



UNIVERSITY OF THESSALY
SCHOOL OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Applying Design Thinking to Sustainability

Diploma Thesis

Athina Tsiarda

Supervisor: Harikleia Tsalapata

August 2024



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ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ

ΠΟΛΥΤΕΧΝΙΚΗ ΣΧΟΛΗ

ΤΜΗΜΑ ΗΛΕΚΤΡΟΛΟΓΩΝ ΜΗΧΑΝΙΚΩΝ ΚΑΙ ΜΗΧΑΝΙΚΩΝ ΥΠΟΛΟΓΙΣΤΩΝ

Εφαρμογή της Σχεδιαστικής Σκέψης στη Βιωσιμότητα

Διπλωματική Εργασία

Αθηνά Τσιάρδα

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Diploma Thesis

Applying Design Thinking to Sustainability

Athina Tsiarda

Abstract

This thesis investigates how we can apply Design Thinking to address the challenges and problems of food sustainability. Focusing mainly on empathy, research, ideation and originality, Design Thinking is an effective solution to issues related to sustainability both in the food sector as well as in water, air, and energy. This study includes a literature review on the issue of global food waste as well as a thorough explanation of the Design Thinking methods that we used to develop our final solution, a platform that helps users and consumers live healthier and more sustainable lives.

Keywords:

Design Thinking, sustainability, ideation

Διπλωματική Εργασία
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Αθηνά Τσιάρδα

Περίληψη

Αυτή η διατριβή διερευνά πώς μπορούμε να εφαρμόσουμε τη Σχεδιαστική Σκέψη για να αντιμετωπίσουμε τις προκλήσεις και τα προβλήματα της βιωσιμότητας των τροφών. Εστιάζοντας κυρίως στην ενσυναίσθηση, την έρευνα, τον ιδεασμό και την πρωτοτυπία, η Σχεδιαστική Σκέψη είναι μια αποτελεσματική λύση σε ζητήματα που σχετίζονται με τη βιωσιμότητα τόσο στον τομέα των τροφίμων όσο και στο νερό, τον αέρα και την ενέργεια.

Αυτή η μελέτη περιλαμβάνει μια ανασκόπηση ερευνών για το θέμα της παγκόσμιας σπατάλης τροφίμων καθώς και μια λεπτομερή εξήγηση των μεθόδων της Σχεδιαστικής Σκέψης που εφαρμόσαμε για να αναπτύξουμε την τελική μας λύση, μια πλατφόρμα που βοηθά τους χρήστες και τους καταναλωτές να ζουν πιο υγιεινά και πιο βιώσιμα.

Λέξεις-κλειδιά:

Σχεδιαστική Σκέψη, βιωσιμότητα, ιδεασμός

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Abbreviations

DT	Design Thinking
EPA	Environmental Protection Agency
SDG	Sustainable Development Goals
SOI	Sustainability-oriented Innovation
UI	User Interface
UN	United Nations

Chapter 1

Introduction

1.1 General

Food is absolutely necessary for our well-being—it directly affects our bodies both physically and mentally. Essential nutrients like vitamins and minerals must be present in what we eat in order for us to be healthy; therefore, good eating habits are very important. At the same time, adopting methods of eating that will be carried on continuously is a way of taking care of ourselves holistically while still ensuring environmental sustainability. The world is facing a lot of problems due to climate change, increase in population, and depletion of resources which need to be solved as a matter of urgency. The way forward is to put up systems that can produce sustainable food. For food security and to cut on environmental pollution, it is important to adopt methods of food production and consumption that will not harm the surroundings. The whole process includes looking at everything in the food cycle and seeing how they can be sustainable. It is essential because we want to stay away from things that can hurt us or the earth. For example, we should choose to eat things that were grown and made using methods that did not harm the environment like conserving soil fertility through sustainable farming practices which include water and air quality too. Then we also need to realize the weight of packaging materials toward nature and pick those that can decompose easily. Our health and the natural world could benefit if we make eco-friendly practices part of what we do every day about food. When we decide to eat healthy by choosing items that have been sourced and produced sustainably, we decrease our chances of getting ill with chronic diseases like diabetes, heart disease, or obesity – while also taking care of this earth[6]! These can include everything from organic farming or agroecology through reducing food waste[7]

down the line right up until encouraging more people towards plant-based diets; not only will such actions help restore biodiversity, they'll improve soils too, but what's more important is that it'll cut greenhouse gas emissions as well create fairer working conditions all around. Changing over to sustainable methods of production needs to be done in a holistic way, which means using science along with new technologies and involving communities at every stage. Furthermore, paying attention to how and what we eat concerning the environment can improve mental health and elevate energy levels. When our bodies get certain sustainable food ingredients, they are able to perform at their best because these elements serve as the fuel that is required; on the other hand, feeling like you are doing something good for our planet while choosing to eat healthy may bring inner peace and make one feel fulfilled. Therefore, healthy eating aligned with sustainable food systems offers a radical approach to building a more robust and fair future. This means if we start doing things right now it will be possible for us to save the earth from destruction. The only way out is using things that can decompose because if not so, a lot of trash will be collected and burnt hence polluting the air which has adverse effects on our health.

1.2 Design Thinking

Description of design thinking:

Design Thinking (DT[8]) is an innovative problem-solving approach that prioritizes creativity, empathy, and experimentation. It is a method that is directly related to the field of programming and Computer Engineering, as it prepares the software design process so that the final product or service is as targeted and personalized to the user as possible. It utilizes a diverse array of tools and strategies to tackle intricate challenges by blending analytical and creative thinking. DT comprises several essential phases, including conceptualization, experimentation, and exploration, with a focus on gaining profound insights into the problem, producing multiple potential solutions, and testing these ideas with users and other stakeholders. Through this process, design thinking facilitates the development and sharing of new knowledge and opportunities that were previously unknown or overlooked. It's a human-centered approach that encourages collaboration and a deep understanding of user needs, leading to more effective and impactful solutions.

The design thinking methodology[9] encompasses a series of crucial steps. It begins with

empathizing with users to deeply understand their perspectives and needs. Next, it involves identifying the core problems that need to be solved. Following this, the process moves into the ideation phase, where many creative ideas are generated. These ideas are then transformed into physical prototypes to visualize potential solutions. Finally, these prototypes are then put through an extensive testing procedure to gather valuable feedback and insights, which inform further iterations and improvements. These core design thinking ideas provide a solid framework for addressing difficult problems and encouraging creativity and are being analyzed below:

Empathy: This stage of design thinking is a fundamental step that focuses mainly on understanding the user's needs, experiences, habits, and emotions. The reason this phase is so important is because it creates the foundations for the whole design thinking process so that the resulting solutions are exclusively designed and focused on the needs of the users. First, we try to gain a direct view of what is happening in their lives, what challenges they face every day and their motivations. Then we attempt to see things from the user's point of view in order to adopt a different visual perception of situations and develop a sense of empathy and a connection with them. Finally, it is equally important to identify both the needs of the users as well as their frustrations and the points that make it difficult for them.

Identification: The recognition stage is the phase during which, after we have collected all the data and information from the empathy stage, we try to arrive at a clear definition of the problem. The reason this step is so important is because it lays the groundwork for developing the next steps of thinking, ideating, and developing the solution. First, we have the synthesis of the information and conclusions that emerged during the empathy stage so that the basic patterns and ideas rise. Then we define the problem and formulate it in a clear and concise way, which includes all the basic needs and problems of the users.

Ideation: During the ideation stage, the three main characteristics that describe it are innovative ideas, improvisation and creativity. The main goal of this phase is to generate as many possible solutions and ideas as possible to the problem we defined in the very previous stage. The purpose is to have a very large variety of ideas that capture all aspects of the problem, and not so much their quality, before narrowing down to the most likely to be implemented. So starting out, we try to generate and record as many ideas as we can think of and then, we try to focus on more innovative ones and develop our creativity by thinking outside the box.

Prototyping: The prototyping stage of design thinking is the stage during which we utilize

all the ideas we produced in the ideation stage in order to modify them into models that we will test. This step is extremely critical in order to thoroughly examine the solutions we have found, whether they are feasible, whether improvements are needed, and if this happens, to carry out repeated tests. To make these happen, we started by implementing the best ideas for trial and testing. Through the use of prototypes we evaluate the usefulness of these ideas and seek comments and feedback for possible improvements, changes and upgrades.

Testing: The testing stage is the stage during which we use the prototypes we have created in order to test them and understand users' experiences, tastes, and discomforts. Through this information, it is possible to find out what is lacking in the prototypes, their limitations or areas which can be bettered. The prototypes are constantly redesigned and improved following these recommendations until they meet all needs.

1.2.1 Human-centered design

Businesses trying to enhance the customer experience and become more customer-centric seem to find that design thinking provides a solid foundation. Design thinking centers innovation and problem-solving around the user, closely analyzing consumer wants and needs, and testing and experimenting with solutions to refine and adapt them. Effective use of design thinking requires an adherence to a few cultural principles, such as a commitment to customer-centricity, acceptance of change as the standard, and the ability to adapt quickly. These foundations enable organizations to implement the essential stages of design thinking: identifying opportunities and problems, generating creative alternatives, rapidly and affordably prototyping possible solutions, testing concepts with users through co-creation, and empathizing through ethnographic research. If the customer experience is to be a true undoubted advantage, design thinking must transform both external customer interfaces and internal operations and processes. By recording and monitoring the tasks of employees that need to be done as thoroughly as the external customer experience, organizations, and companies can implement this human-centered[10] methodology holistically. The result of this approach is high consumer experiences, complete satisfaction, and trust for all employees and interested customers. However, design thinking, which, as we mentioned, is directly connected to entrepreneurship, also helps significantly in learning processes. By placing students at the center of the process, design thinking offers learning and development professionals the opportunity to be creative and innovative and produce effective solutions. Design thinking is

therefore directly linked to the management of the overall experience in a business, and offers an approach that puts the needs of users at the core in a way that allows businesses to continuously improve and adapt, offering a memorable interface to both functional, social, and emotional level. Essentially, the customer-centric approach of design thinking begins by investigating why, when, and how each user/customer wishes to connect with the company in order to reach the desired result. By applying the methods of design thinking, businesses have the ability to reduce time, effort, cost, and other difficulties that may occur, to finally arrive at the product or service desired. Ultimately, this creates lifelong relationships between companies and their customers.

1.3 Structure of thesis

In the second chapter, the investigation of the problem of food sustainability and waste is presented, and the process of understanding the real needs of users is introduced. In the third chapter, combining the information about the user and his needs, we define the problem we are called to solve. In the fourth chapter is the interview process, which is based on empathy, and helped us create and describe the profile of our target group. In the fifth chapter, the ideation process is developed in order to transform the user's problems into creative and feasible solutions. In the sixth chapter, brainstorming is analyzed through four different activities of Design Thinking to generate as many original ideas as possible. The seventh chapter analyzes the process of evaluating all the ideas produced in the previous steps through categorization and design guidelines. The eighth chapter describes the prototyping process, during which the potential solution is descriptively developed, the user's journey while using this solution, and the testing of our prototype with random users to get feedback. The ninth chapter finally presents the solution of the application for sustainable shopping, in detail, as well as the conclusions of the process and future improvements of the application.

Chapter 2

Problem Investigation

2.1 Description of the problem

2.1.1 Food Sustainability

What is a sustainable food system?

