.

What distinguishes ArtSy(nc) from conventional art platforms is its innovative approach to audience engagement. In addition to enabling users to vote on their favorite artworks, ArtSy(nc) employs a sophisticated algorithm to highlight the most esteemed pieces, ensuring that exceptional talent receives the recognition it deserves. Furthermore, ArtSy(nc) integrates a dynamic projection system, allowing the selection of artworks to be displayed in public spaces, thereby blurring the lines between digital and physical artistry.

Navigating the ArtSy(nc) ecosystem is intuitive and user-friendly. Users can explore a map feature to locate nearby projectors, enriching their surroundings with digital art installations. Artist profiles are easily accessible through a comprehensive search function, enabling users to discover new talent and explore diverse artistic styles.

Central to the ArtSy(nc) experience is the interactive swiping mechanism, which facilitates effortless engagement with a vast array of digital artworks. This feature not only empowers users to express their preferences but also fosters a sense of community participation and dialogue.

In summary, ArtSy(nc) represents a pioneering initiative in the realm of digital art appreciation, offering a harmonious blend of accessibility, innovation, and community engagement. Through its multifaceted approach, ArtSy(nc) endeavors to elevate digital art to new heights of visibility and appreciation, enriching the cultural landscape for artists and audiences alike.

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 into 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 swiping mechanism.
- For the art sponsor it is important that they can easily connect with the local artists.

Effortless registration is important for all groups. The box is tested for weather resistance by exposing

it to heavy rain. For stability, we will use SolidWorks to test if the material can withstand the force.

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. Figure 1 is visualizing the concept of scrum.

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.

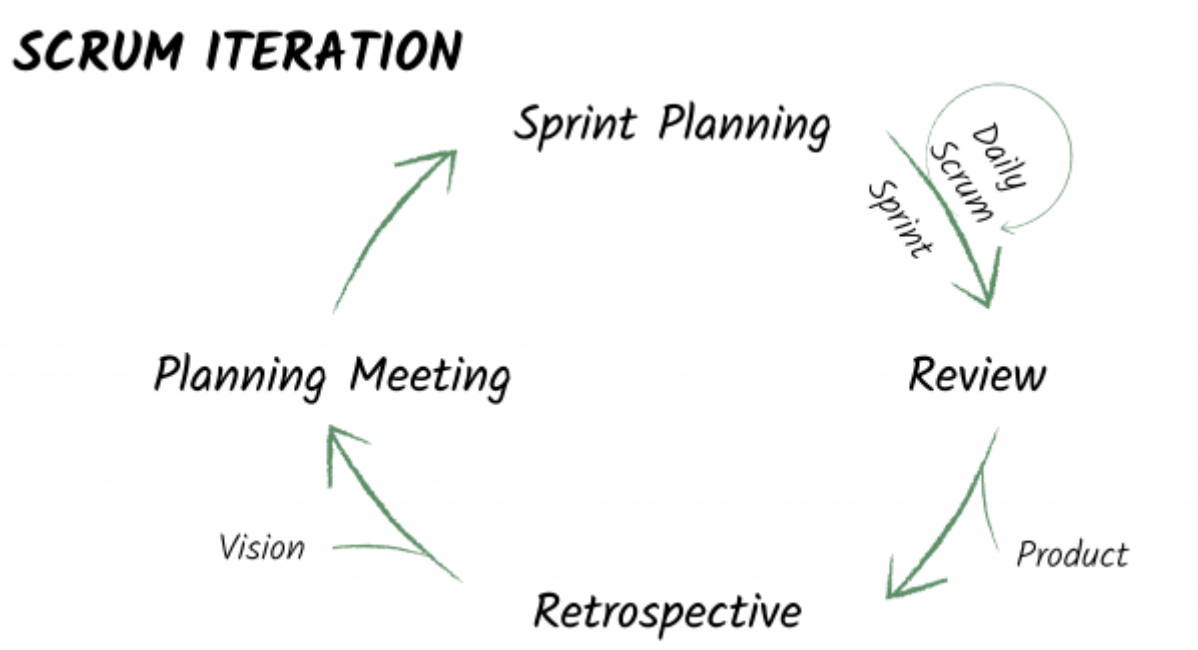

Figure 1: Scrum

1.8 Report Structure

This report is divided into eight chapters. They are described in Table 3 to give an overview of each topic.

Table 3: Report Structure

	Task	Description
1.	Introduction	Short introduction into the topic and presentation of our team and the motivation of each member as well as a little summary of the problem which should be solved, the objectives and the requirements
2.	State of the Art	Research and analysis on products which are already exists on the market
3.	Project Management	Overview of the applied methods of project management in the team and the time management
4.	Marketing Plan	Marketing analysis with identifying the target audience and the competitors and presenting the market strategy we can use to introduce our product in the market
5.	Eco-efficiency Measures for Sustainability	Possibilities and measures to make our product as sustainable as possible according to environmental, economic and social aspects
6.	Ethical and Deontological Concerns	Presentation of the importance of ethics in our project according to engineering, marketing & sales, and environmental ethics
7.	Project Development	Process and evolution of our product with different concepts, sketches and the final product
8.	Conclusions	Summary of the report and possible future visions

2. State of the Art

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 closer together through art. Our goal is to create a digital platform for local artists to share their art through 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 features that we wanted to have in the project and then compared them with the skills and knowledge 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.

In this chapter, the aim is to introduce digital art and take a closer look at the different styles that digital art includes. We also present existing platforms that operate on similar principles to ours and explore methods for keeping a projector in outdoor settings in good condition.

2.1 Digital Art

Digital art is a creative and exiting way for artists to express themselves using computers and modern technology. Instead of traditional tools like brushes, paint and canvas, digital artists use software and various devices to create their art. Due to the rapid development of digitalisation, digital art has a lot to offer for artists in this field. The artworks can be experienced online, in galleries, or even through virtual reality. In this chapter, the aim is to get a better understanding of what digital art is and what it includes. **[Adobe, 2024]**.

Digital art refers to any artwork created using digital technology, whether it's on a computer, tablet, or other digital devices. This broad category encompasses various forms of visual art, including digital

painting, 3D modeling, animation and graphic design. Unlike traditional art forms that use physical materials like paint or clay, digital art relies on software programs and electronic tools.

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 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, 2024]**.

Digital art has created a new way for artists to create art, with lots of opportunities and different styles of working. Websites and social media are a great way to for showing off digital art, bringing artists together and letting them interact with 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, 2024]**.

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 results. In Figure 2 there is a 3D environment of a bedroom created using Blender and in Figure 3, there is a digital drawing created using Adobe Photoshop.

Figure 2: 3D model of bedroom

Figure 3: Digital painting

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 revolutionising the way artists create, distribute and monetise their work, while advancements in AI promise to redefine the creative process itself. NFT is a type of digital asset that represents ownership of a unique item or piece of content using blockchain technology. Each NFT is one-of-a-kind and cannot be replaced with something else of equal value. NFTs are often used to buy and sell digital art, collectibles, music, videos and other digital creations, providing a way to verify authenticity and ownership in the digital world **[Coursera Staff, 2023]**.

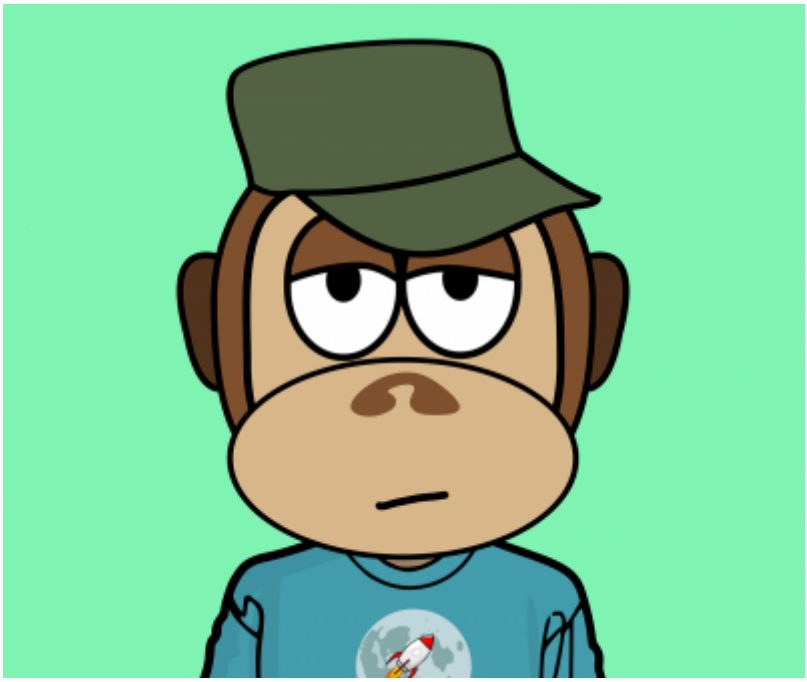

Figure 4: NFT (non-fungible token)

In an increasingly digitised 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.

2.2 Platforms for Digital Art

In today's digital age artists have unprecedented opportunities to showcase their work and connect with global and local audiences through various digital platforms. This chapter explores the landscape of digital art platforms, highlighting popular websites, apps and social media platforms that empower artists to exhibit their art digitally. We will discuss what these platforms provide for artists and what we want to include in our own project.

Platforms for digital art have evolved from basic online galleries to sophisticated ecosystems that cater to artists, collectors and enthusiasts alike. Initially serving as repositories for images, these platforms now integrate multimedia formats, interactive features and social networking elements. They have become vital tools for artists seeking visibility and recognition in an increasingly competitive art market.

One of the prominent trends in digital art platforms is the deep integration of social media functionalities. Platforms like Instagram, Pinterest and TikTok have become essential tools for artists to share their work, connect with followers and build their brands. Social media's visual-centric nature complements art presentation, fostering direct engagement and real-time feedback from audiences.

Popular Digital Art Platforms

- **Instagram**: Instagram is one of the biggest social media platforms in the world. It is also a leading platform for visual artists to showcase their portfolios through posts and stories. Artists utilise Instagram's visual nature to captivate audiences, share their creative processes and connect with fellow artists and art enthusiasts globally **[Instagram, 2024]**.

- **Behance**: Behance is a professional platform where artists and designers can showcase their portfolios and projects. Artists benefit from Behance's exposure to industry professionals, potential clients and collaborators, facilitating networking and career growth. Behance is part of the Adobe Creative Cloud **[Behance, 2024]**.
- **ArtStation**: ArtStation is a specialised platform for digital artists, featuring portfolios of concept art, illustrations and 3D works. It provides a dedicated space for artists to share their digital creations and connect with like-minded professionals in the entertainment and gaming industries **[ArtStation, 2024]**.
- **DeviantArt**: DeviantArt is a vibrant online community for artists of all backgrounds to exhibit their art, participate in challenges and engage in critiques. Artists can gain visibility and feedback from a diverse global audience on DeviantArt's platform **[DeviantArt, 2024]**.

In Figure 5 is all the logos of the platforms mentioned before:

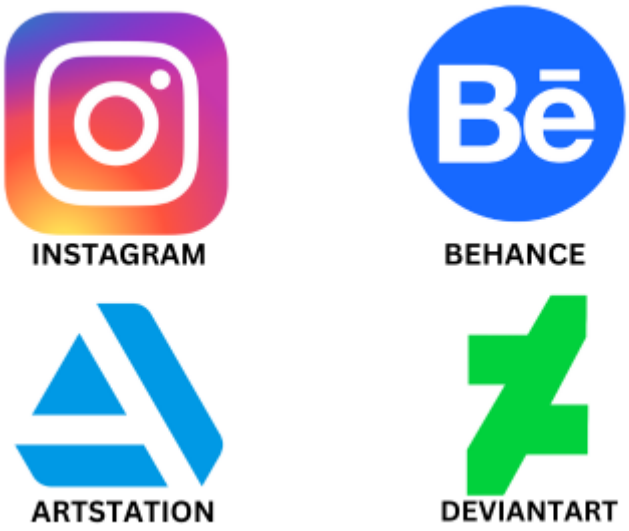

Figure 5: Logos of the platforms

These platforms are popular for good reason. Below are listed features that we consider strengths of the mentioned platforms and features that we ourselves want to incorporate into our own project.

What platforms provide for artists:

- **Exposure in Social Media:** By leveraging digital platforms, artists can showcase their work to a global audience of art enthusiasts, for followers and local audience, collectors and potential buyers, transcending traditional physical exhibition constraints.
- **Community Engagement:** Artists can actively engage with their audience through comments, likes and direct messages on digital platforms, fostering meaningful connections and cultivating a loyal following.
- **Portfolio Showcasing:** Artists can create comprehensive portfolios showcasing their artwork and design projects. Artists can organise their work into projects, add descriptions and highlight key details to present a professional and curated portfolio.
- **Feedback and New Ideas:** Forums enable artists to receive constructive feedback and critiques from peers and industry professionals, fostering growth and improvement in artistic skills.

The evolving landscape of digital art platforms empowers artists to share their creativity, expand their audience reach and engage with global communities in unprecedented ways. By leveraging innovative features and embracing technological advancements, artists can navigate the digital realm to promote their work, foster connections, and contribute to the vibrant and dynamic world of digital art. As these platforms continue to evolve, artists will benefit from new opportunities for exposure, collaboration, and artistic expression in the digital sphere.

2.3 Packaging Projectors in Urban Spaces

The uploaded art in our platform is to be shown in urban spaces. However, what exactly constitutes urban spaces?