A food system that prioritizes food safety and nutrition is called sustainable. The system is divided into several stages, the first of which is the food processing stage, during which the food is prepared and then delivered to the customer. Nowadays the current systems are not sustainable since they do not satisfy the previous requirements. Approximately 735 million individuals[11], or 9.2% of the global population, were undernourished in 2022 (122 million more than in 2019). Additionally, these unsustainable practices have contributed drastically to climate change and are responsible for 1/3 of greenhouse gas emissions as well as 70% of freshwater consumption worldwide. The elements that determine whether a system operates according to the rules of sustainability are the following[12][13]:

- Economic sustainability[14]: remains profitable all along.
- Social sustainability: has great benefits for society.
- Environmental sustainability: has a favorable impact on the environment.

A food system must be able to demonstrate resilience and adaptability in order to be considered sustainable. Since unforeseen events and obstacles can occur, the system should be built to adapt quickly to these changes. This calls for integrating resilience and adaptability into the system's socioeconomic and biophysical components.

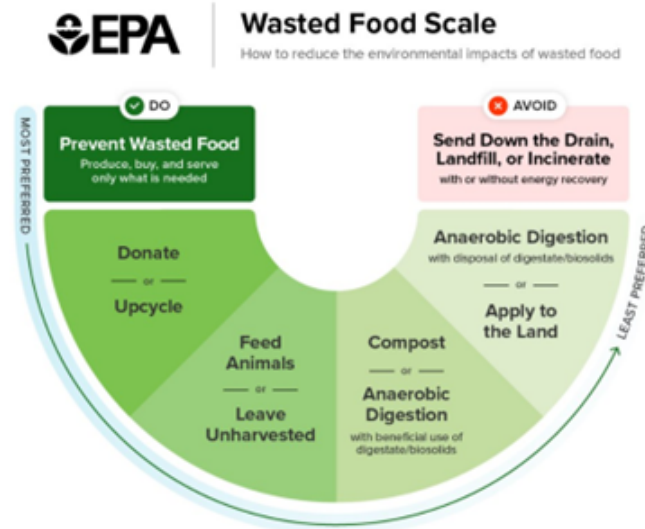


Figure 2.1: Wasted Food Scale, How to reduce the environmental impacts of wasted food[1]

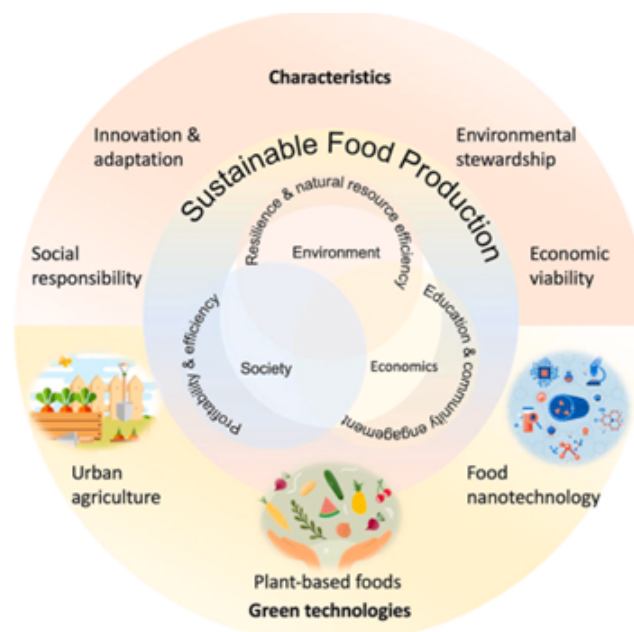


Figure 2.2: Characteristics of Sustainable Food Production[2]

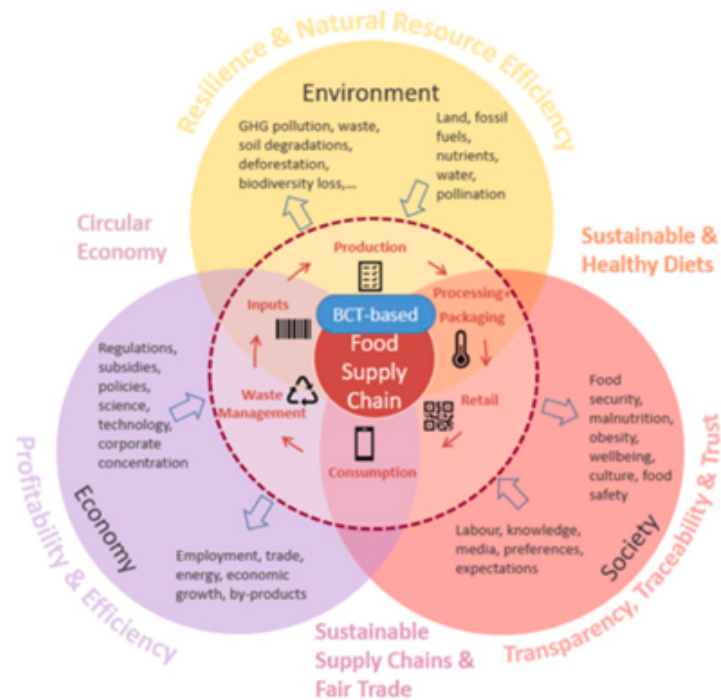


Figure 2.3: Framework of the design of a sustainable food production system[2]

2.1.2 Define the problem

It is a fact that overpopulation, urbanization, the projection of wrong consumer behavior, and the climate crisis have negatively affected all food systems. Therefore, there is an urgent need to redefine the practices used in these existing systems in order to acquire a more sustainable character.

Half of all workers worldwide are employed in the agri-food sector, which is the largest economic sector in the world[15]. Sadly, poverty, lack of access to political representation, infrastructure, work opportunities, and education are issues that small-scale farmers and fishermen must deal with. Food insecurity is still primarily caused by poverty, which therefore poses a challenge to food producers globally.

The humanitarian injustices in the food system cannot be resolved by increasing food production. More than 795 million people are undernourished even though more than enough food is produced.

Throughout recorded history, most of the world's food has come from just nine plant species, with half of all calories coming from rice, wheat, and maize. 75% of the calories that people eat comes from a combination of potatoes, barley, palm oil, soy, and sugar. This emphasizes how diverse agriculture is necessary to guarantee food security in the future.

The concentration of power in the world's food industry is causing increasing concern. A single company's bacteria and enzymes are used in over 50% of cheeses, four businesses control the majority of crops, and one kind of pig dominates the world's pork production. The Cavendish banana variety leads the world's trade in even though there are 1,500 variations. The food industry's diversity and environmental challenges require immediate response.

Also, the issue of excessive consumption has greatly contributed to the lack of essential foods, which in turn causes the malnutrition that is common in several third-world countries. The wealthiest countries are the primary initiators of this phenomenon, while the children of the poorest ones are the main victims. Both malnutrition and reduced nutrient intake can lead to stunted growth.

2.1.3 Main Challenges of Food Production

The next fifty years will certainly bring many kinds of difficulties that the world's food production system will certainly face.

- Climate change
- Limited agricultural land
- Water scarcity
- Slow productivity growth
- Reliance on fossil fuels
- Increased food consumption

All of the above[16] are some examples of these challenges.

It has frequently been suggested that one of the most important strategic approaches for businesses to support sustainable development is sustainability-oriented innovation or SOI. However, because the corresponding products must simultaneously satisfy environmental, social, and economic objectives, the creation of SOI comprises a relatively complex enterprise. A wide range of stakeholders must be integrated, the relevant innovation scope must be defined, and related user needs must be well understood. These are only a few of the significant obstacles inherent in SOI development in businesses.

2.1.4 What Can We Do About the Global Food Crisis?

As the SDG 2023 Progress Report pointed out, it is urgent to find a solution and take appropriate measures, through investment in sustainable agricultural crops, in order to transform existing food systems into more sustainable ones, and thus eliminate the differences that exist to ensure food safety worldwide. According to the Secretary General's report on UN Food Systems, changing our food systems is essential to rescue the Sustainable Development Goals, and therefore include these goals into worldwide policy agreements, conversations, and ambitions.

Overall, the triple bottom line idea, which emphasizes social responsibility, environmental sustainability, and economic viability[17], is one that many businesses embrace. This idea facilitates interchangeability, enabling companies to make up for deficiencies in one area by investing in another. However, the public frequently misunderstands social justice, animal welfare, fair work, local farming, organic food production, and the definition of "natural." This also applies to food sustainability. Whatever the definition, food sustainability refers to producing adequate food given the availability of nutrients, water, fertile land, and a suitable climate to support the global population.

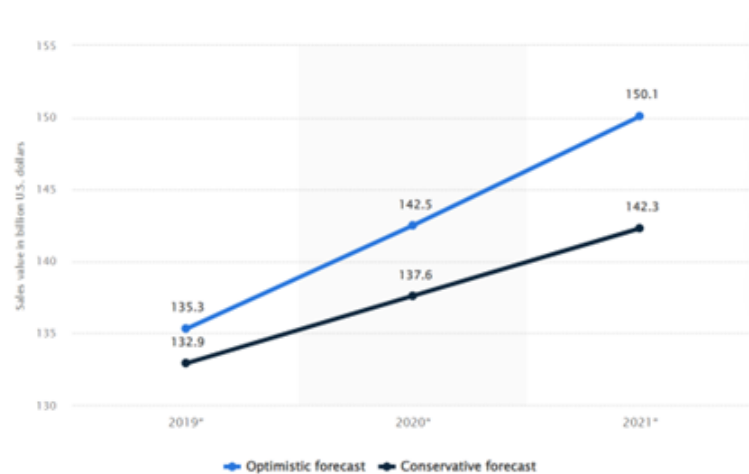


Figure 2.4: Projected sales value of sustainable products in the United States from 2019 to 2021[3]



Figure 2.5: Sustainable Development Goals[4][5]



Figure 2.6: The Swift Wheel: Changing Consumer Purchasing[5]

2.2 Identifying Correlations

In order to understand the different aspects and sides of the problem in relation to the social environment and the wants and needs of the user, we implemented the following activity called "Identifying Correlations", during which we recorded three ideas for each of the following associations:

Ideas related to the problem

- Greenhouse gas emissions: During the process of food production, especially from animal husbandry, significant amounts of greenhouse gas emissions are noted, which gradually lead to climate change.
- Water scarcity: Most quantities of fresh water are used in agriculture, and unsustainable practices during this process can pollute and completely deplete water sources.
- Deterioration of soil health: The intensive methods applied in agriculture cause the depletion of nutrients found in the soil as well as its erosion, thus reducing both the productivity and the sustainability of agriculture.

Ideas related to the problem and people

- Consumer awareness: The largest percentage of people do not care about their eating habits, because they are not aware of the consequences of the choices they make both on the environment and on their health.
- Inadequate access to food: Despite the fact that there is a great sufficiency in food production, there is no equal distribution and due to the enormous waste, many people are on the verge of malnutrition.
- Farmers' lives: Small-scale farmers struggle to make ends meet due to economic instability and lack of access to sustainable agricultural inputs.

Ideas related to the problem and places

- Coastal areas: These areas can be easily affected by extreme weather phenomena such as sea level rise, and storms, and become a destructive factor for agricultural crops.
- Rural areas: These areas are directly affected by water scarcity, the destruction of soil nutrients, and the economic difficulties of agriculture.
- Urban areas: Cities are faced with the problem of food waste management as well as the urban heat island phenomenon, whereby the temperature in the center of urban areas is higher than in suburban and rural areas.

Problem-related ideas and feelings

- Concern: consumers are increasingly concerned about the impact of food production policies on the environment, climate change and their health.
- Disappointment: The feeling of disappointment prevails very often among consumers as many of the sustainable products in supermarkets are not affordable, while there is not even a large variety and many find it difficult to find them.
- Hope: People seem to be optimistic about movements towards a more sustainable way of life and innovative farming practices.

Ideas related to the problem and actions

- Local Markets: Supporting local markets and shops can help develop ecological farming practices and financially support local farmers so that they can further develop their production.
- Adopt sustainable eating habits: By following a more sustainable and healthy diet, where meat consumption is low, people can make a significant contribution to reducing the environmental footprint of food.
- Programs and campaigns: Through the organization of programs and campaigns to inform about the reduction of food waste, consumers can come into contact with innovations such as composting, food donation and learn to do a better meal preparation.

2.3 Shadowing

Another activity that will help us to understand the real needs of the users is "Shadowing". During this activity, we randomly selected a user and followed him throughout the day to observe his daily sustainability habits.

Participant profile

- Name: John
- Age: 35
- Occupation: Office Manager

- Location: Suburban area
- Lifestyle: Moderately active, commutes by car, limited awareness of sustainability practices

We noted during the day what his habits were and what schedule he follows:

Morning:

7:00 AM: John wakes up and gets ready to go for a run in the park near his house. He takes a reusable water bottle with him, showing an interest in his health and an environmentally conscious attitude.

7:45 AM: He chooses to eat cereal with milk for breakfast and puts a piece of fruit in his bag to eat later at work.

8:15 AM: He drives to work and notices on the road the rest of the people and some of his colleagues going to their jobs by bicycle or using the means, but he finds his car much more convenient.

Midday:

12:00 PM: He goes down to the cafe across from his work where he gets a coffee and a sandwich wrapped in plastic, preferring convenience over sustainability.

3:00 PM: Leaving the office, waiting for the elevator, he notices the recycling bins and a poster about composting but doesn't show much interest.

Evening:

6:00 PM: He cooks a precooked meal that he bought from the supermarket, and wishes he knew how to cook something tastier and healthier on his own.

7:30 PM: He's sitting on his couch scrolling through social media, and an ad that appears on the Instagram home page about reducing energy consumption at home catches his attention and he clicks to read it.

Summary: John exhibits a readiness to pick up new skills and adjust to more environmentally friendly habits throughout the day. The two main things he struggles with are convenience and ignorance. John may gradually make improvements to his lifestyle that will make it more sustainable, ecologically friendly, and healthful by implementing tiny, doable adjustments like meal planning, looking into alternate transportation options, learning about composting and upgrading his home with energy-efficient features.

2.4 “What does this person need?”

During this activity, we will try to envision a person in a store looking for sustainable food options. Thinking about this, we will imagine what the user’s needs might be in order to achieve food sustainability. Seven answers are being provided below:

- Find out about locally grown and seasonal products
- Determine the labels and brands of sustainable food
- Recognize the effects that his dietary choices have on the environment
- Plan his meals effectively to reduce food waste
- Opt for plant-based foods instead of dairy and meat, when feasible
- Encourage his neighborhood’s farmers and marketplaces
- Reduce the amount of single-use plastic by reusing bottles and bags

2.5 “What? How? Why?”

In this activity, we continued following the above hypothetical scenario, where a person is in a grocery store trying to find sustainable food options. Based on this scenario, we answered the following questions to better understand the demands and motivations of the user with respect to food sustainability so we can then create solutions that effectively address them.

What?

The user looks at the different products that exist on the grocery store’s shelves.

He reads the labels with the ingredients contained in every product that interests him.

Compares prices from different brands of similar products.

How?

The user takes his time to read the labels carefully.

The user has brought a reusable bag made of recyclable materials so as not to take the plastic ones.

The user is focused and thoughtful about the products he wants to buy.

Why?

The user wants to be sure if the products he’s going to buy will be mainly sustainable.

The user is interested and concerned about his health and the environment.

The user tries to balance the sustainability and affordability of the products.

In the next stage, we will try to understand the user by answering questions such as how the user does what they do, if it requires effort, and if the activity seems to be a negative or positive experience.

How does the user do what they do?

- The consumer closely examines and reads product labels to find information about sustainability.
- The user is focused and spends a lot of time without rushing.
- The user tries to arrive at the best option by cross-checking information from the labels and looking for the prices to be affordable.

Does it require effort?

- It takes effort to read all the labels and try to understand the ingredients and information listed.
- It requires more time than a simple trip to the market.

Does the activity seem to be a negative or positive experience?

- The activity is both a positive and a negative experience. While the user seems to be quite focused and concentrated on his goal of making a sustainable food choice, this process seems to be quite time-consuming and requires a lot of effort, a fact that can cause irritation and frustration to the user.

In the next stage, we will try to interpret the reason for which the user behaves in this way, to understand his motivations and intentions.

Why does the user do what they do in the particular way they do it?

- The user is interested in the protection of the environment and his health, therefore he values sustainability.

- He knows that the choices he makes every day with his shopping have a terrible impact on the environment, so he tries to be careful and informed to contribute to reducing the carbon footprint.
- The user wishes to contribute to all the efforts made, both collectively by organizations and individually, to preserve the environment.

Based on the above answers we came up with the following assumptions about the user, and then some design ideas emerged that we can think about and test in order to come up with a solution.

Hypotheses

- The user seems to be more motivated when it comes to a combination of both interest in preserving the environment and personal values.
- The user would find very helpful an app that could locate more economical and sustainable food options.
- The user would be greatly facilitated if there was an easier labeling system on the products so that he could identify the viable products with greater comfort and ease.

Design Ideas to Test

- Establish a guide in stores that will lead consumers to the products they want and give them information about them without requiring them to carefully read the product labels and details.
- Offer incentives and rewards to users when they choose sustainable products to motivate them and more and more consumers to adopt a more sustainable lifestyle.
- Creating an app that will scan products on the market and show them sustainability rates or suggest other sustainable options.
- Optimization of product labels so that it is clearer to be read by the common consumer, and the product can be easily identified as sustainable.

Chapter 3

Problem Definition

3.1 "How Can We..."

After we have carried out the process of researching the problem, we will try to combine the information we have collected and the conclusions we have drawn to reformulate the problem. At the same time, the process of innovative ideas that will lead us to choose our final solution will be facilitated.

Some of the main problems of the users seemed to be the affordability of the prices of sustainable products, the lack of information[18] and knowledge, and the limited time they have at their disposal due to the fast pace of life.

Redefining the problem:

"How could we..."

How could we design a system that would combine the affordability of sustainable products, and at the same time make them easy to locate for busy users?

"Who...What...Why..."

Who: The user is looking for sustainable products.

What: The user needs affordable prices on sustainable products without wasting a lot of time.

Why: Because the user needs immediate access to sustainable foods, at prices that he can afford and at the same time be able to be informed and acquire the necessary knowledge about sustainability.

In order to cover as many aspects of the problem as possible, we will rephrase the problem

in more detail below: Using the “How could we..” approach:

How could we design a shopping platform to make users’ lives easier that would offer sustainable products at affordable prices through a short time process?

How could we integrate technology into the daily life of consumers to give them the opportunity to be informed about sustainability issues, and to come into contact with new sustainable products that are budget-friendly, while saving time?

How could we collaborate with farmers and small-scale producers in order to organize information campaigns and strategies to shape the prices of the products so that they are accessible to the entire consumer community?

Using the “Who...What...Why...” approach:

Who: Users with limited free time in their daily lives.

What: They need an easy way to identify and select sustainable affordable food products.

Why: They lack time and available information to make environmentally friendly choices easily.

Who: Users who are meticulous about their shopping budget.

What: They need affordable prices and deals on sustainable food.

Why: Already existing sustainable foods and products are considered expensive and difficult to locate in all stores and markets.

Who: Environmentally conscious users with busy lives.

What: They need immediate access to sustainable products and concise and comprehensive sustainability information.

Why: They struggle to find time in their busy lives for accurate information and sustainable options.

Through this redefinition of the problem, we can better develop creativity for innovative and original ideas and solutions that will address all aspects of the problems such as the affordability of sustainable products, the lack of available time for users, and the accessibility of all sustainable goods.

3.2 “Why-How?”

To clearly define the different needs of users in a way that emphasizes an intermediate solution, we will use the following activity, where using “Why” questions will lead to more abstract answers while “How” questions will lead to more specific ones.

Step 1: Identify some basic user needs:

The user needs to understand how much his food choices affect the environment.

The user needs to reduce the amount of food waste in his home.

The user needs to have access to more affordable sustainable food options.

The user needs a community where he will be able to share knowledge, tips, and information for a more sustainable lifestyle.

The user needs easier ways to adopt sustainable and environmentally friendly methods in his daily life.

Step 2: Ask “Why” to each of the above needs:

Need 1: The user needs to understand how much his food choices affect the environment.

Why? Because users must make conscious decisions that are in line with their beliefs.

Why? Because users need to feel safe and confident that their choices have a positive impact on the environment.

Why? Because users want to feel that by choosing a sustainable way of life, they are participating in making a difference.

Why? Because they need to feel that they are serving a purpose with their efforts for a more sustainable life.

Need 2: The user needs to reduce the amount of food waste in his home.

Why? Because users need to save money.

Why? Because consumers need to reduce their environmental footprint.

Why? Because users must be more careful in the use and consumption of the goods.

Why? Because users feel responsible, useful, and conscientious.

Need 3: The user needs to have access to more affordable sustainable food options.

Why? Because users have a specific budget that they must maintain while simultaneously

trying to live sustainably.

Why? Because users have to find the balance between affordable prices and ethical limitations.

Why? Because users need to integrate sustainability into their daily lives without financial pressure.

Need 4: The user needs a community where he will be able to share knowledge, tips, and information for a more sustainable lifestyle.

Why? Because users need encouragement and motivation from others.

Why? Because users need to share knowledge and experiences.

Why? Because users need to feel a sense that they belong somewhere where the collective spirit and mutual understanding prevail.

Why? Because users need to connect with people who share the same concerns and strive for the same goals.

Need 5: The user needs easier ways to adopt sustainable and environmentally friendly methods in his daily life.

Why? Because users need easy and simple tips to incorporate sustainability into their busy lives.

Why? Because users need to see the benefits of their actions immediately.

Why? Because users need to feel that the sustainable way of life is something real and not impossible.

Why? Because users need sustainability to be integrated into their fast-paced lives naturally and easily.

Step 3: Ask “How” to each of the above needs:

Need 1: The user needs to understand how much his food choices affect the environment.

How? Providing comprehensive information about the origin of the products and their carbon footprint.

How? Giving users the option to compare similar products and how they affect the environment.

How? Providing users with a label system that will promote and display more sustainable products.

Need 2: The user needs to reduce the amount of food waste in his home.

How? Implementing a meal preparation system for the whole week.

How? Providing advice and tips for proper food storage and reuse.

How? Offering easy recipes for making the most of food.

Need 3: The user needs to have access to more affordable sustainable food options.

How? Promoting discounts and offers on sustainable products.

How? Establishing partnerships with local farmers and promoting their natural products.

How? Creating a guide to affordable and on-budget shopping for sustainable products.