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 frequently utilised for public celebrations and gatherings. It is essential for every city to provide secure urban spaces, as they play important role for social community and inclusion. **[saferspaces, 2014]**.

In this chapter, we will introduce the essential specifications required for the projectors we intend to use. We will explore methods for storing projectors outdoors and in public spaces to maximise their durability and safety.

Projectors are needed to showcase the uploaded art in our platform to 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, approximately 3000 ANSI lumens are sufficient, whereas for outdoor projectors, approximately 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 Digital Light Processing (DLP), Liquid Crystal Display (LCD) and Liquid Crystal on Silicon (LCOS) technology. While DLP technology uses a chip with millions of micro mirrors 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 and resistant for other possible disruptors. 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 unauthorised 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. Placing of the projector must be in a safe distance from people in the public.

There are already boxes that are designed for outdoor projections. These can be opened to the side (Figure 6) or from the front (Figure 7). They either have a bracket to screw it to a ceiling or a simple base as a stand. The boxes are made of aluminum or stainless steel and are often of welded construction. The windows are made of Plexiglas and are glued on. The boxes are protected against water up to a watertight protection class of IP54 and are also fitted with rubber seals **[Kinytech, 2024]**. Our project will follow these long lasting solutions.

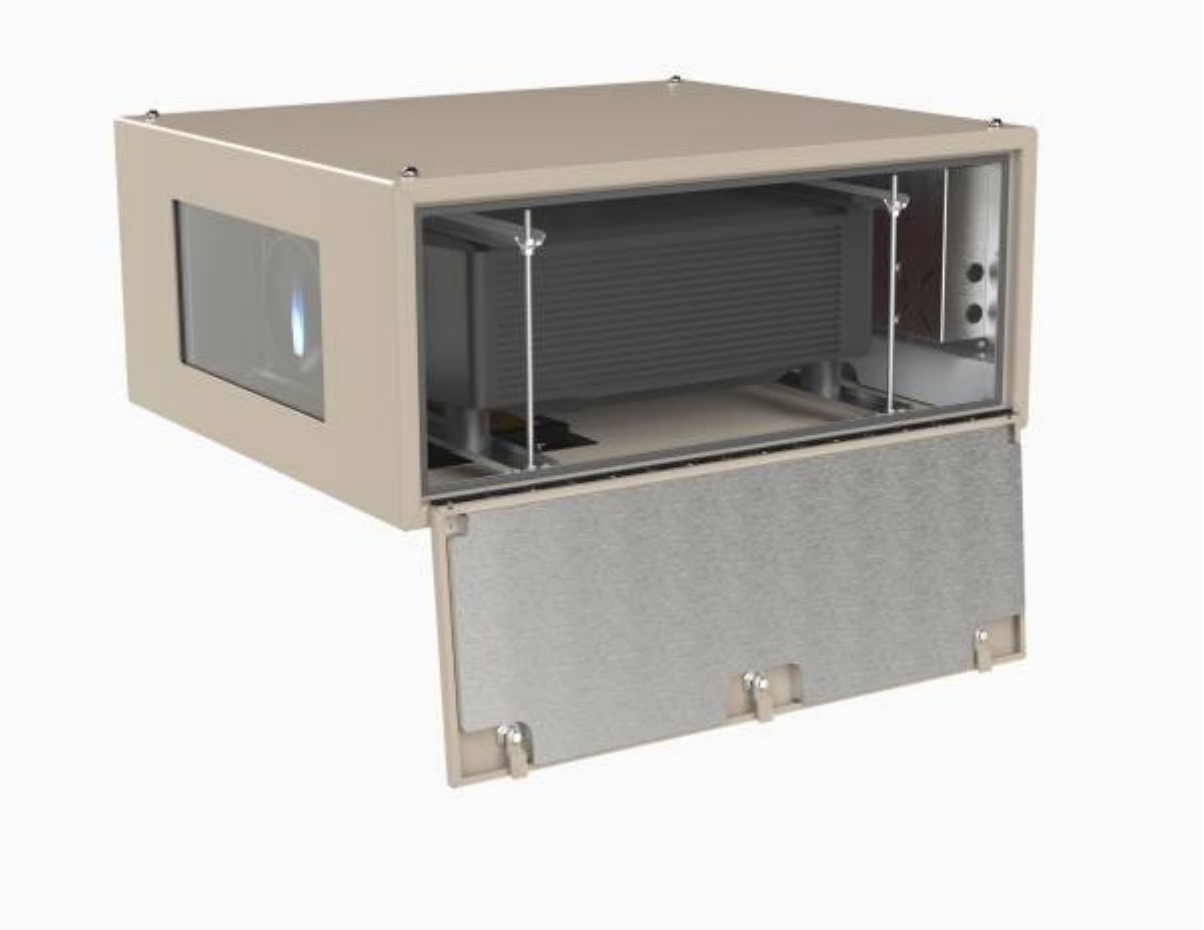

Figure 6: Box with door on the side **[Tempest, 2014]**

Figure 7: Box with door on the front **[Kinytech, 2024]**

2.4 Conclusion

After analysing the state of the art the team has identified a direction to create a project that is guided by 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. **Platforms for Digital Arts:** The project is based on a platform to showcase the digital art of local artists. The team aims to make a working platform for different user types (artist, art lover, art exhibitor) to ensure a smooth user experience while connecting all the people related to digital art. By researching similar existing platforms we gain more information what should be included in our project.

3. **Packaging Projector in Urban Spaces:** 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 a sustainable solution to ensure the ethical and long-lasting lifetime of the projector.

The team has all the required skills to create working results for the project. By combining different backgrounds and educational knowledge within the team, we will be able to create the desired outcome.

3. Project Management

In the upcoming sections, each aspect of project management will be delved deeper into. The scope definition will be outlined to keep goals clear and focused. Timelines will be discussed to ensure timely completion of tasks and efficient resource utilization. Additionally, stakeholder identification and engagement, effective communication channels, risk analysis, procurement procedures, and detailed project planning will be covered.

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, which 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 8), as well as the specifications necessary for constructing the prototype (as depicted in Figure 9).

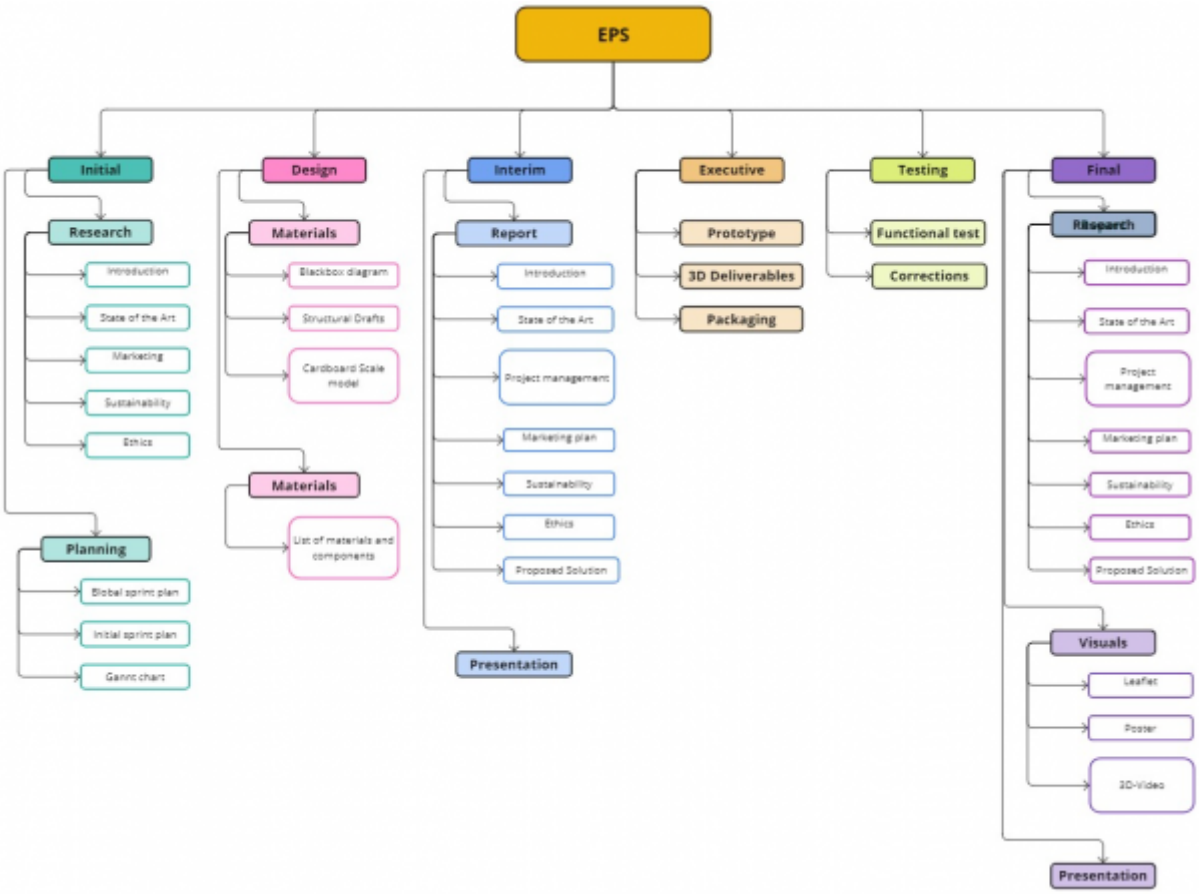

Figure 8: Scope of the EPS divided in the following topics: Initial, Design, Interim, Executive, Testing and Final.

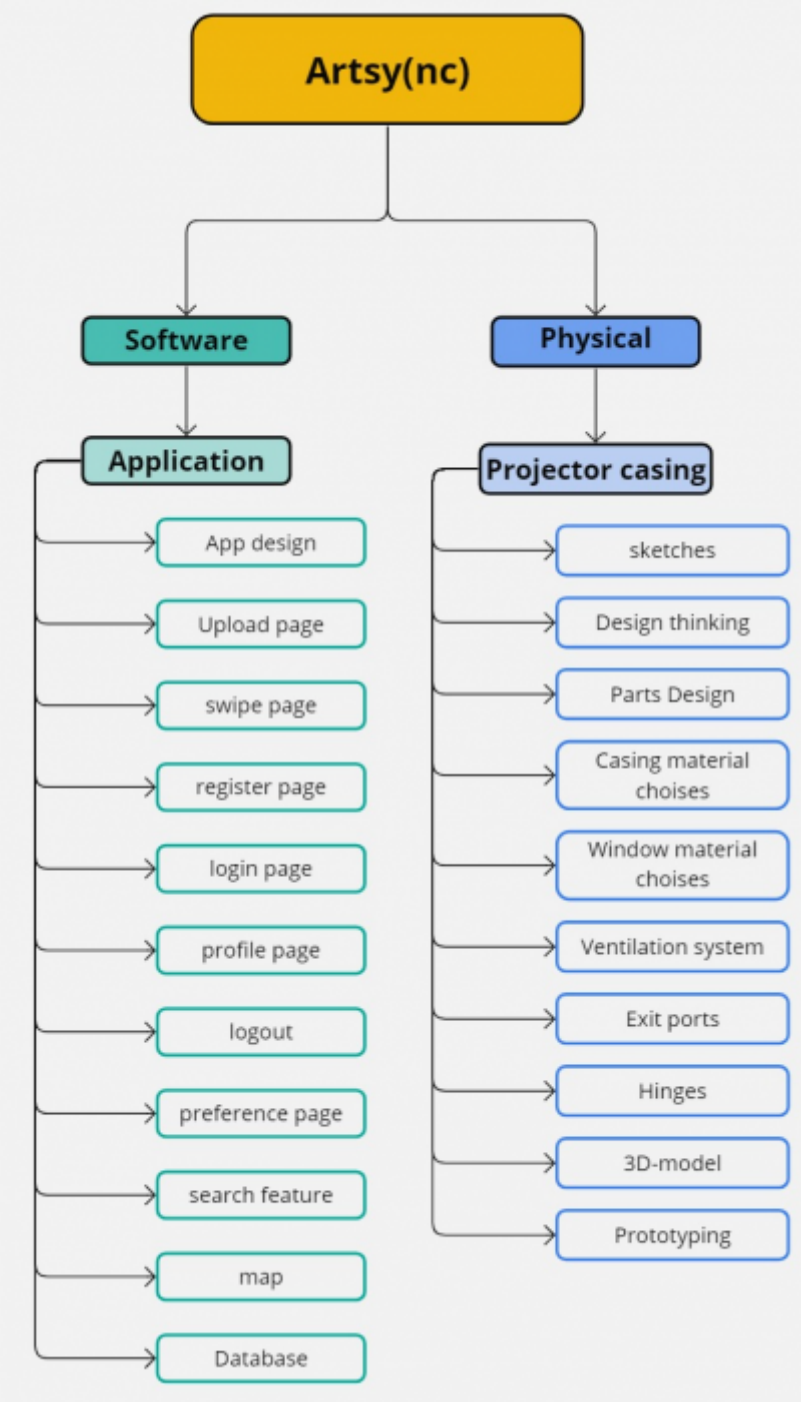

Figure 9: Scope of building the prototype is devided in the software and physical side.

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 NFTs on the platform will not be incorporated. For the prototype, there will be no engagement with the government to place the product outside for usage. So what will take place for the prototype is building an initial prototype version of the 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 log in and upload art so people can vote for the art they most like.