Need 4: The user needs a community where he will be able to share knowledge, tips, and information for a more sustainable lifestyle.

How? Creating a group community online where users can share tips and experiences.

How? Organizing sustainability-themed meetings or webinars.

How? Creating a forum where users can share success stories and content about everyday sustainable habits.

Need 5: The user needs easier ways to adopt sustainable and environmentally friendly methods in his daily life.

How? Providing an application where users can find information and advice for a sustainable life.

How? Through notifications and messages daily as reminders for users to strive to achieve a “sustainability goal”.

Final definition of the problem: “How might we create an app that would assist users in minimizing food waste, connecting with a supportive community, accessing reasonably priced sustainable solutions, and easily adopting sustainable behaviors into their daily routines?”

Chapter 4

Interviews and User Persona

4.1 Empathetic Interviews

Empathy[19] is the most critical quality when asking someone to conduct a relaxed and comfortable interview. Therefore, it was very important to present a behavior during the interviews that would create an atmosphere of comfortable honesty and trust. So, to establish this, we initially emphasized being an active listener. This means maintaining eye contact throughout the interview, nodding, and using expressions such as “I understand you” or “I can relate to what you are saying” to show that we are genuinely interested in what the interviewee is saying. Also, with the main goal of validating his feelings, we tried to give space to the interviewee to express how he felt, avoiding judging him. In situations where we noticed that the interviewee might be showing frustration, we tried to comfort them by saying, “It sounds like you had a difficult experience and I appreciate you sharing that with me.” In addition, another way to achieve empathy was to incorporate open-ended questions, because these types of questions force the respondent to be open and discuss their most private thoughts and feelings. Throughout the interview, it was very helpful to focus on demonstrating our ability to remain positive and to offer frequent breaks at times when we noticed that the interviewee was occasionally uncomfortable. Moreover, we set boundaries from the beginning by showing respect for the interviewee and, if they felt uncomfortable, we tried to shift the topic, put them at ease and not force them to talk about anything they did not want to. At the end of the interview, we thanked the interviewee for their time showing continued empathy and appreciation for their person.

In developing the questions, we based our design on the following activities: “Roadmap”,

”Interviewing with the goal of empathy”, and ”Color, promote and reflection”.[20]

”Roadmap” The roadmap played a significant role in analyzing the interview process, providing a new perspective on the problem. It also greatly contributed to the empathetic understanding of the user, as it involved extensive observation of the user and their behavior during the selection process, as paying attention to how the interviewee reacts to specific questions, to his facial expressions as well as his body posture. No detail was overlooked, and all the observed facts were connected in a broader context.

”Interviewing with the goal of empathy” The activity is entirely based on empathy. The purpose of conducting interviews is to explore individuals’ unique experiences, perspectives, and problem-solving approaches to a particular challenge or issue. The aim is to gain insight and understanding without any preconceived notions, allowing for an open and unbiased exploration of the interviewee’s thoughts and potential solutions. Thus, during the duration of the interviews, we followed some practices that facilitated both us and the interviewees. At first, we tried to ask ”why” often, even to things that seemed to have an obvious answer, while avoiding general questions. On the contrary, we emphasized on formulating clear and very specific questions. Also, we encouraged the recounting of events and stories, so that we could form a picture, beyond how users think, but also how they act and behave. We put a lot of emphasis on the interviewees’ body language, and we allowed there to be gaps and spaces of silence so that the interviewee could think and maybe this would lead to deeper, more detailed answers. Finally, the questions we asked were as neutral as we could so we didn’t aim for any specific answer.

”Color, promote, reflection” This activity helped us focus on users’ needs, desires, and feelings, by categorizing the questions into three groups: ”color” questions that assist the user in exploring the subject, ”promotion” questions that shift the conversation to other topics and ”reflection” questions that encourage the interviewee to reflect and reexamine their ideas and beliefs. Based on this activity above, we divided the questions we prepared into these three categories:

Color

- Do you know what a sustainable food system means?
- Would you like to know more about how the products you consume are produced?

- What are your eating habits?
- What would motivate you to try new products?
- How many times a week do you go shopping at the market?

Promote

- Do you think the quality of food and the way it is produced affects your health?
- What are the eating habits of the people around you?
- How often do you change brands in the products you buy?
- Would you download an app that would help you shop more sustainably?

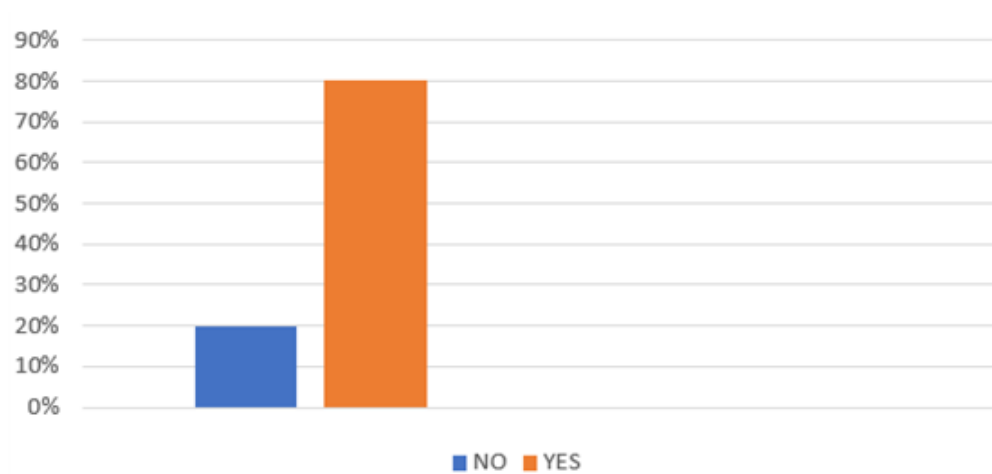
Reflection

- How do you feel about the policies implemented by the food industry that harm the environment?
- Based on what criteria do you think people buy their food?
- How would you encourage someone with "bad" eating habits to try better quality products?
- If buying sustainable products helped you collect points and earn discounts on your purchases, would that motivate you?

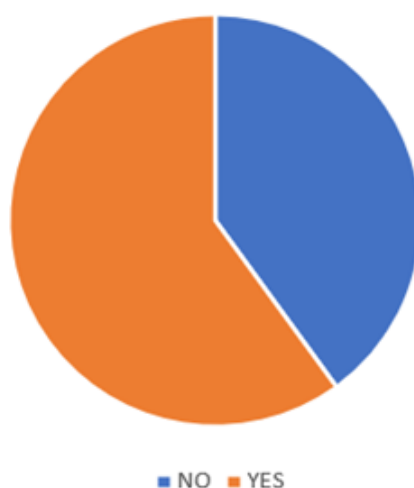
Based on all the above data, we conducted the interview process in order to investigate, document, and track the users' demands while observing everyday routines. This helped us to paint a picture of the users' eating patterns, understanding of food sustainability, and willingness to adapt or change those behaviors. The results are presented in the following section.

4.2 Interview Results

Do you know what a sustainable food system means?



Would you like to know more about how the products you consume are produced?



Do you think the quality of food and the way it is produced affects your health?

All respondents answered positively

How do you feel about the policies implemented by the food industry that harm the environment?

Most responded that they are not happy with the situation and that it seems quite worrying. They also believe that these policies are responsible for most of the environmental pollution and should be drastically restricted.

What are your eating habits?

All five people who participated in the interview prefer homemade food and choose mainly a Mediterranean diet that includes meat, fish, fruits, vegetables, legumes, etc., without necessarily knowing if the foods they consume are sustainable.

Based on what criteria do you think people buy their food?

The criteria they base on are price, taste, marketing, health benefits, and eating habits that are trending on the internet.

What are the eating habits of the people around you?

Almost half of the people who observed around them choose healthy foods and follow a Mediterranean diet. However, the rest prefer to eat foods that are easy to make, junk food, and which are affordable.

How often do you change brands in the products you buy?

Four out of five answered that they rarely change brands of the products they buy, however, one said that he usually changes brands when he finds products that are equally tasty, healthy, and affordable.

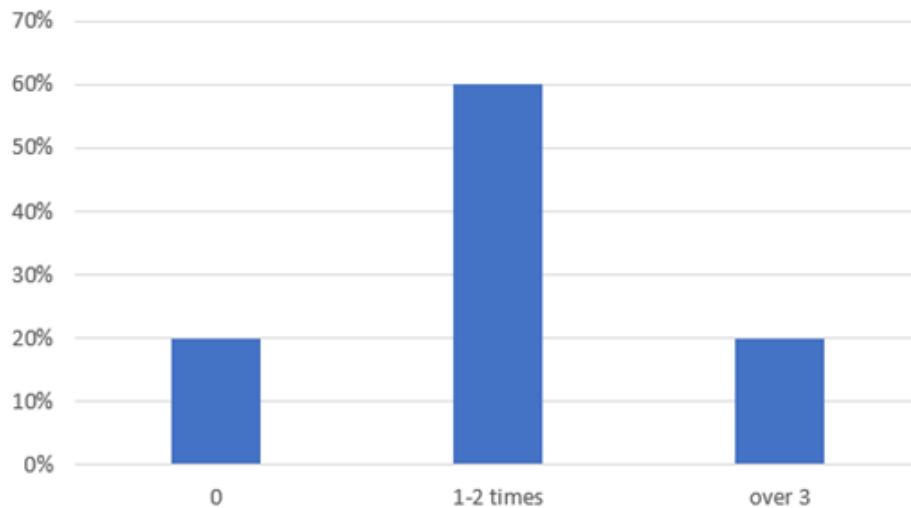
What would motivate you to try new products?

Good marketing, health benefits, price, or even a familiar friend's recommendation are reasons they would try a new product.

How would you encourage someone with "bad" eating habits to try better quality products?

Some ways they suggested is to give/suggest someone to try a sustainable product that they themselves usually buy, inform them about the effects this lifestyle can have on their health, and show them examples from their own healthy lifestyle that it is by no means boring and that in the long run, such a change is only beneficial.

How many times a week do you go shopping at the market?



Would you download an app that would help you shop more sustainably?

While everyone was skeptical, the three concluded that they would download such an application on a trial basis to see if it would be useful to them, and the rest said no.

If buying sustainable products helped you collect points and earn discounts on your purchases, would that motivate you?

They all responded that such a thing would be quite tempting and would definitely encourage them to download such an application.

4.3 User Persona

After analyzing the information and conclusions drawn from our activities and the interview process, we created a user persona. Her name is Jane, is a 25-year-old graduate who has recently entered the workforce. She is trying to balance a demanding everyday life while also being interested in living a healthy and sustainable lifestyle. In regards to who she is and what she does, she is a 25-27 years old European, who just graduated from college. She is a full-time worker, living on her own who loves trips, pilates, and goes to the gym. As far as sustainability is concerned, she needs the food industries to be more transparent about how sustainable they are, and she hopes more and more people will care about their health and the impact on the environment. She also observes people and friends around her thinking that pollution is a big problem, and believing that a more sustainable lifestyle can be beneficial for both people and the environment. In conversations with colleagues and friends, she has noticed them saying that they support food sustainability, that it is difficult to find affordable

sustainable food, and that sometimes they don't even know where they can get them. Concerning her fears, frustrations, and obstacles, she fears that the average lifestyle of people is mainly unsustainable, and it will lead to the destruction of the planet. Additionally, she is frustrated with companies and their policies that burden the environment. Finally, regarding her needs and wants, she wants to travel all around the world, to maintain a healthy and sustainable lifestyle, and she hopes that everyone will have easy access to sustainability.