3.2 Time

During the project, time and deadlines are like the engine that keeps everything moving forward

smoothly. Time is precious, and deadlines give clear goals to work toward. They help to stay focused, accountable, and efficient. Meeting deadlines shows that a team is dependable and committed to the project's success. Good time management not only helps to use resources wisely but also reduces risks and boosts productivity. By respecting time and sticking to deadlines, trust is built with everyone involved and the project stays on track toward its goals.

- 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.

In the Table 4 is estimated cost of building the application.

Table 4: Microsoft Azure Estimate

Service category	Service type	Custom name	Region	Description	Estimated monthly cost	Estimated upfront cost
Compute	App Service		West Europe	Standard Tier; 1 S1 (1 Core(s), 1.75 GB RAM, 50 GB Storage) x 1 Month; Windows OS; 0 SNI SSL Connections; 0 IP SSL Connections; 0 Custom Domains; 0 Standard SLL Certificates; 0 Wildcard SSL Certificates	67,41 €	0,00 €
Databases	Azure Database for MySQL		West Europe	Flexible Server Deployment, General Purpose Tier, 1 D2AS v4 (2 vCores), 1 year reserved, 16384 GB Storage with ZRS redundancy, 0 Additional IOPS, 0 GB Additional Backup storage with LRS, with High availability	4307,40 €	0,00 €
Support					0,00 €	0,00 €
Total					4374,81 €	0,00 €

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 goals. The quality of the product is also of utmost importance. It is a standard to set a high bar for a product, which is not only functional but also fulfills the needs of the consumer by being intuitive and giving a sense of value and satisfaction to the user. Poor quality can lead to doing rework, dissatisfaction by consumers, miscommunication and failure 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 multiple topics are important. Communication is key, 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 the 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 the 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). To have high-quality standards there needs to be a focus on intuitive UX/UI (user experience/user interface) 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 contributes to the 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 to bring the project to success.

3.6 Communications

Inner communication of a team is very important, 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 5.

Table 5: 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

Method/system	What for?	Type
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 prioritization of potential risks that may affect the success of the project **[TechTarget, 2023]**. This process typically includes:

1. Identify the risk:

- Identifying 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. Analyze the possible impact of the risk:

- To analyze the potential impact of risk can be solved in 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 prioritize the risk:

- Evaluate and prioritize 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:

- Respond 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:

- 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 minimize the impact of risks.

In Table 6 is a list of the most important risks and how we are going to manage them.

Table 6: Risk analysis

Risk	Probability (1 to 10)	Detection	Impact (1 to 10)	Consequences	How to prevent
Communication issues and language barrier	6	Misunderstandings	8	Might lead to poor coordination and bad decision-making	We have to be honest if someone doesn't understand what is going on and talk until everything is clear
Skill gaps and difference in study fields	7	Tasks that only one or two has skills for	5	High workload and struggles for certain people	Teach each other what we know already and help others when needed
Leadership and role clarity	5	Problems to get the project going	9	The project doesn't have good progress	We have to define roles for each other and keep a clear vision of what is going on
Technical challenges	6	Might need expertise over our skills	8	We could not reach our target goal	Figure out what kind of knowledge our project requires before doing it
Copyright and legal issues	7	Possible sanctions	6	We might have to reconsider our goals	We must do research about the legal issues regarding to our project
User engagement	4	Challenges to gather users for our application	9	Not enough of visibility to our project	We must market our project the right way for people to get excited about it
Projection locations and permissions	5	Bad places to show the art	8	We might struggle to find the right places for our projectors	We must have clear negotiations where to place the projectors
Funding	5	No progress without funding	10	Impossible to complete the project if we don't have enough of money	We must find the right funders and have a working deal with them

Risk	Probability (1 to 10)	Detection	Impact (1 to 10)	Consequences	How to prevent
Technology reliability	7	The materials we use must be the correct ones to see-trough our idea	7	Bad materials will set us back and fight against the requirements of the project	We must do research for the right materials for our project

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, all our suppliers must be 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, information must be 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, most efficiently and ethically 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 caused 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 7 the stakeholders, their function, interests and influence is determined.

Table 7: 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 supporters	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 10 the stakeholder needs are visualized based on the interest and influence (power) of each. The scaling of interest and influence is shown in Table 7. With 1 meaning low and 5 meaning high.

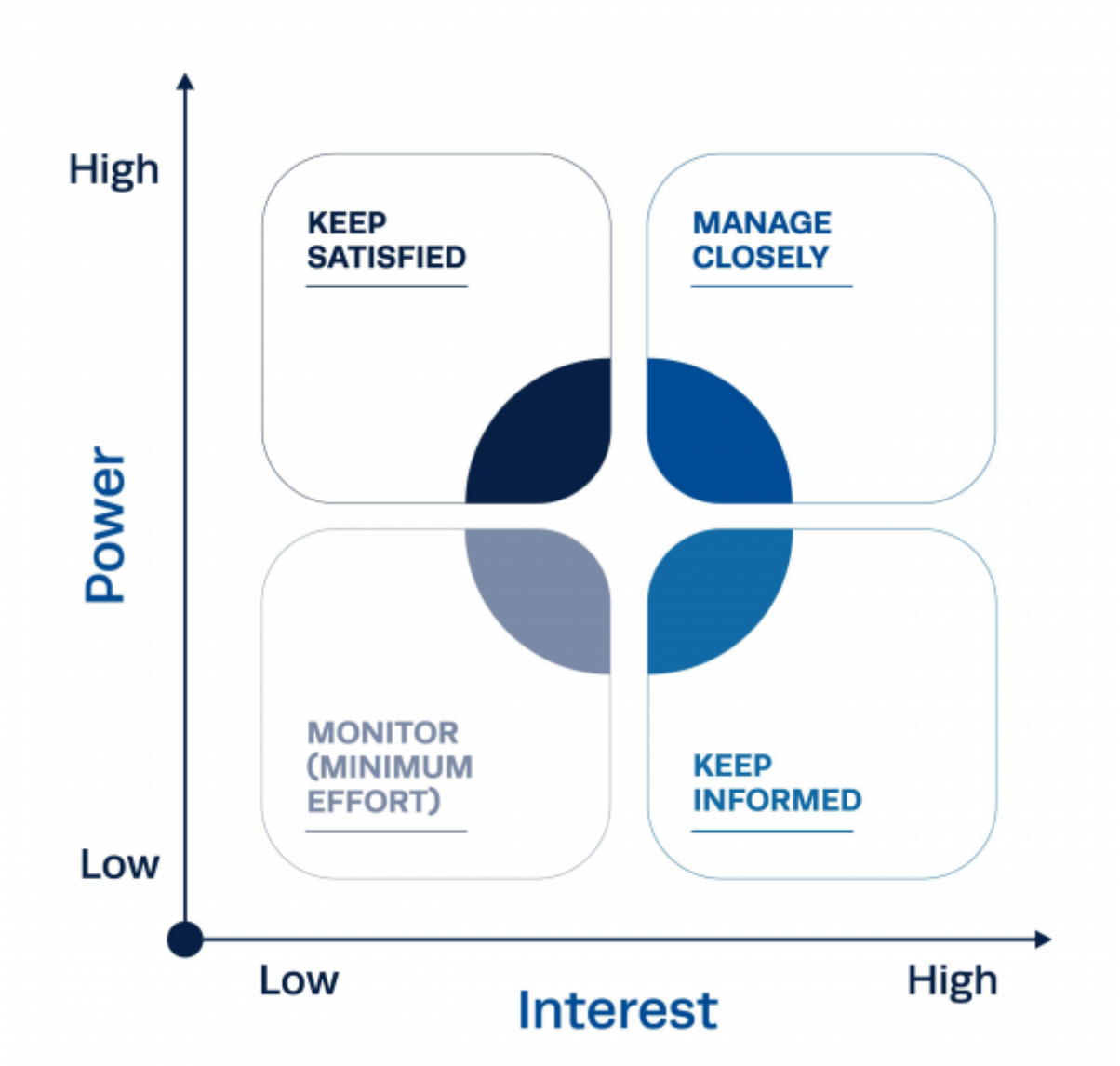

Figure 10: Stakeholders interest vs power overview **[Institute Project Management, 2022]**

3.10 Project Plan

Our global sprint plan for this project consists of 1-week sprints, and it is available here for your reference in 8 .

Table 8: 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	Finished
6	11/4/2024	18/4/2024	Finished
7	18/4/2024	25/4/2024	Finished
8	25/4/2024	02/5/2024	To do
9	02/5/2024	09/5/2024	To do

Sprint	Start	Finish	Status
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

At the beginning of our project a Project Backlog (Table 9) was created. Every task we have to do is listed here to get a clear overview what we have to do.

Table 9: 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
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

To organize every sprint a sprint plan, shown in Table 10 , was created. Before every sprint we write down which tasks we have to finish during the next sprint and who is responsible and involved.

Table 10: 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

After each sprint we update the status of every task in the project pregress register (Table 11).

Table 11: 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
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

The Gantt Chart (Figure 11) is used to get an overview of all the milestones. It shows the timeline of the task, when we start working on and when we have to finish them.

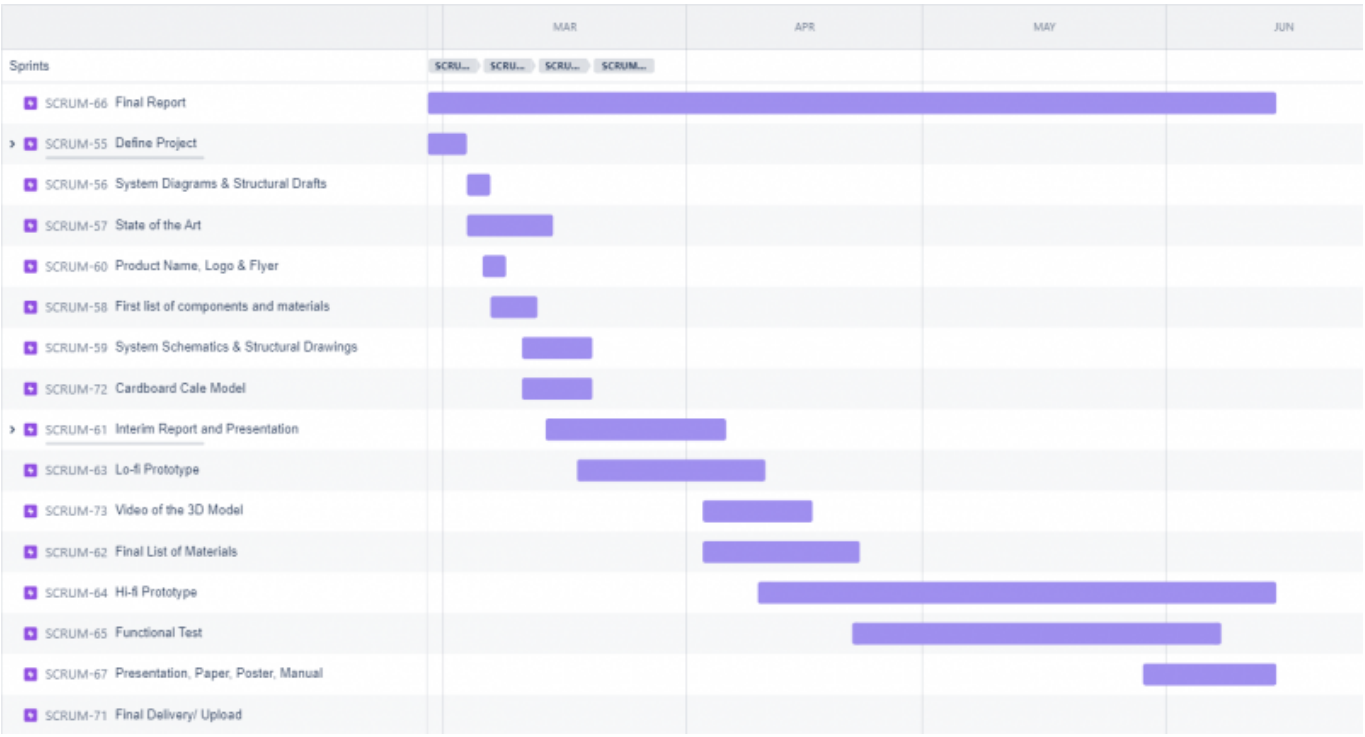

Figure 11: Release Gantt chart

3.11 Sprint Outcomes

During each sprint review, our team discussed the sprint outcomes, including the sprint backlog, completion status, and planned capacity versus achieved velocity. We reviewed the completed tasks from the sprint backlog, highlighting pending items or challenges encountered during the sprint. The completion status was assessed to determine if all planned work was finished, and any unfinished tasks were identified for future sprints.

Additionally, our team compared the planned capacity, which includes estimated effort for all planned tasks, with the achieved velocity, representing the actual amount of work completed during the sprint. This comparison provided insights into our team's efficiency and helped identify areas for improvement.

Overall, sprint reviews provided valuable opportunities for our team to reflect on our progress, identify areas of growth, and make adjustments to our processes to enhance performance in future sprints.

The sprint outcomes are shown in the Tables 12 till 27.

Table 12: 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 13: 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
	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 14: 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 15: 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 16: 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 17: 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 18: 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 19: 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 20: 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 21: 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 22: 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 23: 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 24: 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 25: 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 26: Sprint 15: 13/6/2024 - 20/6/2024

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

Table 27: 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

At each sprint retrospective, our team reviewed the results of the previous sprint and discussed ways of improving (Table 28). We identified what had worked well, such as better communication, but also what was causing problems, such as unclear project requirements. To address these issues, our team took action. For example, we introduced daily meetings to improve coordination and clarified work rules. These changes led to concrete improvements, such as faster delivery times and better quality of work. The sprint retrospectives were invaluable in enabling the team to continuously improve and contribute to the overall success of the project.

Table 28: 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

Sprint	Positive	Negative	Start doing	Keep doing	Stop doing
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	We did everything in time, task distribution	preperation for interim presentation could be better, did not use the Jira sufficiently	use the Jira after every task we did and put in the needed time, spend more time on preperation	not logging tasks	do everything in time and work so ambitious as we do
6	Communication good again	We did not finish all the scrums, We did not do the daily standups every day	More in time with the daily standups, better time management of the scrums	saying we will improve on the daily standups but not improve	communication
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

3.13 Conclusion

The success of a project relies on effective management. By balancing scope, time, and resources, it provides a logical approach to planning, executing, and completing projects. Collaboration and communication with stakeholders are crucial. Teams manage risks, optimize resources, and meet goals within deadlines and budgets. Project management fosters teamwork and improves outcomes. In the next chapter, we'll discuss the vital role of marketing in project success. Marketing helps businesses attract customers and generate revenue by promoting their products or services.

4. Marketing Plan

Chapter 4 will give insights into 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 to view the size of the market and show macro economic factors. After this there will be a SWOT analysis and the strategy will show ArtSy(nc)’s objectives, audience’s and positioning in the market.

4.1 Market Analysis

To better understand the digital art market, a comprehensive analysis will be conducted. This includes exploring audience types, providing a market overview highlighting growth drivers and size, conducting a macroeconomic PESTEL analysis, and evaluating competitors. By examining these aspects, insights into market dynamics can be gained, opportunities identified, and refine our strategies for success.

4.1.1 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 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 who 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 organizations before they can collaborate with the platform, this will also be discussed in the ethical concerns. But the organizations can be any, philanthropist, company or government that 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.

4.1.2 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 endeavors, 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 that 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. With 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 in 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.

4.1.3 PESTEL analysis

PESTEL analysis is a strategic tool used by organizations 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 organizations 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. **[WSU Libraries, 2023]**

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 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 that 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 (augmented reality/virtual reality), Machine learning, Artificial intelligence, 2D/3D (two-dimensional and three-dimensional) 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 prioritizing sustainability initiatives and minimizing environmental impact we aim to promote artistic expression while preserving Porto's urban and natural environments.

4.1.4 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 **[ArtFinder, 2024]**.

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 **[ArtStation, 2024]**.

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 prioritize 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 12 presents a visual comparison between ArtSy(nc) and the competitors via a positioning diagram.

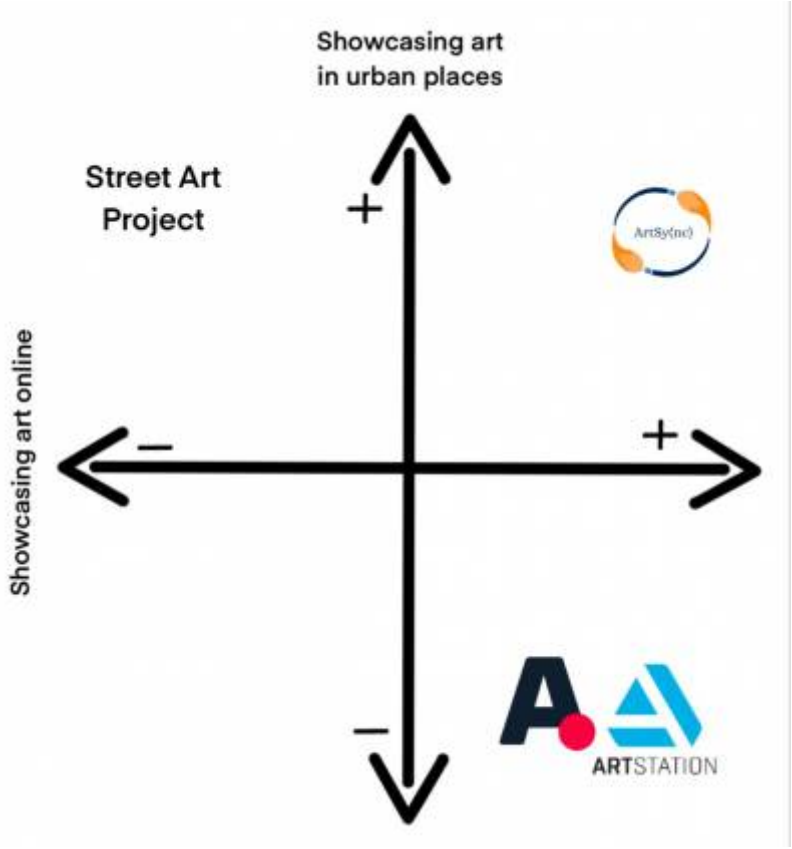

Figure 12: Positioning diagram

4.2 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 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 cities 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 artists who need and look for recognition for their work.
- **Partnerships with Artists:** : Established artists who want to help local artists 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 artists to be more visible can help them by sponsoring the platform.
- **Smart cities:** Cities whose 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 art world:** 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.

4.3 Strategy

In the pursuit of our objective to become a leading platform, a strategic roadmap is essential. Our strategy is outlined by a series of clearly defined objectives, structured by the following criteria: Specific, Measurable, Achievable, Relevant, and Time-bound also referred to as SMART. These objectives, which encompass initiatives targeting Artist Engagement, Art Lover Engagement, Sponsorships, and Expansion, serve as fundamental pillars in guiding our trajectory toward growth and success.

4.3.1 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 this will help ensure continued growth and success.

For artists:

- Of all users, 10% to 15% must be artists by one year
- Get 1 to 2 artworks per artist every two weeks

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

4.3.2 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 ArtS(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 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 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.

4.3.3 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) prioritizes the local artistic talent of Porto providing a dedicated platform for artists to gain exposure within their 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 revitalization 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.

4.3.4 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 the 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 maximize visibility and user adoption.

4. Promotion

We will promote the app through online channels, social media platforms and local art communities to maximize 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.

4.3.5 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 synchronization symbol representing unity. The mix of calm and popping colors creates a positive atmosphere around the logo.

4.4 Marketing Programmes

A marketing programme is a co-ordinated set of activities and strategies designed to achieve specific marketing objectives. These programmes are designed to promote a product, service or brand to a target audience. A marketing programme can include various elements such as advertising, public relations, digital marketing, promotions, events, direct marketing, etc. The main objective of such a programme is generally to attract the attention of consumers, convince them of the usefulness or value of the product or service, and ultimately encourage them to buy or use the product or service in question.

4.4.1 Programmes

Social Media Engagement:

Tiktok and Instagram

We've opted to use platforms like TikTok and Instagram to promote our ArtSy(nc) application for several pivotal reasons. Firstly, these platforms are hugely popular among younger generations, who constitute a significant portion of our target audience. Leveraging TikTok and Instagram enables us to reach a broad audience rapidly, which is crucial for effectively promoting our app. Moreover, TikTok and Instagram are visually-driven platforms that align perfectly with promoting an application centered around digital art. Artists and art enthusiasts are often highly active on these platforms, sharing their creations and discovering new artistic content. By utilizing TikTok and Instagram, we can create compelling content that showcases the unique features of our app, such as the ability for artists to share their digital works and project them within the city. Additionally, TikTok and Instagram

offer powerful sharing capabilities, allowing our audience to quickly disseminate information about our app. Users can share stories, links, and videos on their profiles, enabling our app to gain visibility and reach new potential users. In summary, TikTok and Instagram are strategic choices for promoting our ArtSy(nc) app because they are popular, visually engaging platforms with robust content-sharing features. This will enable us to effectively reach our target audience and raise awareness of our app to a wide audience.

Examples

For Artists:

1. TikTok Challenges: We can create engaging challenges where artists can showcase their digital artworks shared on the ArtSy(nc) app. For example, initiate a challenge inviting artists to create a time-lapse video of their digital painting process and use the hashtag #ArtSyChallenge.
2. Artist Spotlight on Instagram: Highlight artists who use the ArtSy(nc) app on our Instagram account. For example, post their artworks accompanied by a brief biography and an interview about their creative process.

For Art Lovers:

1. Urban Art Tours on TikTok: We can create TikTok videos showcasing our artistic installations projected throughout the city using the ArtSy(nc) app. Show different artworks, their locations, and provide practical tips for art enthusiasts on how to use the map feature to find these artworks. Use trending hashtags like #ArtSyCityTour.
2. Art Hunts on Instagram: We can organize interactive art hunts on Instagram where art enthusiasts can follow clues to discover hidden digital artworks in various locations.
3. Artwork of the Day on Instagram: We can share daily posts on Instagram featuring digital artworks available on the ArtSy(nc) app. Invite art enthusiasts to join and download our app.

These examples provide targeted approaches to engage both artists and art enthusiasts via TikTok and Instagram, leveraging the features of each platform to effectively promote and raise awareness of the ArtSy(nc) app.

Tourist websites, Travel Bloggers

We plan to collaborate with tourist websites, travel bloggers, and influencers in the tourism industry to promote our application. This will ensure that when people search for attractions to visit in the city, the ArtSy(nc) app appears among the things to do, allowing them to use our map to discover digitally projected artworks throughout the city while also introducing them to our application and its innovative concept. By being present on these platforms, we can capture the attention of a wide range of individuals, regardless of their age. Many travelers seek unique cultural experiences when exploring a new destination, and our app can offer an innovative approach to discovering digital urban art and exploring the city simultaneously. By partnering with bloggers and influencers in the travel industry, we can leverage their credibility and engaged audience to showcase our app and encourage travelers to download it.

Examples

For Art Lovers : Let's say we're working with a popular tourist site like GetYourGuide or TripAdvisor. We agree to include information about our ArtSy(nc) application in their “Things to do” or “Attractions” section. When visitors visit this site to plan their trip, they will discover our ArtSy(nc) application as an option for discovering the digital works of art projected in the city. In parallel, we are collaborating with an influential travel blogger who writes about unique cultural experiences in

different destinations. We invite him to use our application on his next trip to that city. The blogger then shares his experience on his blog and social networks, highlighting the ease of use of the application and the digital artworks he has discovered.

Physical promotion

To promote ArtSy(nc) not only digitally but also physically there are many options to do so. Think about flyers, leaflets, posters, travel guides, QR codes and events. One of the reasons for also promoting physical is that there will be more brand visibility in everyday spaces where people live, work, and socialize. This increased visibility can lead to greater brand recognition and awareness among a diverse range of individuals. The flyers, posters, QR-codes and leaflets will be placed in strategic locations like tourist information points and local cafes in order to reach people who are already interested in art and culture. This targeted approach increases the chances of reaching potential artists and art lovers who would appreciate the platform. It can also grab the attention of people who might not be actively searching for art experiences online. This can introduce a whole new audience to ArtSy(nc). These forms of promotion all have the same goal but can be distributed at different locations. The flyers and leaflets can be in local shops, cafes, or other public spaces. And QR-codes can be distributed throughout the city at all locations. The posters for example at bus stops and universities. The goal of these promotion methods are that people will recognize the brand, what ArtSy(nc) is all about and also download and engage with the application.

Examples

1. A customer in a café sees the flyers with the logo and QR-code in combination with the platforms goal. Now two things can happen, or they download the app by scanning the QR-code or they pass on but at least know we exist.
2. When someone is in high traffic or waiting for the bus and sees ArtSy(nc)’s posters at bus stops or on the street they generate awareness about the brand name and download the app.
3. When a person goes to the store and buys a product ArtSy(nc) can distribute leaflets about the platform and events in the shopping bag.

The events are also verry important, it Is a place where not only artists and art lovers can go but it is also a place where potential sponsors can be invited. ArtSy(nc) can host a variety of events, including artist talks, workshops, and public art walks centered around projected artworks. These events not only create a community atmosphere for artists and art lovers but also provide a platform to showcase ArtSy(nc)'s features and the artists it empowers. By inviting potential sponsors to these events, we can demonstrate the platform's value proposition and build mutually beneficial partnerships.

One of the strong cases why these physical promotions will be local is that it can create a sense of local pride and ownership to the people in the community. People might be more interested in checking out the platform if they see it showcasing art in their city neighborhoods.

Sponsors

1. Seek partnerships with public places and cultural institutions: Our first idea is to contact museums, art galleries, cultural centres, libraries, public parks and other places frequented by the public to discuss the possibility of projecting digital art in their spaces. And to propose a collaboration that could offer them increased visibility while enriching the cultural experience for their audience.
2. Organise collaborative events: We can plan events where we project digital art and invite sponsors to participate in exchange for visibility. For example, we could organise a digital art

night in a park with live performances, music and food, and invite local businesses to sponsor the event in exchange for their logo on promotional material.
3. Approach local businesses and brands interested in culture and art: We want to contact local businesses who might be interested in sponsoring cultural events or who could benefit from the association with digital art. For example, technology companies, media companies, commercial art galleries, clothing or tourism brands may be interested in this type of partnership.

4.4.2 Budget

4.4.3 Control

4.5 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

This chapter delves into the specific measures to minimize the environmental footprint of ArtSy(nc). This will be done by exploring considerations for the design and production of the outdoor spotlight housing, strategies for reducing energy consumption and waste management, and methods to mitigate light pollution. Furthermore, it will be about the application itself which is being developed with sustainability in mind, focusing on energy-efficient coding practices and user interface design that minimizes unnecessary resource use. Finally, the chapter will explore how the application can be a tool for promoting environmentally conscious art and user behaviour.