4.3.1 Empathy Map

In order to gather all the characteristics and elements that describe the personality of our user persona, we created the following empathy map:

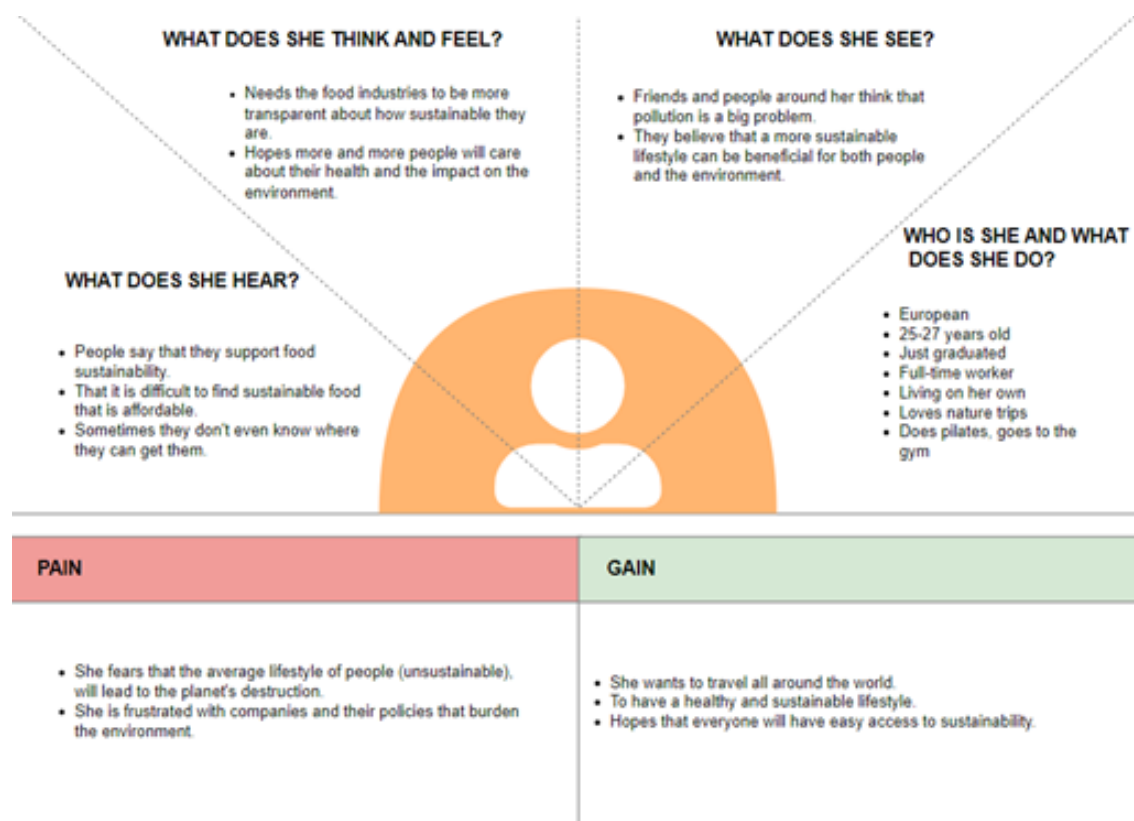


Figure 4.1: Empathy Map

4.3.2 User Journey

With the user's journey, we will try to make a brief description of the user's life, from the beginning of her childhood until today, emphasizing on experiences and events that in-

fluenced both her way of thinking and living, as well as her needs and wishes.

Early life and childhood:

She grew up in a middle-class family, where education played a very important role. Both her parents were professionals, and thus having them as role models, she learned the value of responsibility and working hard. On weekends they went on nature trips, and so these experiences created the foundations for her love for nature and the environment. Throughout her school years, she was a consistent student, while environmental issues caught her attention and she participated in projects and organizations such as tree planting and recycling at every opportunity.

Teenage years:

During her teenage years, she became more aware of issues related to the environment and its protection, and became more responsible for sustainability issues, applying eco-friendly practices such as reducing plastic in her daily life. Also, her love for traveling grew through school trips and trips with her friends, along with the experiences and knowledge she gained, she began to prefer and choose more sustainable and eco-friendly ways of traveling.

Adulthood:

She chose to study engineering and major in environmental issues. During her studies, she participated in many activities and projects related to sustainability and technology. Also, through the years of her studies, she started her fitness journey which included gym, pilates, and many times group mountain climbing.

Current life and interests:

In her mid-twenties, she works in a company as an engineer while simultaneously combining her passion for sustainability and environmental protection. Her lifestyle and habits reflect the way she grew up as she strives to live sustainably. She mainly prefers public transport and tries to shop sustainably whenever possible due to her limited free time. She continues to work out, maintains a healthy lifestyle, and tries to organize trips and small getaways as often as possible.

Future aspirations:

Looking to the future, she aspires to continue to grow both personally and professionally,

possibly furthering her studies in either business or sustainability and the environment. In the long term, she hopes to be able to contribute to environmental causes through her career, but also to use as many means as possible, in order to change her daily habits and adopt a fully sustainable way of life.

Chapter 5

Ideation

5.1 Ideation Process

One of the most important stages in the design thinking framework is ideation, where expansive creativity[21] and exploration are encouraged. This stage places more emphasis on coming up with a large number of ideas than on the original quality of those notions. By adopting this approach, we are able to explore a wide range of potential solutions without the constraints of immediate evaluation. In order to meet the demands of the user, ideation involves actively redefining problem statements, questioning underlying presumptions, and investigating alternate strategies. The ultimate objective is to utilize a wide range of thoughts and viewpoints to convert the user's problems into creative and workable solutions. To achieve this we will start by using some of the basic brainstorming exercises which include writing down five possible solutions, one possible solution with a budget of 1m euros, and one possible solution with a budget of 1 euro.

5.2 Five Possible Solutions

Public educational programs: Organizing campaigns to inform citizens about the benefits of sustainable food for their health.

Financial rewards: Offering financial rewards, coupons, and discounts to consumers who choose to purchase sustainable products.

Urban agriculture: Promote agricultural products through the balcony or roof farm

concept and urban gardening.

Labelling: Establish labels on all food products to indicate sustainability and environmental impact during production.

Taxes: Taxes should be increased for those who do not recycle or waste food to discourage negative behavior.

5.3 One Million Euros Solution

With a budget of 1 million euros, one potential solution could involve the development of a small sustainable “city”. This comprehensive plan would encompass a food sustainability promotion program, which would allocate funds to support various initiatives aimed at creating a more sustainable and environmentally friendly community.

Educational programs: These programs would be designed to raise awareness about sustainable food practices, educating citizens on the importance of making environmentally conscious food choices.

Local markets: The plan would involve the establishment of local markets dedicated to providing fresh and healthy food options, sourced from local farms and producers. This initiative aims to promote local agriculture and encourage healthier eating habits among citizens.

Reward program: A reward program could be implemented to incentivize citizens and participants to actively engage in events that promote sustainable practices and prioritize the purchase of sustainable products. This initiative aims to further promote the city’s sustainability efforts and encourage widespread participation in sustainable living.

5.4 One Euro Solution

Reaching out to friends, relatives, or coworkers who might not prioritize leading a sustainable and healthful lifestyle is an incredibly cheap method that costs just 1 euro or possibly no money at all. Start by identifying these people and starting a discussion on the health and

energy benefits of adopting a good diet. Provide basic recipes, cooking advice, and inexpensive and easily available food selections. To appeal to their principles, emphasize how living sustainably will assist the environment. Offer to join them in these activities and support them in taking baby, doable steps like experimenting with new dishes. This personal, supportive intervention can have a significant impact on their well-being, leveraging social influence and connection without any financial cost.

5.5 Powers of 10

During this simulated checkout activity, we created a scenario where we observed customers consulting product reviews before finalizing their purchases. We were instructed to envision a situation where the customer makes purchases across a wide range of price points, from budget-friendly to high-end items. Below, you will find the detailed conclusions and findings derived from our observation.

User Behavior and the Process of Making Decisions

Consumer behavior regarding the price range:

- For inexpensive products, short and simple reviews may be enough.
- For items in the moderate to expensive price range, people look for detailed reviews with advantages and disadvantages, personal experiences, and thorough explanations of specific features.
- Reviews of expensive items often cover long-term use, durability, and customer service experiences.

Consumer behavior regarding the review depth:

- For low-cost items, short reviews are okay.
- Moderate to high-cost items, include detailed feedback like pros and cons, personal experiences, and specific feature feedback.
- High-cost item reviews should also cover long-term use cases, durability, and customer service experiences.

Consumer behavior regarding the decision-making time:

- For inexpensive products, it doesn't take long, it's an instant decision.
- For moderately priced products, it varies from a couple of days to a week.
- For expensive goods , it can take more than weeks even months.

5.5.1 Conclusion

It is a fact that the price of a product definitely affects the behavior of the consumer. When it is cheap, the user is satisfied with a short reading of the review, which is not the case with products that cost more. As far as an expensive purchase is concerned, the interested buyer studies and thoroughly examines the reviews before deciding whether to proceed with the purchase of the good or not.

Chapter 6

Brainstorming

6.1 Brainstorming Ideas

Brainstorming helps to develop many different and creative ideas. The purpose is to analyze these ideas to find an effective and innovative solution in the end. To implement this activity we will record as many ideas as possible:

Reduce food waste:[22] Try to convince food industries and households to reduce food waste through composting and good meal preparation throughout the week.

Prefer local farmers: Significantly helps to reduce the carbon footprint of the atmosphere and the planet, and to keep agricultural areas alive.

Adopt plant-based foods: Including more plant-based foods in our diet can help to reduce meat consumption.

Pick sustainable seafood: Choose seafood that has been responsibly farmed and produced to save marine environments and avoid overfishing.

Be your own producer: Encourage consumers to invest in rooftop or balcony farms and gardens to help grow some of their own food.

Educate consumers properly: Through programs and campaigns, inform consumers about the sustainability of food production industries and the impact they have on both their health and the environment.

Encourage programs for food recovery: Support initiatives that "recycle" excess food from farms or restaurants so that it can be composted or given to those in need.

Reduce packaging waste: Prefer products whose packaging is made of recyclable materials rather than plastic or other materials that pollute the environment.

Advocate for food innovation: Propagate and invest in developing innovative sustainable food production technologies that avoid environmentally harmful practices.

Encourage policy change: Support the establishment of political parties aimed at reducing food waste and enacting ecologically friendly policies.

Promoting food diversity: Educating consumers about the advantages of including a range of foods in their diet for their health and to encourage biodiversity in agriculture.

Reduce water footprint: Encourage the use of alternate irrigation techniques to preserve a variety of water sources and inform customers about the importance of water footprint.

Push consumers to be responsible: Urge customers to keep track of their food consumption and adopt a moderation approach to overconsumption.

6.2 Analogous Inspiration

In this activity, we are asked to write down some fundamental wants, values, and feelings to help us come up with a solution for the issue we are facing. Next, we provide a list of goods and services that address the requirements, values, and sentiments we stated before. Lastly, we describe the fundamental concepts and characteristics of each product or service.