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 (Illustrated in Figure 13): the environment, the social and the economy, a concept formalized in 1992 by the Earth Summit in Rio **[United Nations, 2024]**. 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.

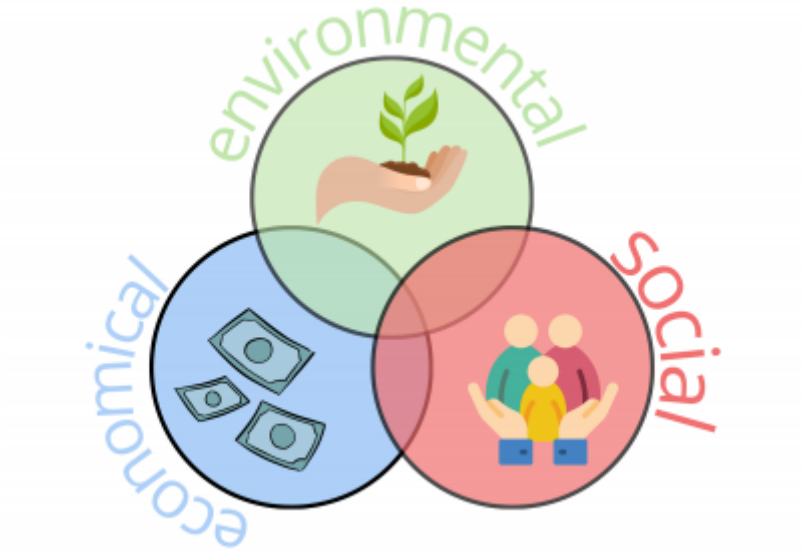

Figure 13: The 3 pillars of sustainability

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?

We aim 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 Carbon dioxide 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 the 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 United Nations 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 (LCA), 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 (Illustrated in Figure 14) 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 14: 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.

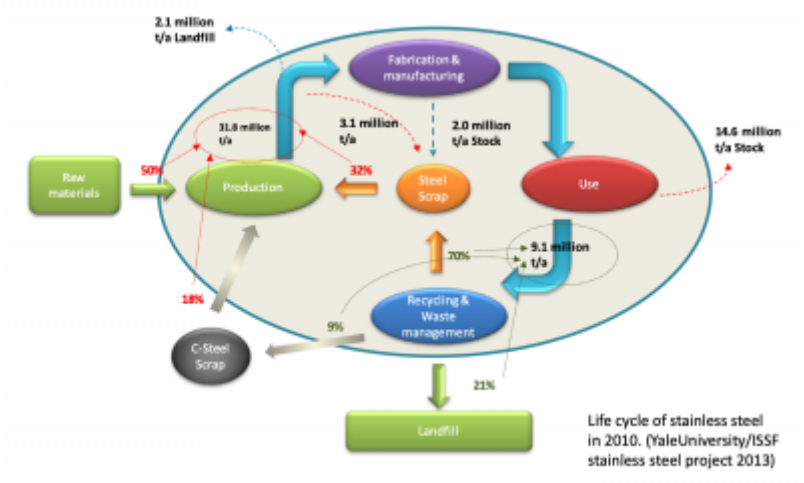

Figure 15: Lifecycle of stainless steel

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, molding, 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 committed to conduct our concept with an environmental and social conscience.

With this in mind, we have integrated effective methods such as the 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

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 fulfill 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]**.

6.1 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]**.

6.2 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 a 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, 2024]**.

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 making fair prices, better wages and sustainable development. Companies have to be transparent to the public about the production of their products and their way of treating

the employees and also the sustainability and environmental impact of their products and services **[Masterclass, 2022]**.

6.3 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, 2024]**.

6.4 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 with ethical principles. By maintaining a professional and ethical framework, we aim to provide a safe and respectful environment for artistic engagement and expression.

6.5 Conclusion

Overall, these chapters underscore the importance of ethics across various sectors, guiding actions towards responsible conduct and societal well-being. They discussed various aspects of ethics within different domains, including deontology, engineering, business, environmental ethics, and the implementation of ethical guidelines.

Deontology emphasizes fulfilling duties towards others, focusing on moral rules rather than consequences. Engineers, as pivotal creators impacting society and the environment, have ethical obligations to ensure safety, sustainability, and honesty in their work. This is outlined in guidelines such as those provided by the NSPE, emphasizing public welfare, honesty, and conflict avoidance.

In the business realm, ethics are fundamental, particularly in marketing and sales. Companies prioritizing ethical conduct not only gain short-term profits but also enduring customer loyalty and reputation. Marketing ethics entail honesty, fairness, transparency, and responsibility, including fair pricing, wages, and sustainable development.

Environmental ethics delve into humanity's responsibilities towards nature, advocating for sustainable practices and recognizing our dependence on the environment. It emphasizes promoting harmonious coexistence with nature through multidisciplinary approaches and ethical considerations.

ArtSy(nc) exemplifies ethical implementation through copyright compliance, content moderation, and user data protection. Upholding principles of transparency, accountability, and user safety, ArtSy(nc) aims to provide a respectful environment for artistic expression while managing liability and adhering to ethical principles.

7. Project Development

7.1 Introduction

In this chapter, the development of ArtSy(nc) will be explained. It shows the whole process starting with ideas and sketches and ending with a final product. It is divided into five subchapters.

In the first part, the ideation, the black box diagram is presented and the first sketches are shown. The second part is the concept. Here the complete product is explained and what it contains: components, technology, and in the app the functions.

The third section is Design. In this part, the choice of materials is explained and detailed sketches are shown. The hardware that is used is also explained in detail.

As there is only a budget of 100 €, the product cannot be manufactured in this way and it is built as a simplified prototype. In the fourth subchapter, the differences between the final product and the prototype are described. The results of the tests carried out are also presented here. Finally, there is a conclusion to summarize the most important points 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 in Figure 16, 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 16: 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, and a challenge to implement your skills as an artist.

- **Projector/ public spaces:** The lights can be a nuisance, on the contrary, it can also bring more life and beauty to the city, create more awareness for digital art and artists, adding creativity to people and their daily lives.
- **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 not personal but it helps with diversifying your taste, a possibility to see more art in a short amount of time, it helps lowering the bar for competing and opening the door for small artists to participate.

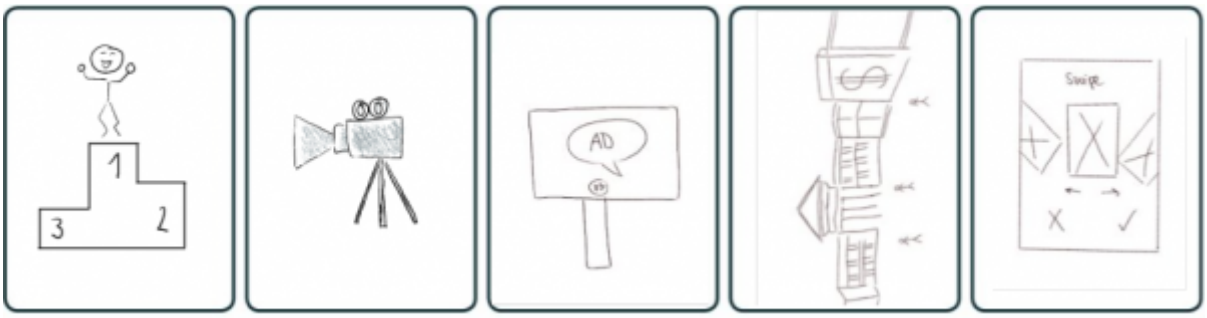

Figure 17: User-Needs

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

In this chapter, the visualization of ArtSy(nc)'s concept is explored through its key components: corporate identity, app design, app development, projector feature, and marketing & feedback. Each element contributes to the platform's identity, functionality, and success, shaping ArtSy(nc) into a dynamic hub for artistic expression and community engagement. Figure 18 is visualizing the concept. The conceptualization phase of the project, wherein fundamental elements concerning the identity and functionality of the platform, ArtSy(nc), are described. From the inception of the logo and color palette to the development of both LoFi and HiFi prototypes, the process is outlined. Additionally, attention is drawn to the unique design considerations regarding the outdoor spotlight housing feature.

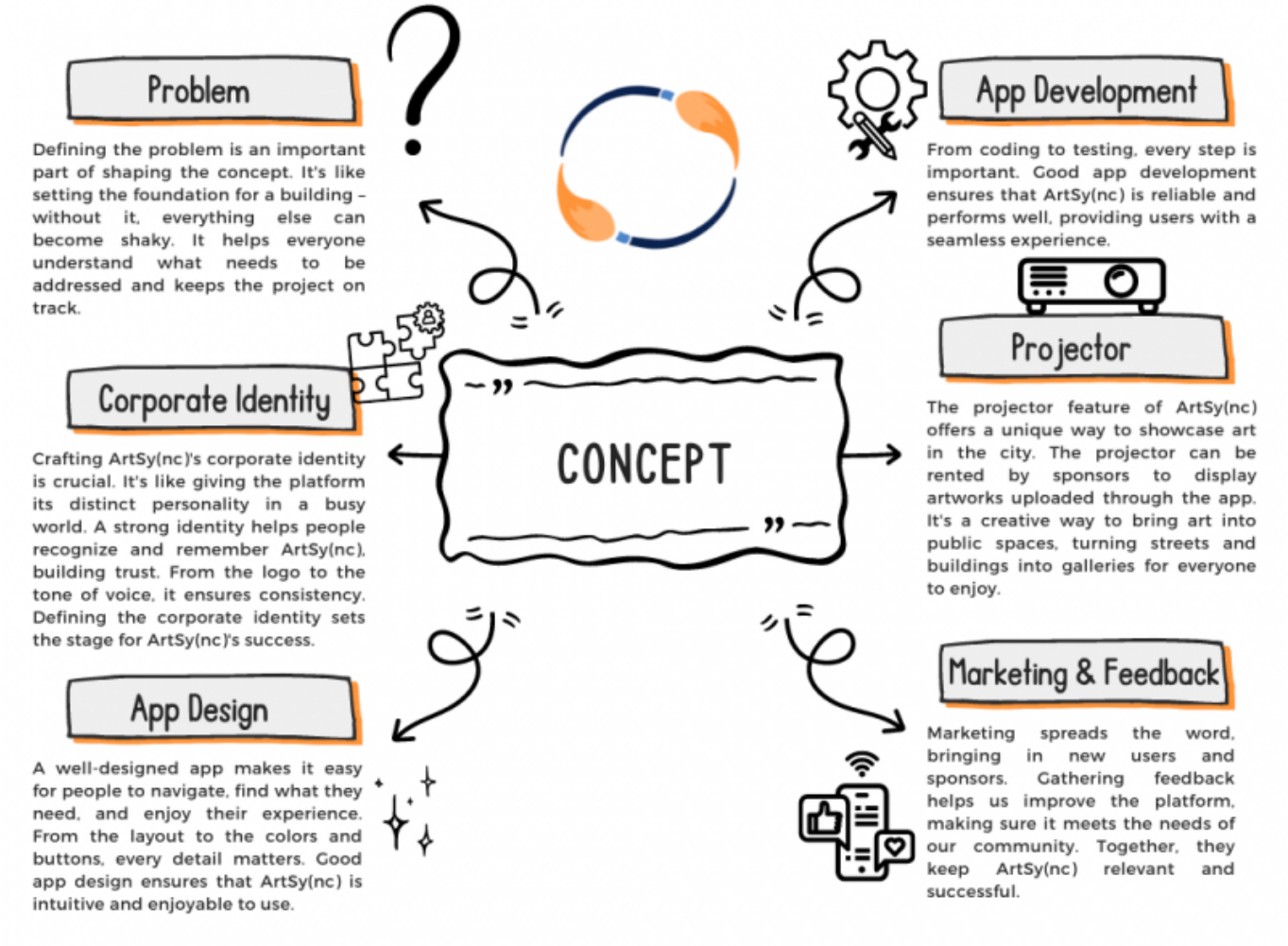

Figure 18: Logo

7.3.1 Logo Design

ArtSy(nc) is connecting public spaces with artists, so synchronizing them. The name also includes the word “artsy”, which stands for creativity and showing artistic talent. The logo of ArtSy(nc) (illustrated in Figure 19) incorporates a sync illustration and displays it by using two paint brushes. Since we are really passionate about art, we included a little flame at the top of the paintbrush 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 in possible exhibitions and put it onto the packaging design.