Wants

- Healthy food
- Clean water
- Safety
- Economic stability

- Education

Values

- Innovation: Originality and creative solutions for sustainability
- Equity: Fairness in terms of opportunity and accessibility for all
- Integrity: Behave in an environmentally ethical way
- Appreciation: Appreciating the careful handling of resources from nature
- Preservation: Putting the health and safety of the environment as a priority

Feelings

- Concern
- Empathy
- Responsibility
- Hope
- Satisfaction

Some of the products and services that seem to provide solutions to the wants, values, and feelings that we listed previously, are seen below:

Photovoltaic systems is a product/service that, in terms of needs, it definitely offers financial stability and security, it works based on innovation, conservation, integrity, and appreciation, and finally creates security in terms of safety, responsibility, and satisfaction.

Main Ideas

- Change sunlight into electricity through the photovoltaic effect.
- Enhanced energy security and less dependence on the power grid.
- Potential for long-term reduction in electricity bills exists due to cost savings on installation.

- Placement of the panels on rooftops or firmly fixed on the ground allowing sunlight interception at its maximum angle.

Eco-clean cleaner for all purposes is a well-known product that covers needs such as safety, clean water, and financial stability. It stands with the ideas of innovation, conservation, integrity, and equity, and it also addresses empathy, hope, concern, and satisfaction.

Main Ideas

- Taking care of the environment using eco-friendly ingredients to lessen damage to our surroundings.
- Non-toxic mixtures put together so that people using these substances do not get hurt.
- Containers made of materials that can be recycled, to lower waste production.
- Eco-labels that demonstrate adherence in environmental standards.

Electric scooters are now a well-known means of transportation that offer financial stability and safety in terms of environmental pollution. The main values are innovation, preservation, and safety of nature and it seems to be the ideal response to feelings such as concern, passion, responsibility, and hope.

Main Ideas

- Since it does not use any fuel, it is completely safe in terms of pollution from exhaust gases.
- Provided stations and locations where people can drop off electrical appliances for recycling.
- Front and side lights so that driving is safe even in low light conditions.
- Ability to connect with mobile apps like GPS, route statistics, and more.

Clean Kilo one of the UK's largest eco-friendly supermarkets is a zero-waste shop that provides healthy food and meets needs like this for financial stability and security. In regards to the values it walks by, include originality and innovative ideas, appreciation of the environment, and satisfies feelings of concern, responsibility, hope, and satisfaction.

Main Ideas

- Encouraging the use of environmentally friendly practices and products.
- Reducing the carbon footprint, by purchasing local goods from the farmer.
- Encouraging customers to use their reusable bags.
- Given stations and locations where people can dispose of difficult-to-dispose products.

By combining the features of the above products/services we came up with the following solutions related to the challenge we face of "How can we live more sustainably":

Home energy and Eco-cleaning: When you install a solar panel system in your house and use environmentally friendly cleaning techniques, you are helping create a healthier environment for yourself and your family. This can be achieved by reducing your carbon footprint and supporting the health of the people close to you.

Transportation and Shopping: Another way of significantly reducing your impact on the environment and adopting a more sustainable lifestyle is by buying from shops that sell zero-waste products and using electric scooters to commute short distances.

Volunteering for Sustainability: Sign up for sustainability projects and events in your area to be informed and help preserve a clean environment for all residents.

Track and Improve: Measure and review your energy utilization, transportation standards, and consumption habits to be able to identify what are the points where you can improve, make adjustments, and head towards a sustainable life.

Chapter 7

Evaluation of Ideas

7.1 Evaluating Ideas

It is obvious that one must filter through these early-stage concepts before they are further developed into more specific prototypes that may eventually become products. During the refinement process, they must also be sorted out according to their relevance to solving problems faced by potential users while also making sure they meet all customer requirements. In this manner, one can be certain that they are ultimately receiving a solution that combines creativity, usability, and user appeal rather than simply any old answer. Evaluation[23] is a way to ensure that the chosen solution is creative, viable, and sustainable in the long term by paying attention to practical considerations such as budget, time, and technical constraints. Besides, this makes it possible to identify innovative ideas that give a competitive advantage as well as manage any potential risks via proactive risk identification and mitigation strategies. Effective assessment can improve the efficiency with which resources are used, enabling teams to focus their efforts on developing a long-lasting, scalable, and more effective solution. This would allow the course to strike a balance between creativity and realism, leading to the emergence of a substantial, long-lasting solution that can address the underlying problem and raise customer satisfaction.

7.2 Evaluation of Ideas Through Categorization

This activity was used to help us categorize the ideas we generated into three groups. In the first group, we will arrange the simplest ideas, which are easy to implement. In the next

category will be the original ideas that can nevertheless become reality, while in the third category belong the ideas that are certainly innovative but are not yet implementable with the existing means and technologies of the time:

Simple ideas

- Public educational programs
- One euro solution: Encourage friends to change their lifestyle into a more sustainable one
- Reduce food waste
- Prefer local farmers
- Adopt plant-based food
- Pick sustainable seafood
- Reduce water footprint
- Push consumers to be responsible

Innovative Ideas

- Financial rewards
- Urban agriculture
- Labeling
- Be your own producer
- Encourage programs for food recovery
- Reduce packaging waste
- Advocate for food innovation
- Promoting food diversity
- Volunteering for sustainability

- Home energy & eco-cleaning
- Transportation & shopping
- Track & improve

Ideas that can not be implemented

- Taxes
- One million euros solution: Create a small sustainable “city”
- Encourage policy change

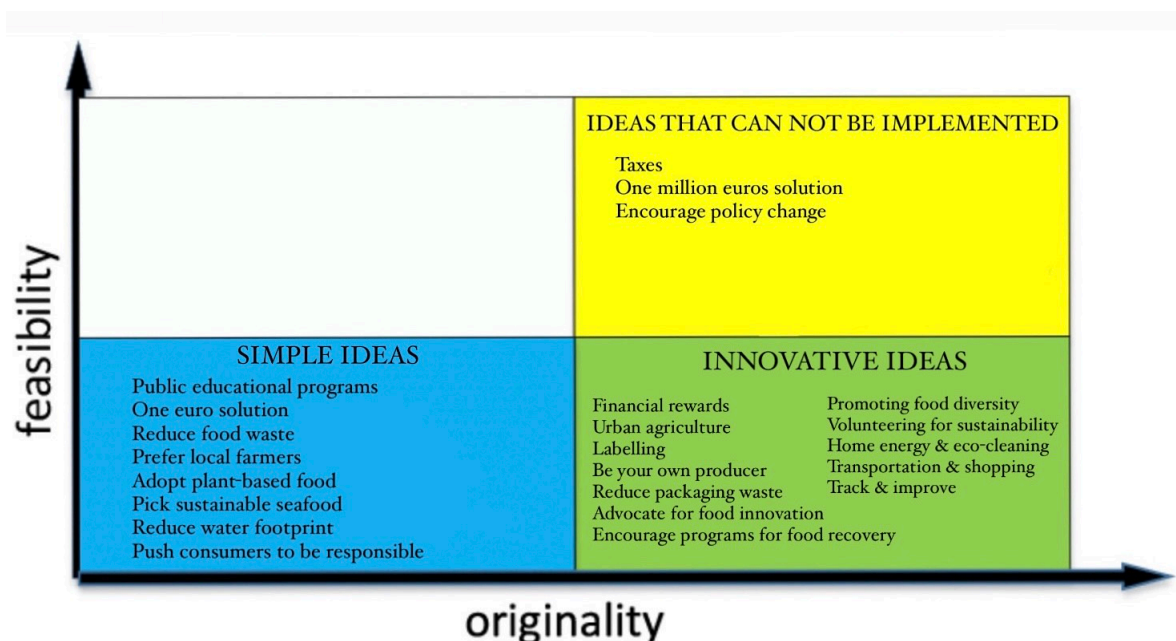


Figure 7.1: 2x2 Matrix, Selecting Ideas

7.3 Design Guidelines

To create effective and helpful guidelines we will try to translate the conclusions we have drawn about users, through research, into solutions rather than observations.

Insight: Users desire to see a noticeable impact on the environment from their actions.

Design Guideline: Promptly demonstrate to users the extent to which their actions are reducing their carbon footprint or conserving water.

Insight: Users are not entirely aware of the easy ways in which they might live a more sustainable existence.

Design Guideline: Create instructional films, online games, and tutorials to give users knowledge about living sustainably.

Insight: It is vital that there be ways that users can track their progress and accomplishments which will in turn motivate them.

Design Guideline: In developing design guidelines consider including progress tracking systems supported by visual cues together with milestones and achievements.

Insight: People want to receive advice customized for their way of life and interests while using the tool.

Design Guideline: Suggestions and recommendations should always be about what the customers prefer and do by taking into consideration their past behavior.

Insight: Users find challenges interesting and like to participate in interactive games.

Design Guideline: Develop games and challenges that will intrigue users to participate in them, in order to create teamwork and a sense of participation.

Insight: Users like participating in sustainable activities since they are aware that they will receive rewards for doing so.

Design Guideline: Make an app where users may participate to gain discounts and points.

Insight: Users want an interface that is as straightforward and user-friendly as possible.

Design guideline: Create an application so that everyone will be able to use it because of its simplicity of it, and the easy menu.

Insight: Users wish to let their friends and buddies know about their accomplishments in terms of sustainability.

Design Guideline: Create an app in which users will be able to share things and achievements sustainably related, to any social network.

Insight: Users highly value tools that offer pointers and counsel on leading a more sustainable lifestyle.

Design Guideline: Provide a tool or application that will suggest smart solutions, cus-

tomized to each user's unique needs and preferences.

Insight: Users really appreciate it when an app appeals to everyone and is easy to access.

Design Guideline: Ensure that the app offers a wide range of information and includes audio-visual media.

To summarize, a useful application related to sustainability must be simply designed to appeal to everyone. Include actual metrics related to environmental impact, offer the ability to watch educational videos and articles, and record any relevant user progress. Also offer tips and advice, based on the user's performance, and create challenges and goals to become "better". A reward system seems also practical, with points and coupons or offers.

Chapter 8

Prototype

8.1 Solution Through Whiteboard/Poster

In design thinking, the prototype stage is where concepts are translated into concrete models for investigating possible solutions and gathering user feedback. This requires building basic but less detailed models to test specific features, the results of which inform the next ones. The process comprises the selection of ideas for prototypes, construction of models through different tools and means, user testing, feedback analysis as well as design refinement while key practices are; keeping it simple, concentrating on user experience, permitting criticism, embracing mistakes, and getting around quickly. This phase allows us to confirm and facilitate the solutions in readiness for future development or deployment.

To start with the creation of the prototype, we will present the proposed solution through a whiteboard/poster. It will include the problem we want to solve, the goals of this solution, the audience we are addressing, and the description of the solution:

Problem

- How can we help people live and eat sustainably?

Objectives

- Help users adopt a healthier diet.
- Learn to distinguish sustainable products.
- Inform them about the benefits of a sustainable lifestyle to their health and the environment.

- Be aware of the negative effects that the policies, applied by producing companies, have on the environment.

Target group

- People who are interested in their nutrition, and want to follow a healthier and more sustainable way of life, mainly young people over 25 years old.

Solution

- Create an application that will record the user's purchases in the market, evaluate the products based on their sustainability rate, recommend new "better" products, and based on their performance offer them discounts and coupons.

How to access market

- Through advertising on social media such as Instagram, Tik Tok, YouTube.
- Through posters in supermarkets, at checkouts when customers exit.