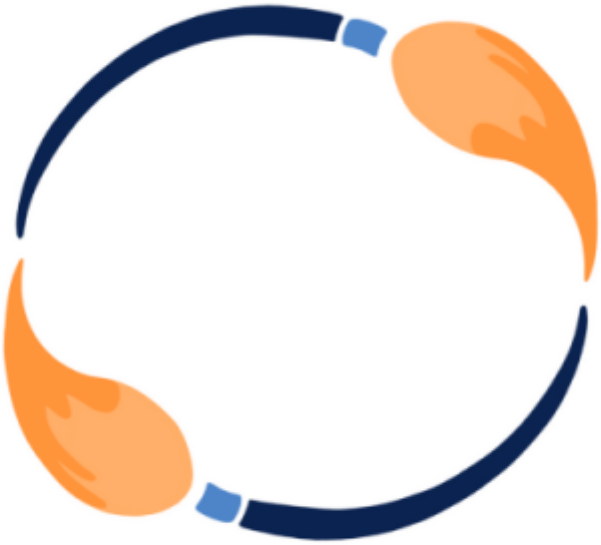

Figure 19: Logo

7.3.2 Color Palette

The color palette (illustrated in Figure 20) 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 20: color palatte

7.3.3 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 21 shows some of the wireframes, the full working file can be viewed here: **[Figma, 2024]**

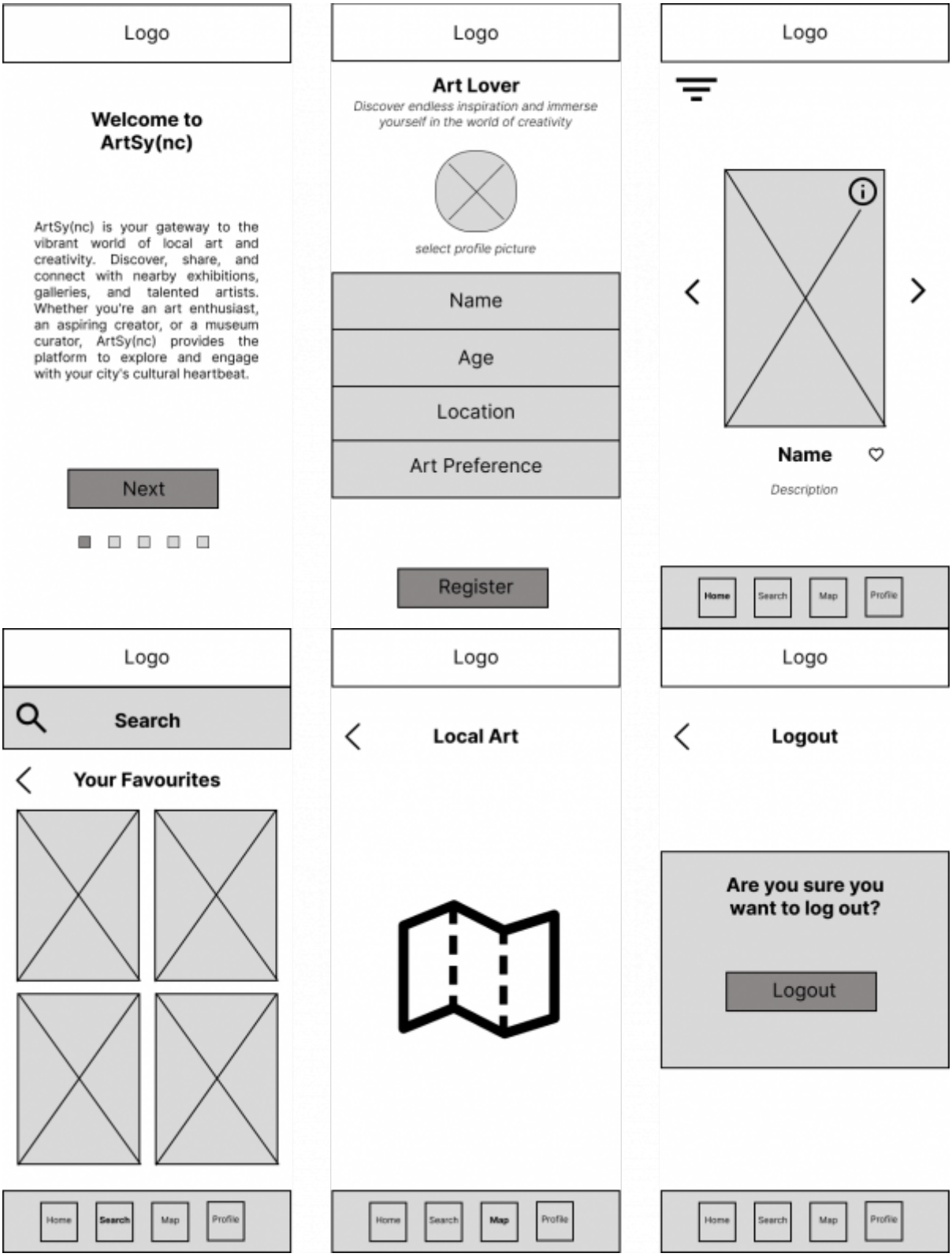

Figure 21: LoFi Wireframes

7.3.4 HiFi wireframes

The high-fidelity (HiFi) prototype provides a comprehensive visual representation of the platform's design and functionality. Building upon the foundational elements established in the LoFi prototype, the HiFi prototype refines and enhances the user interface, incorporating detailed design elements, interactive features, and realistic content. Through meticulous attention to aesthetics, usability, and user experience, the HiFi prototype offers stakeholders a tangible preview of the final product, facilitating feedback, validation, and iteration. This stage marks a significant milestone in the iterative

design process. Figure 22 shows some of the wireframes, the full working file can be viewed here: **[Figma, 2024]**

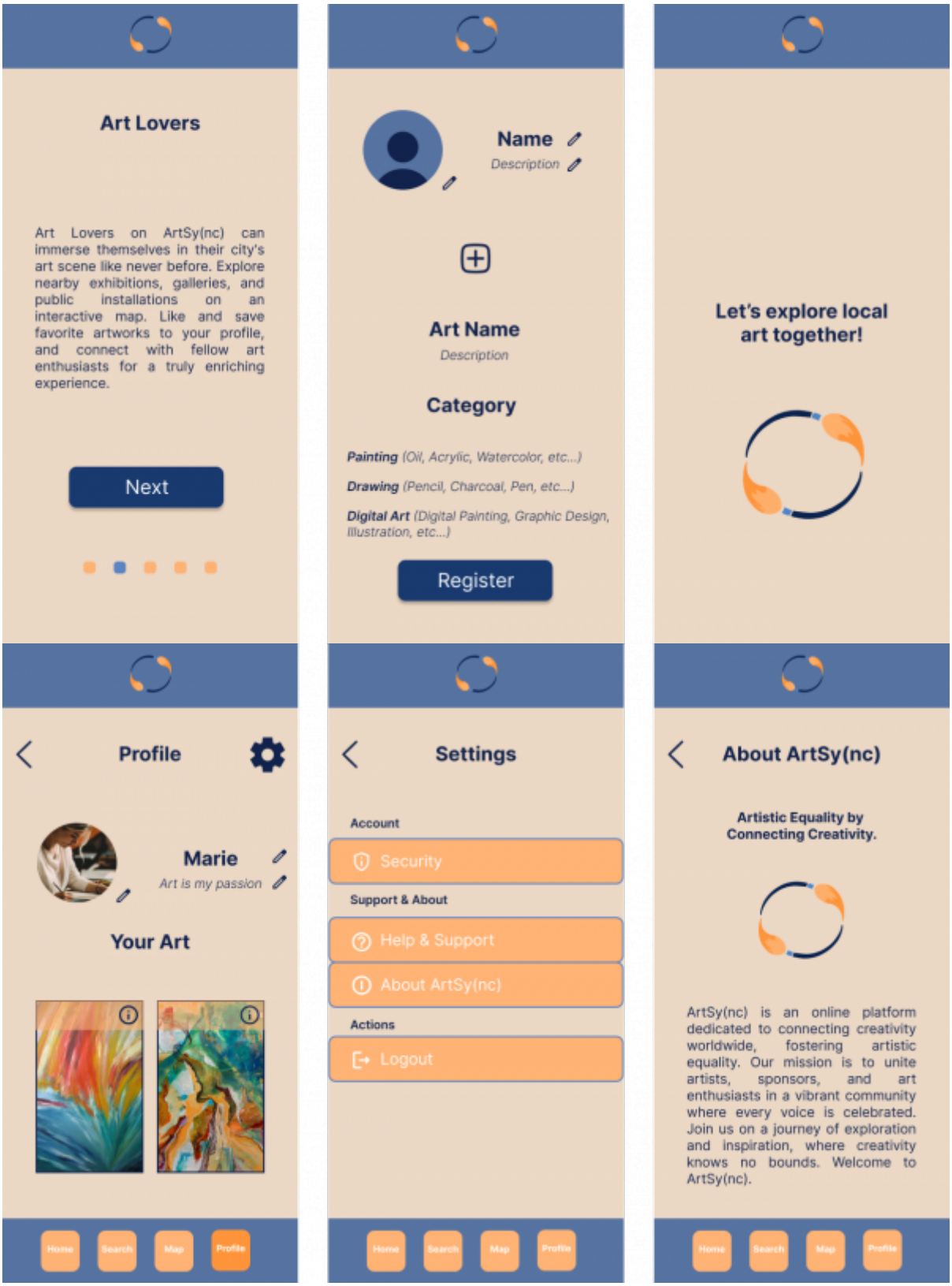

Figure 22: HiFi Wireframes

7.3.5 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. As you can see from Figure 23: We want to use steel for the outside of the box and UV-resistant glass for the window. Obviously, we want to secure the box by adding a lock. On Figure 24 and Figure 25 at the back of the box we have added a ventilation system to prevent the projector from overheating inside. On the side, as shown in Figure 26, we intend to place the QR code for our ArtSy(nc) app along with general information about digital art. This is aimed at educating individuals who are unfamiliar with the subject.

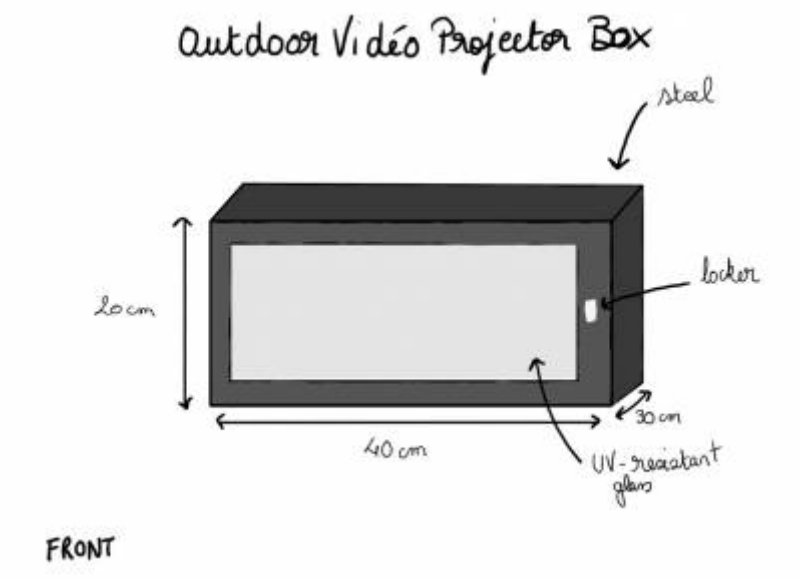

Figure 23: Box Drawing Front

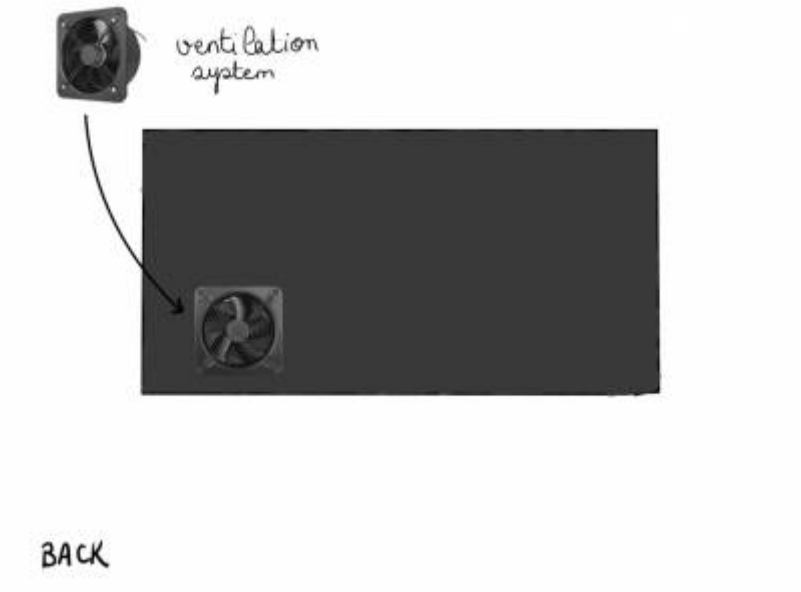

Figure 24: Box Drawing Back

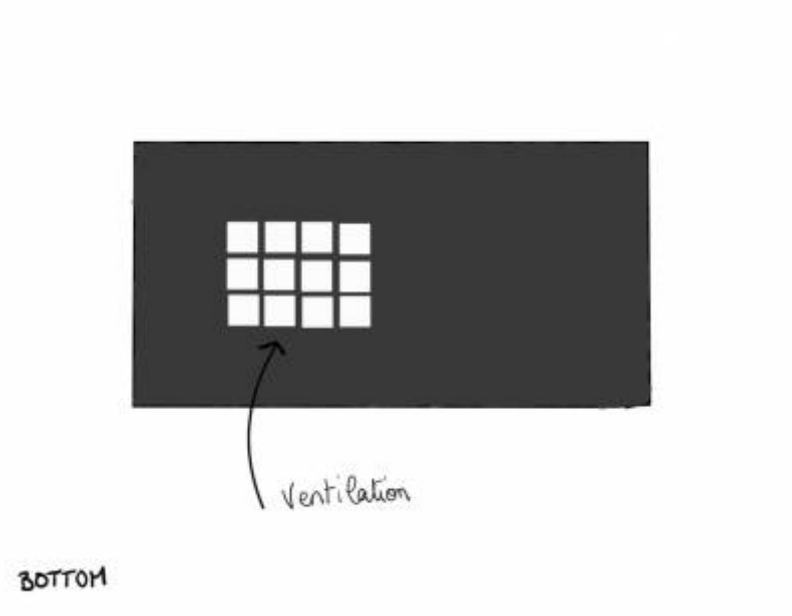

Figure 25: Box Drawing Bottom

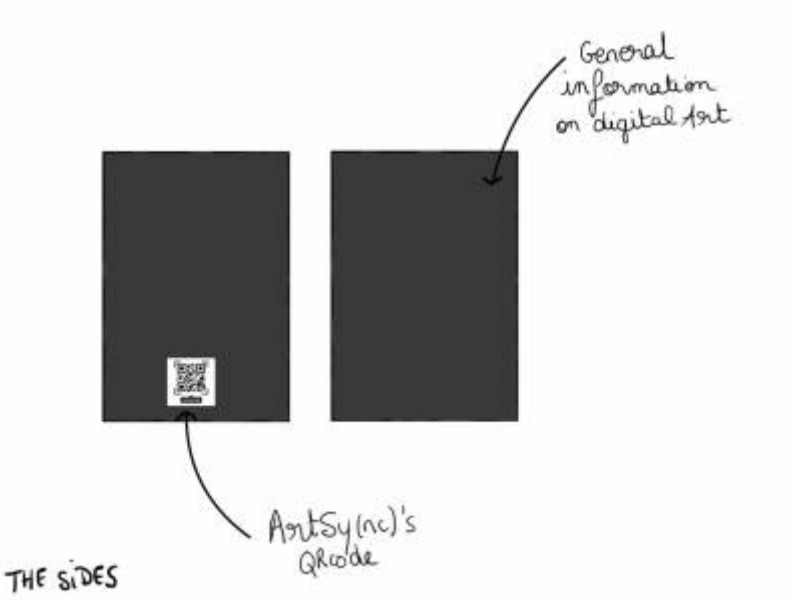

Figure 26: Box Drawing The Sides

We improved, illustrated by Figure 27, 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 holes for easy airflow. The door is now on the back. The lower panel is like a drawer so you can pull it out and can use the laptop while showing art.

Figure 27: Improved Box Drawing

7.4 Design

7.4.1 Structure

7.4.1.1 Projectorbox

We want to be able to show art anywhere in the city. But for this we need the right technology: a projector and a laptop. As we want to show it everywhere, the technology must be protected against everything: sun, rain and theft. A weather-resistant box that can be locked is constructed as protection.

However, this box only has the task of protecting the box. It should not draw attention to itself, it should not be noticed at all. The public should be able to concentrate on the digital art. For this reason, the box is kept very simple. It is also not connected to the app. They are completely independent of each other.

A welded assembly should be constructed first, as this is the best way to protect the technology from rain. In addition, stainless steel is easy to weld. However, this is not ideal for assembly. Therefore, individual parts are now bolted together. Another advantage is that broken parts can be replaced more easily and the entire box does not have to be replaced. To keep the number of parts to a minimum, the frame is folded and therefore only consists of two parts (Figure 28). Each of it is screwed together with five screws on the long side and three screws on the short side. A large number of screws are used to close the box tightly. The metal also overlaps due to the edging and liquids are prevented from penetrating.

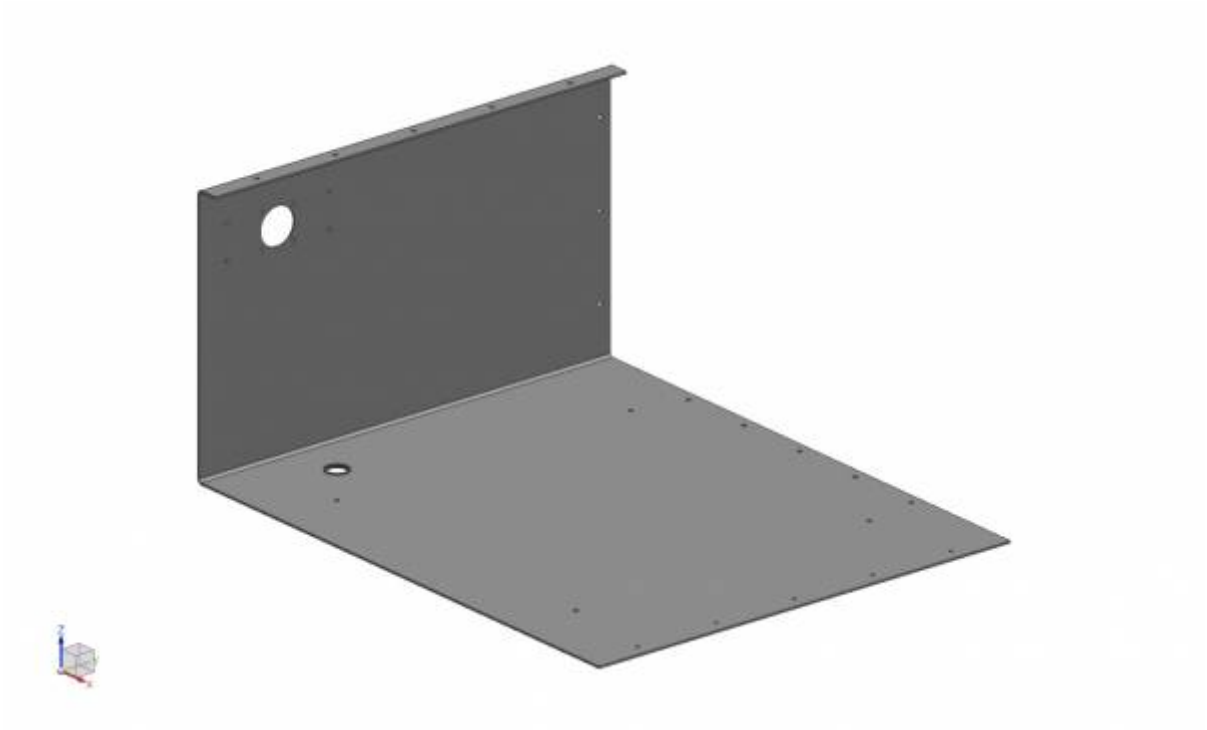

Figure 28: Folded Side

The front consists of a welded assembly and the Plexiglas. The front is fitted with four tabs (Figure 29). They are each welded from the inside. No great force is applied here, so it is sufficient to weld from one side without expecting distortion. Rubber seals are also glued in between the flaps to completely seal the box. The tabs are exactly the same on the opposite side. This facilitates material procurement and also material processing. The Plexiglas is also glued in.

Figure 29: Front

Two panels are installed in the box. The upper one is for the projector and is simply screwed to angle irons. The lower one is for the laptop and runs on rails, which are also shown in SolidWorks in simplified form as angle irons. The plates are made of aluminum because it is very light. They are also provided with many holes to allow good air circulation. Additionally, there are also two large slots on

the right-hand side for the cables.

To prevent the box from overheating, there are small 12 V fans at the bottom left and top right. They are protected from the outside by a grille.

The bottom part of the box is for cable management. Three sockets are required here: Beamer, laptop and fans. The cables have been neglected in the 3D model for simplicity. A transformer is also installed at the bottom, as the box is connected to a 230 V power source and the fans are only designed for 12 V. The transformer and the sockets have been indicated in the 3D model. A hole has been drilled on the underside for the external power supply. As this is laser-cut, edge protection (Figure 30) is used to prevent the cables from being slit.

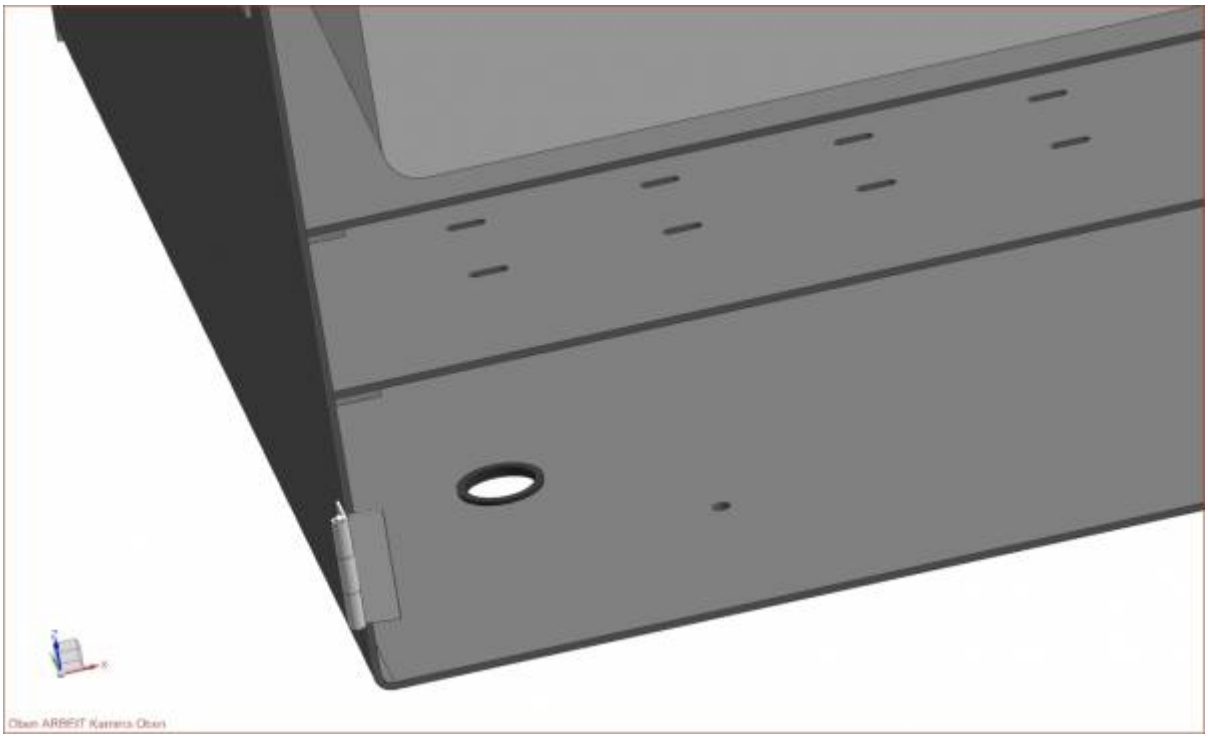

Figure 30: Edge protection

As the digital art is to be projected in all kinds of public places, there must be different ways of setting up the box. In our project, we have developed three: a stand for simple parks (Figure 31), rubber feet for cafés (Figure 32), for example, and a construction to hang the box on a pole (Figure 33).

Figure 31: Stand for parks

Figure 32: Stand for parks

Figure 33: construction for a pole

The box has been designed so that you can quickly switch between the options. There are four holes on the underside of the box (Figure 34). Either the rubber feet can be screwed on directly or a plate, which is used as a base plate for the other two options. The base plate is square. This has the advantage that the projector can be aligned exactly as it is needed. This is particularly important for the construction of the mast. The projector can project to the front, left and right and is therefore very flexible in terms of position.

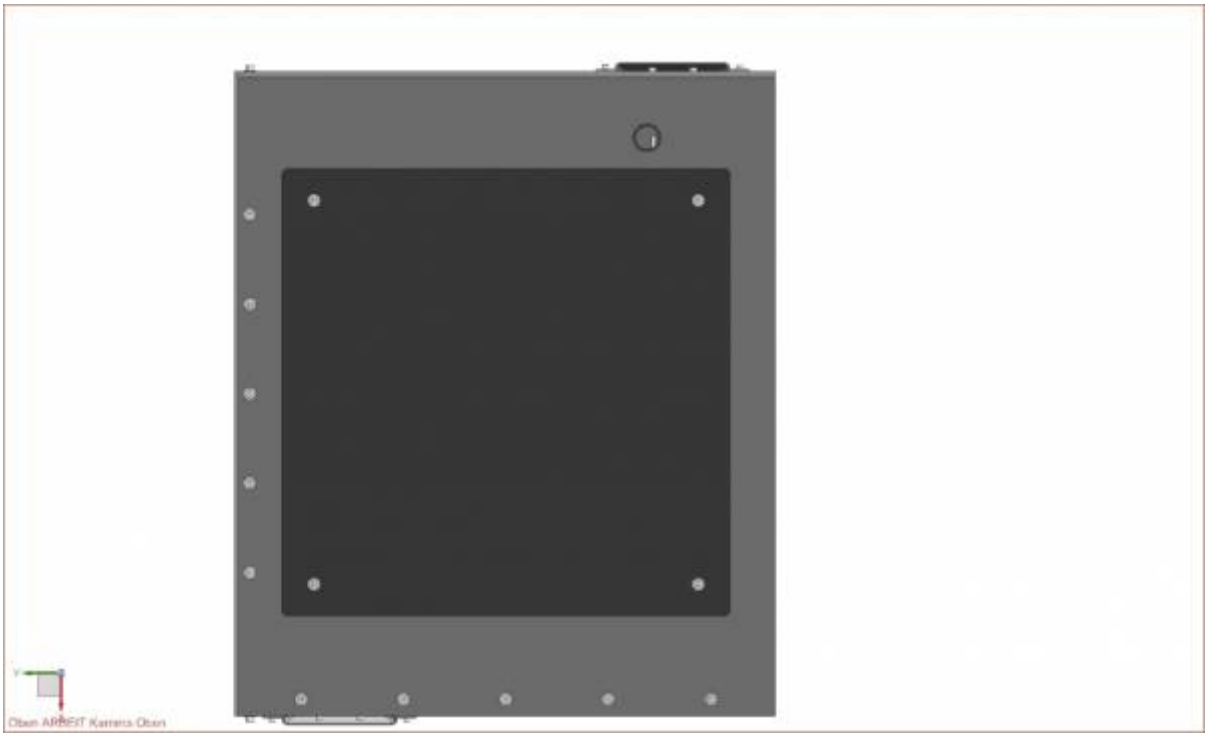

Figure 34: Bottom with four holes

The brackets are both made entirely of stainless steel and are both welded assemblies. This is not a problem here, as everything is made from one material and therefore does not pose an obstacle to recycling. Overall, care was taken in the design to use the same standard parts wherever possible,

which makes procurement, production and assembly much easier. Although the screw lengths vary, M4 screws were almost always used and the same washers and nuts can always be used regardless of the length. M3 screws are used for the fans due to the holes in the fans. Washers are not used here due to the very low force exerted.