8.2 The User Journey

Initial installation

After downloading the program, the user starts by setting up his profile. He provides the program with his personal data, food preferences, and any allergies he may have, so that it may provide him with a better-personalized experience. This first stage also includes linking to the user's supermarket cards, accounts in the banking applications, and electronic receipts from his purchases, in order to enable the user's purchase data to be automatically transferred to the application.

Everyday use

Every time the user goes to the market to do his shopping, he uses the application, in which, immediately after completing the purchases, he is updated with the products he bought, and the sustainability rate of each product is displayed, along with some metrics related to how friendly it is, the packaging materials, etc. Additionally, the user is also given the ability to see the sustainability score which reflects the sustainability of their recent purchases. This score is updated in real time and gives a relative picture of the user's shopping habits.

Recommendations

The user can see suggestions for more sustainable alternatives to items he buys frequently. If, for example, the user often buys bananas that are not organic and their production method includes techniques that are not environmentally friendly, then the application suggests a different ethically sourced brand. Besides recommendations, the user has access to educational content, explaining the importance of different products' sustainability. This may include details such as the advantages of organic farming, the significance of limiting plastic consumption, or the influence of carbon footprints created through local sourcing.

Discounts and sales

By using the application, the user earns points, coupons, and offers by choosing sustainable products and increasing his sustainable score. He redeems these points either in subsequent purchases of specific sustainable products or by making donations to environmental causes and organizations. In addition, the app is updated when there are offers on products that are often selected.

Notifications

The user receives notifications that remind him to continue making sustainable choices, suggest a new nearby eco-friendly store, or inform him of a new release of a product line of a sustainable brand that he has already chosen. He also receives reward notifications such as when sustainable and organic products are continuously chosen, for example for a month in a row.

Overall

The user has a positive experience that inspires him to make more ecologically friendly choices. Because of the benefits and discounts it provides, the app encourages him to include sustainability into his regular purchasing routine. It also makes him feel proud of himself for the sustainable accomplishments he makes. Furthermore, the user gains the ability to make decisions that are ethically and environmentally friendly.

8.3 Usage Scenarios

Scenario: Using "EcoShopper" - A Sustainable Shopping App

Characters

- Emma: a young working woman who cares about sustainability and wants to make environmentally friendly choices.
- John: Emma's friend, who is not so environmentally conscious, but is open to learning more about sustainability.
- Mary: the cashier at the supermarket.
- Eco-shopper: a shopping application that helps you shop sustainable products, as it keeps a history of your purchases, shows you how sustainable a product is, suggests "better" products, educates you about what it is sustainable, and based on performance it offers you points and discount codes.

Scene 1: Emma downloads EcoShopper

Context: Emma, in her attempt to find new ways to lead a more sustainable lifestyle, reads about the "EcoShopper" app. Without thinking about it too much, she decides to download it and try it out.

Script:

Emma has come back from work and just before getting ready to leave for her afternoon workout, she scrolls through Instagram and TikTok and finds the EcoShopper app, and decides to download it.

Emma: (thinking) "This app looks very interesting and might help me make more sustainable and environmentally friendly choices."

Emma downloads and opens the app. She starts browsing around and sees that the app offers a variety of features, such as tracking purchases, recommending sustainable products, providing educational articles on sustainability, and offering points and discounts.

Scene 2: First impression and experience using "EcoShopper App".

Context: Emma goes to the market near her house for her shopping, and it is the first time she has used the "EcoShopper" application. She wants to see how it works and how it will help her with her choices.

Script:

Emma enters the supermarket and starts browsing the aisles looking at the shelves and thinking about what she wants to buy. At the same time, she opens the "EcoShopper" application.

Emma: (thinking) "Let's test the application to see what alternatives I can find that are more sustainable and eco-friendly."

Emma with the application scans a shampoo, it shows her to what extent the specific shampoo is sustainable, and it suggests another shampoo that is more eco-friendly.

EcoShopper App: "This particular product is relatively poor in terms of sustainability and has a score of 35/100. A better option we recommend is "Ecogreen Shampoo" with a score of 90/100. The packaging is made from sugar cane and its production policies are environmentally friendly."

Emma: "That's such a better choice. I'll go with that one."

Emma puts the shampoo suggested by the app in her basket and continues shopping, while using the app for the rest of her shopping, in order to offer her sustainable alternatives.

Scene 3: Payment, exit from the market and rewards.

Context: Emma finishes her shopping and heads to the cash register to pay. She wonders how the application will show the purchases she made in her history, and based on them, what bonuses and discounts she can earn.

Script:

Emma takes her place at the checkout and puts away her shopping. The cashier scans the products and Emma pays.

Mary: "I have seen that you have made very good choices. Would you like to scan the receipt to redeem points through a card or app if you have one?"

Emma: "Yes! I have the "EcoScoper" app, today is the first time I downloaded it and used some recommended products."

Emma scans the receipt's barcode and is immediately notified by the app. EcoShopper app: "Congratulations! You earned 50 EcoPoints by choosing sustainable and environmentally friendly products. Use them for discounts on future purchases."

Emma uses the points through a discount on the final amount of her purchases.

Mary: "Thank you for choosing our store! Have a nice day."

Emma: "Thank you, you too!"

Emma leaves and opens the app. She sees that in the recent purchases section, she can see in detail the products she bought and their viability rate.

Scene 4: Discussing the experience

Context: Later in the day, Emma meets her friend John for a walk, and shares with him the experience she had in her shopping with the use of the "EcoShopper".

Script:

Emma and John are in the park talking as they take their walk.

John: "What are you doing? How are things going?"

Emma: "I downloaded a new app called 'EcoShopper' and used it when I went to the market. Very useful. It helps you buy eco-friendly and sustainable products, and for that, it even gives you points and discounts that you may use to receive offers on future purchases. I won 50 points, for the very first time!"

John: "That sounds very interesting. Do you think I should try it? How does it work?"

Emma: "It's very simple and easy. You download the application, connect with your cards, and while you shop you can scan different products that interest you and it will show you its sustainability rate, and suggest similar but eco-friendly alternatives. It also keeps a history of your purchases and offers you discounts through the points you collect. You should try it!"

John: "Maybe I do. I have been wanting to move towards a healthier and more sustainable way of living for some time now, but I don't know how or where to start."

Emma: "This application is very easy, I recommend it without reservation. You can also save money by making better choices."

John: "Okay, you convinced me! I will download it right now, as we're talking about it."

Emma and John continue their walk while talking, and John downloads the app at that moment.

8.4 Test with Users

Testing with users is a necessary step in order to get an extensive comprehension of the functionality of our proposed solution. Through these tests, we will have the opportunity to understand more about how we can improve our idea and what changes would be helpful to make. In addition, we will be able to understand in-depth the needs and preferences of the users, modify our solution based on their requirements, and adapt it to them.

In order to achieve this, we created an initial prototype of the application we intend to implement and provided it to two users, to describe their experience after coming into contact with it. To give us some guidance on what they like and find useful, what they don't like and needs to be changed or corrected, and what else they think we should include.

8.4.1 Prototype UI

The early draft of the prototype we will implement (i.e. the application) includes:

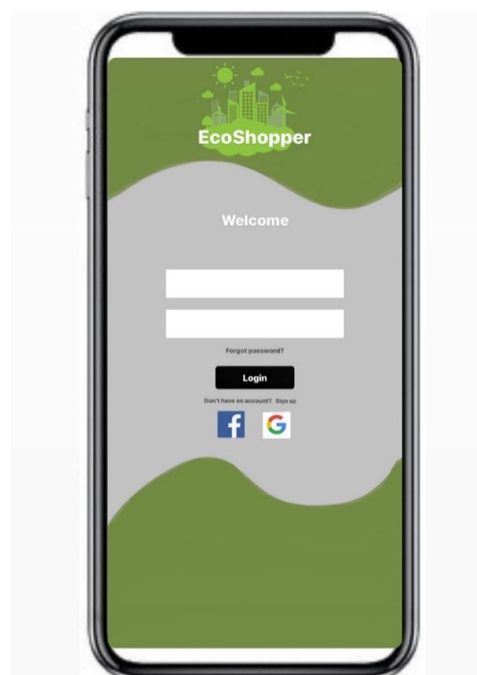


Figure 8.1: Login Page: Login/sign-in process

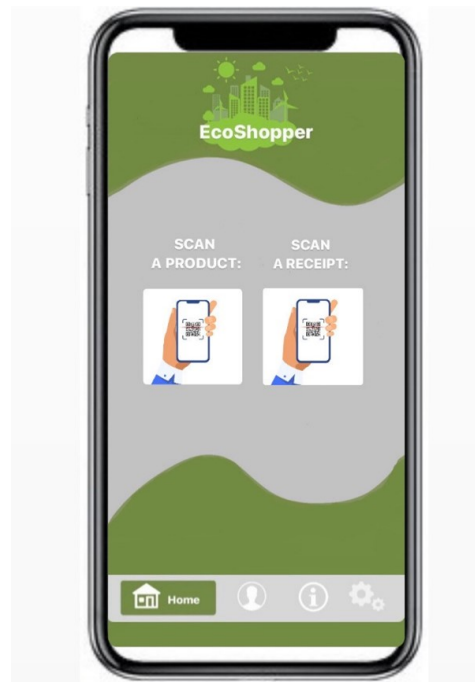


Figure 8.2: Home Page: Product-barcode/Receipt scanner

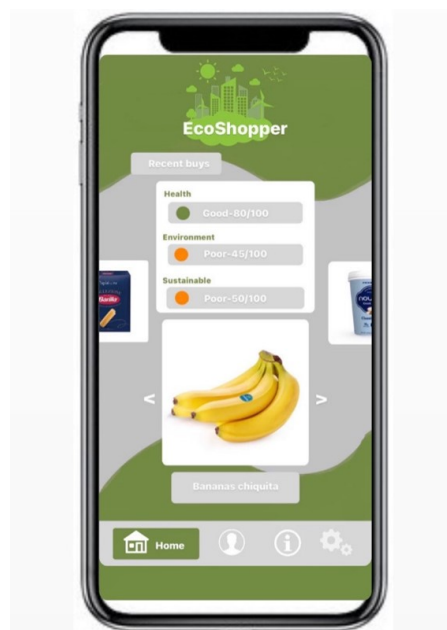


Figure 8.3: Recent Buys Page: List of purchased/scanned products with nutritional and environmental details

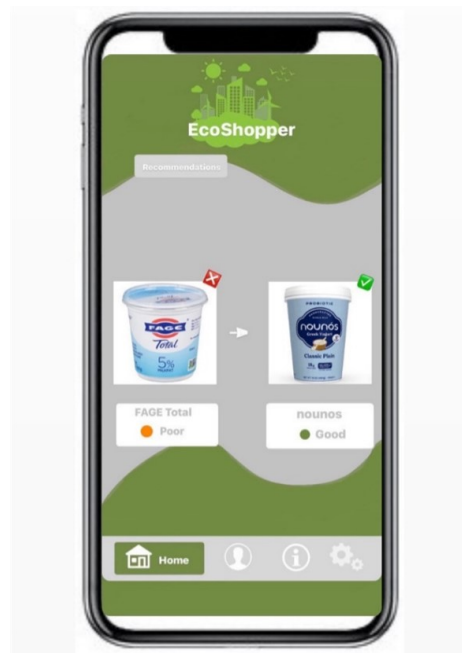


Figure 8.4: Recommendations Page: A more environmentally friendly and sustainable alternative for each buy