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

7.4.1.2 Materials & Components

Materials

Why did you choose these materials?

Plexiglas is a transparent plastic material, also known as polymethyl methacrylate (PMMA). It is often used as an alternative to glass because of its lightness, impact resistance and transparency. Plexiglas is made from acrylic polymers and is available in a variety of thicknesses and finishes, including transparent, opaque, colored and even reflective. It is widely used in applications such as shop windows, illuminated signs, security windows, furniture, vehicle windscreens, aquariums and many others.

We chose to use Plexiglas for the glass in our box to protect an outdoor video projector for several important reasons. Firstly, Plexiglas is extremely weather-resistant. Its robustness makes it suitable for outdoor use, where it can withstand harsh weather conditions such as hailstorms. Unlike glass, Plexiglas does not break easily on impact, making it a safer choice for protecting the projector from potential impacts caused by objects or adverse weather conditions. Plexiglass also offers high optical transparency. This optical clarity means that the projector will always be able to project effectively through the material. What's more, unlike glass, Plexiglas does not yellow over time, guaranteeing consistent visual quality for video projection. Another key advantage of Plexiglas is its UV resistance. This is particularly crucial when a projector is used outdoors, where it is exposed to the sun. Plexiglass will protect the projector from damage caused by UV rays, extending its life and preserving its image quality. Finally, plexiglass is lighter than glass, making it easier to transport and install the protective box. Despite its light weight, plexiglass is more durable and stronger than glass, offering superior protection to the video projector without adding excessive weight to the structure.

In summary, the choice of Plexiglas for the glass in our outdoor projector protection box is based on its weather resistance, high optical transparency, UV resistance and light weight, providing an effective and reliable protection solution for our outdoor video equipment.

Stainless steel, also known as stainless steel or stainless steel, is a metal alloy composed mainly of iron, chromium, nickel and possibly other elements such as molybdenum. The material is renowned for its resistance to corrosion and oxidation, making it a popular choice for a variety of applications in the construction, automotive, aerospace, food and many other industries.

We have chosen stainless steel as the material for our outdoor projector protection box due to its numerous advantages, including corrosion resistance, durability, modern aesthetics, and environmental sustainability. Firstly, stainless steel offers excellent corrosion resistance, making it an ideal choice for outdoor environments exposed to weather conditions. It can withstand moisture, rain, and temperature changes without corroding or rusting, ensuring reliable and long-lasting protection for the video projector against outdoor elements. Additionally, its exceptional durability allows it to resist impacts, scratches, and daily wear, ensuring a long lifespan for our outdoor installations.

Stainless steel requires minimal maintenance and retains its new and clean appearance even after prolonged use, thereby reducing long-term maintenance costs. Furthermore, the modern aesthetic appeal of stainless steel complements various decors. Its shiny and clean appearance adds an elegant touch to our outdoor installations, creating an attractive and professional environment. Lastly, stainless steel is also a sustainable choice environmentally. It is a recyclable material that can be reused at the end of its useful life, reducing its environmental impact and contributing to the conservation of natural resources.

In summary, the choice of stainless steel for our outdoor video projector protection box is based on its corrosion resistance, durability against impacts and scratches, modern aesthetics, and environmental sustainability. These features make stainless steel an ideal material to ensure reliable and aesthetically pleasing protection for the video projector in an outdoor environment while adopting an environmentally conscious approach.

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 35), 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.

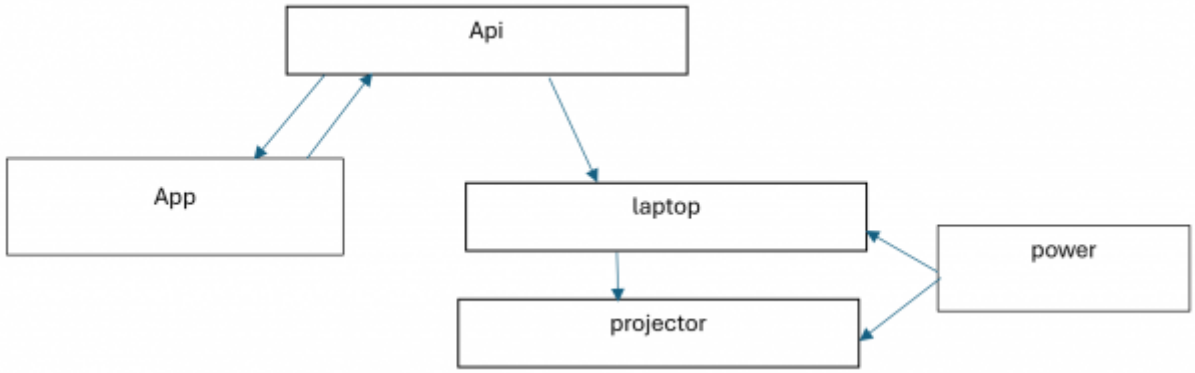

Figure 35: Black box Diagram

7.4.2.2 Software

In the following Table 29 the user stories are described

Table 29: 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

As A(n)	I Want	So That
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 36, 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 **[Tom Greenwood, 2024]**. Additionally, the database design is illustrated in Figure 37:

1. **Frontend Design Technologies**: Table 30
2. **App Design Technologies**: Table 31
3. **Backend Design Technologies**: Table 32
4. **Backend Database Technologies**: Table 33

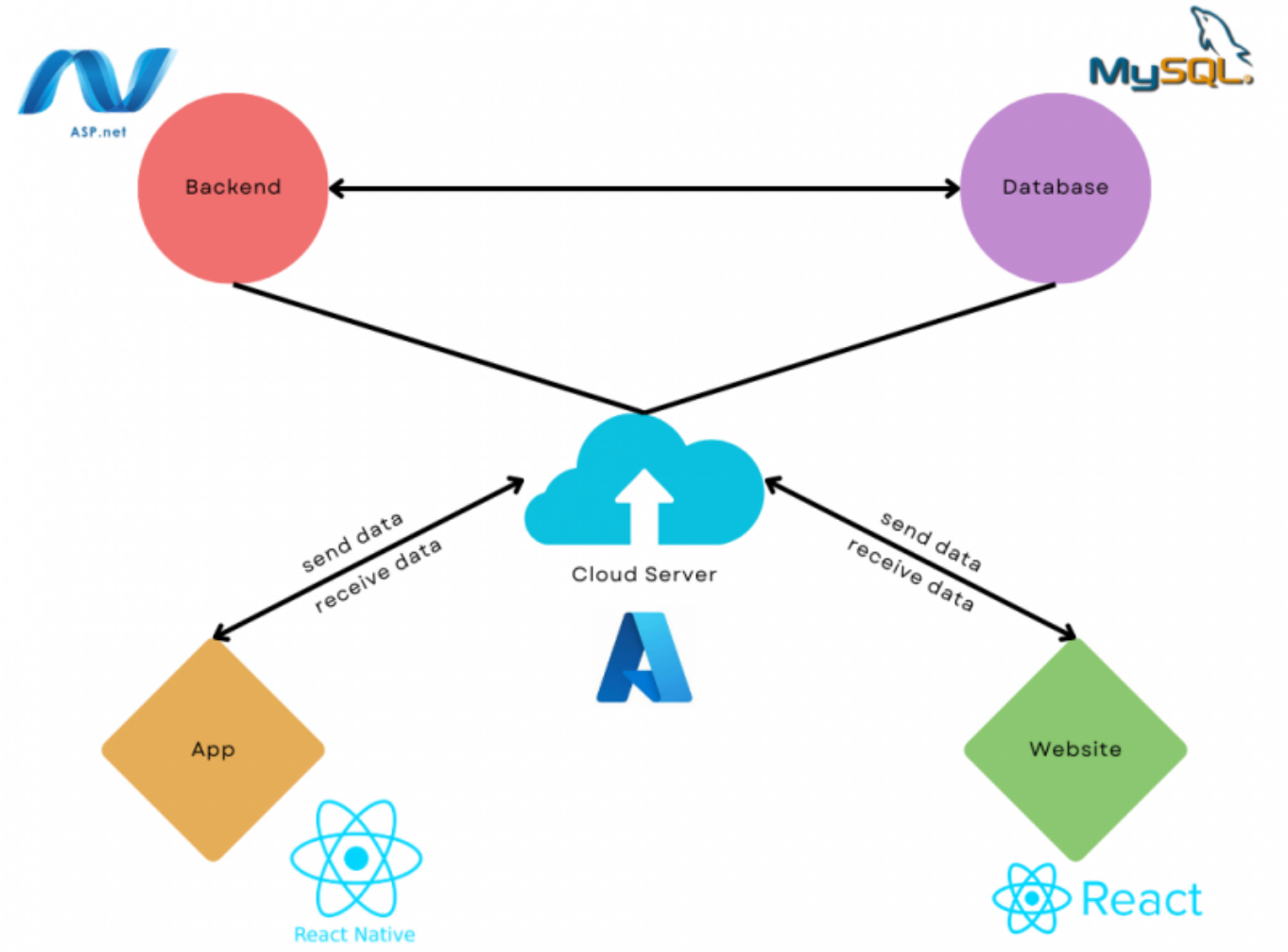

Figure 36: Webservice system

Table 30: 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
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 31: 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
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 32: 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
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 33: 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

Name	Type	Performance	Ease of use	Scalability	Flexibility	Cost	Security	Compatibility	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
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

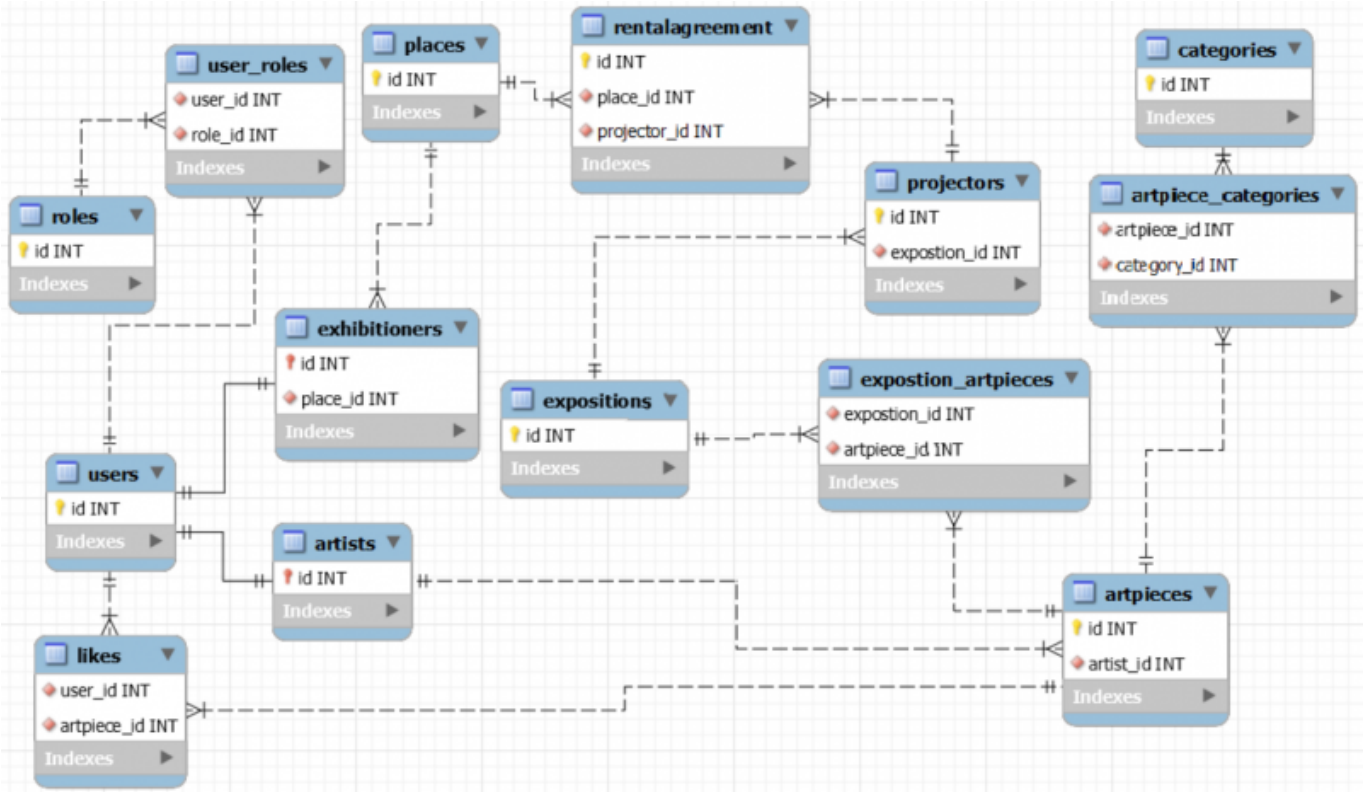

Figure 37: Database Design

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 **[Digital.gov, 2024]**.

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.

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