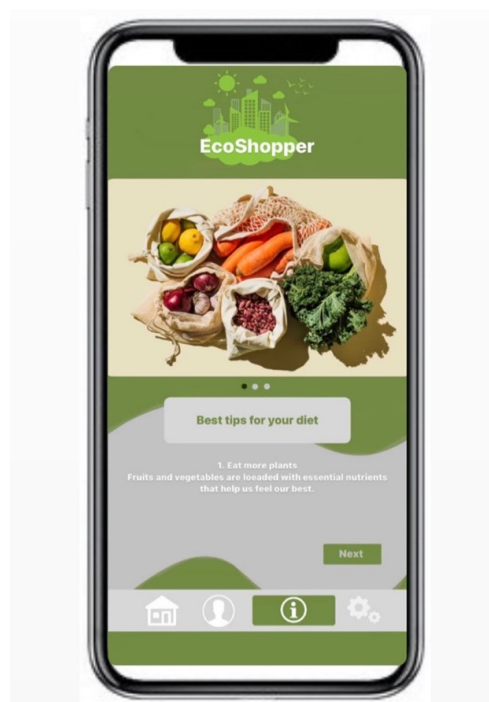


Figure 8.5: Info/About Page: Educational materials and information about sustainability and some everyday tips to achieve a more sustainable lifestyle

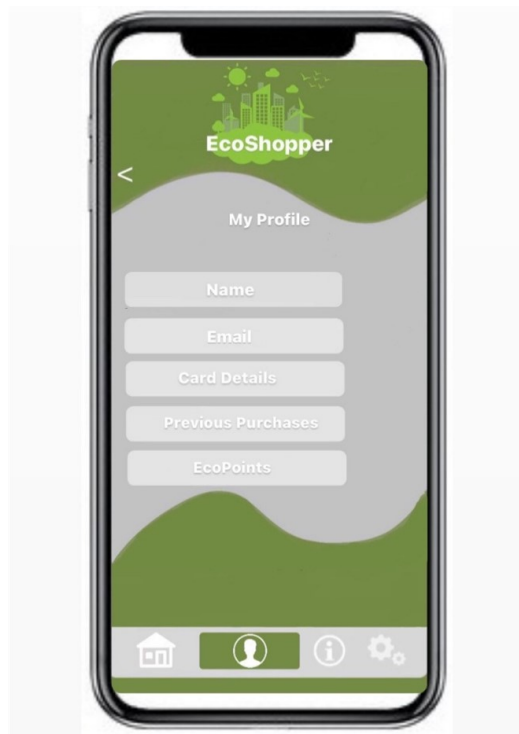


Figure 8.6: Profile Page: User's personal information

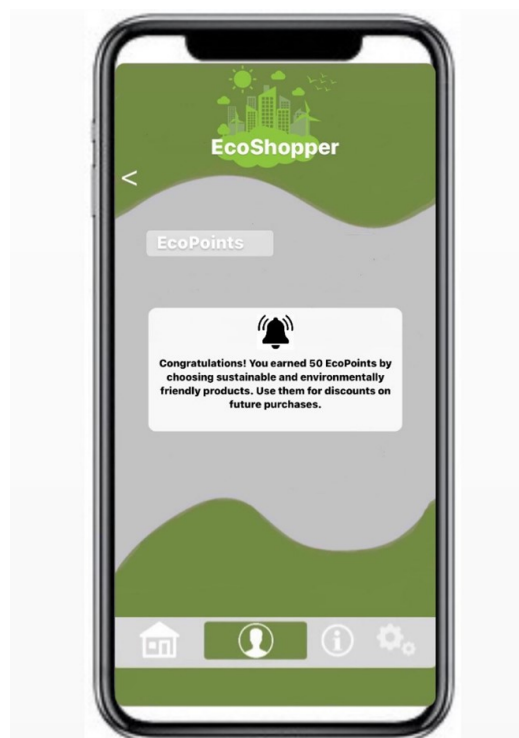


Figure 8.7: "EcoPoints" Page: User's personal point-score

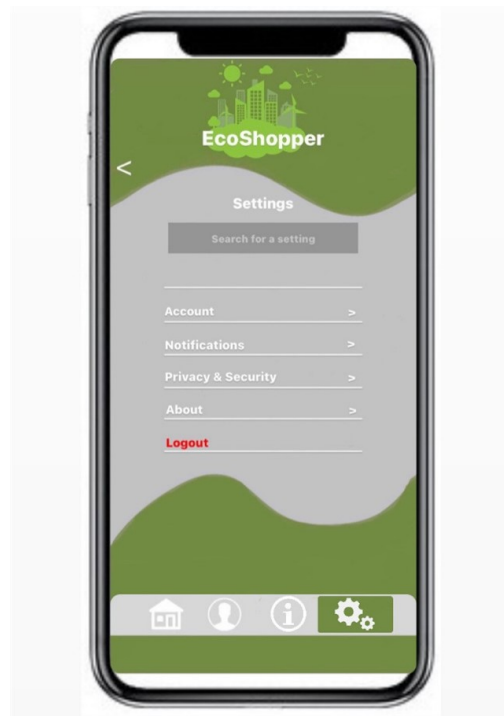


Figure 8.8: Settings

8.4.2 Prototype Reviews

User 1: “Such an application seems like a highly practical and intriguing idea. In addition to providing you with more knowledge about the sustainability of the things you purchase, it also serves as an additional motivator for you to easily and simply make better decisions using your mobile device, particularly if you lead a healthy lifestyle. Points and discounts are unquestionably advantageous because most people prefer to purchase ”cheap” products rather than high-quality, sustainable ones, which are typically more expensive. This will make it simpler for them to shift to more sustainable options, and even if they don’t initially agree with it, it’s likely that they will gradually begin to alter their consumption habits. Given the environmental crisis the world is currently experiencing, it is crucial to control your spending patterns by looking for ways to improve and so contribute to reducing the environmental impact. The app appears user-friendly, and it would be appealing to create a section where people could exchange their experienced advice on how to shop more sustainably, etc.”

User 2: “This app is a vital tool for all and especially young and conscious customers. It gives us the power to make better choices for ourselves and the planet when it comes to buying our weekly groceries, all while offering us financial benefits and rewards for our

actions. Thanks for creating such a valuable product! Suggestions for improvement: you can add a communication feature giving us access to share tips, recipes, and products. “

Chapter 9

Conclusion

9.1 Final Product

After following all the above steps we ended up creating our final product/solution. It is an innovative application designed with the sole purpose of helping users lead a more sustainable and healthy life. It serves as a multi-tool for users to make choices that are more sustainable, and environmentally friendly, during their shopping, and at the same time provides them with a wide range of information, personalized suggestions, discounts, and offers, as well as a communication community to share knowledge and experience.

9.1.1 Key Features

Product scanning

- Sustainability rate: The user can scan the products in the market and see the sustainability rate of the specific product. This feature provides immediate feedback on whether a product is sustainable and is an ideal healthy choice for the consumer.
- Alternative options: The application pushes the user to make more educated choices by displaying better and healthier alternative product offers based on the sustainability rate.

Purchase history tracking

- Receipt scanning: By scanning the receipt of their purchases, the user can automatically keep a history of their purchases and see at any time previous purchases.

- Detailed analysis: The application is designed to provide users with an overall assessment of how sustainable each item they buy is, so they can keep tabs on their green milestones as time goes by.

Reward system

- Points and discounts: The user earns points and discounts by shopping sustainably. He can save these points and redeem them on his next purchases.
- Redemption flexibility: The user has the possibility to redeem the points he has collected at any moment he wishes, either immediately on his following purchase or by gathering and using them all at once.

Educational resources

- Information and tips: There is a section with useful information and daily pointers for practicing a healthy and environmentally friendly life. It has content such as nutritional information as well as tips on being environmentally conscious.

Community features

- Sharing Platform: Users with similar mindsets can be able to share different information including recipes, tips, or other ideas. It creates a sympathetic situation by enabling users to pass on their knowledge and even get influenced by others' ideas.
- Interactive Communication: The communication feature enables users to discuss issues further, ask questions related to them, and share their own experiences thus ensuring that they learn together as they develop together.
- Intuitive Interface: EcoShopper has been designed with the sole purpose of being easy and user-friendly so that it can be used by anyone and its functions are completely easily accessible.
- Personalization: The application displays suggestions and tips that are personalized for each user individually, based on the choices he makes and his shopping habits.

9.1.2 Benefits of EcoShopper

Enhanced Awareness

“EcoShopper” offers a number of benefits to improve consumers’ awareness of the effects that their products have on the environment and on human health. Product scanning processes provide adequate information regarding sustainability rates, including water and carbon footprint aspects of environmental impact. As a result, consumers are better able to make decisions that are good for both the environment and their own health.

Informed Choices

With its suggestions for alternative products, the app gives users the power to make healthier and more environmentally friendly purchasing decisions. EcoShopper recommends better options when a scanned product has a low sustainability rating, pointing customers in the direction of healthier and more environmentally friendly solutions. Based on the user’s past purchases and interests, this individualized advice makes sure that suggestions are realistic and simple to use in day-to-day activities.

Community Support

“EcoShopper” gives users a sense of belongingness, by creating a communal environment. The interactive forum is used by the users to share their ideas, advice, as well as sustainable practices that can motivate them and stimulate learning from each other. With the supporting challenges and cooperative objectives such as reducing the use of plastic or increasing purchases that are based on organic items, teamwork is being promoted in achieving sustainable goals.

Rewarding System

Through the provision of points and discounts for selecting environmentally friendly products and other products suggested, “EcoShopper” encourages users to embrace more sustainable and eco-friendly habits. The points are redeemable at any time by them. As a result, this reward system encourages users to continue making sustainable, healthful, and ecologically responsible purchases, which eventually lead to users living more sustainably.

Instead of just being an ordinary shopping tool, EcoShopper strives to be a lifestyle partner that encourages sustainability and well-being. A system encompassing personalized sug-

gestions, educational materials, time-sensitive product ratings as well as a lively community, enables EcoShopper users to always make decisions that benefit the environment and their health alike with every transaction made.

9.2 Future Improvements

Some possible ideas for future improvements to the application are outlined below. With their integration "EcoShopper" will continue to develop and evolve, true to its values and its work to promote a sustainable and eco-friendly way of life:

- Develop partnerships with smaller-scale sustainable companies, for deals
- Enable the possibility to connect with various household appliances so that the user can analyze his ecological impact and obtain up-to-date sustainability advice
- Collaborations with delivery services
- Creating weekly seminars with sustainability experts
- Developing the offline mode function of the application

9.3 Summary

This thesis aimed to analyze the problem of food sustainability, and through the application of the human-centered practices of Design Thinking to arrive at the creation of an effective solution. Applying the steps of Design Thinking one by one, from investigating and defining the problem, interviewing and describing our target user, ideating, brainstorming, and evaluating ideas, and finally, producing and testing the prototype, we managed to implement all creative and innovative activities to reach the desired result. The findings showed that the problem of food sustainability is a major issue that concerns the majority, and despite the difficulties and obstacles, users are interested in exploring new ways to adopt more sustainable habits. So ultimately, we were led to create a shopping app that would encourage users to live more sustainably and adopt a healthier diet.

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