

APPENDICES

Recipe for lasting change

Developing feedback strategies to support
the sustainable transition of Sophia Children's
Hospital's food system

Master Thesis
Strategic Product Design
Sophie Storm van 's Gravesande
April 2025

Appendix A - Project brief

DESIGN
FOR our
future

TU Delft

IDE Master Graduation Project

Project team, procedural checks and Personal Project Brief

In this document the agreements made between student and supervisory team about the student's IDE Master Graduation Project are set out. This document may also include involvement of an external client, however does not cover any legal matters student and client (might) agree upon. Next to that, this document facilitates the required procedural checks:

- Student defines the team, what the student is going to do/deliver and how that will come about
- Chair of the supervisory team signs, to formally approve the project's setup / Project brief
- SSC E&SA (Shared Service Centre, Education & Student Affairs) report on the student's registration and study progress
- IDE's Board of Examiners confirms the proposed supervisory team on their eligibility, and whether the student is allowed to start the Graduation Project

STUDENT DATA & MASTER PROGRAMME

Complete all fields and indicate which master(s) you are in

Family name

Storm van 's Gravesande

IDE master(s)

IPD

☐

Dfi

☐

SPD

☒

Initials

SL

2nd non-IDE master

Given name

Sophie

Individual programme (date of approval)

Student number

4868609

Medisign

☐

HPM

☐

SUPERVISORY TEAM

Fill in the required information of supervisory team members. If applicable, company mentor is added as 2nd mentor

Chair

Jotte de Koning

dept./section

SDE

mentor

Lara van der Veen

dept./section

HCD

2nd mentor

Sascha Verbruggen

client:

Erasmus MC

city:

Rotterdam

country:

The Netherlands

optional comments

! Ensure a heterogeneous team. In case you wish to include team members from the same section, explain why.

! Chair should request the IDE Board of Examiners for approval when a non-IDE mentor is proposed. Include CV and motivation letter.

! 2nd mentor only applies when a client is involved.

APPROVAL OF CHAIR on PROJECT PROPOSAL / PROJECT BRIEF -> to be filled in by the Chair of the supervisory team

Sign for approval (Chair)

Name

Jotte de Koning

Date

1 Oct 2024

Signature

Jotte de Koning

Digitaly signed by

Jotte de Koning

Date: 2024-10-08

11:49:10 +02'00'

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DESIGN
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TU Delft

Personal Project Brief – IDE Master Graduation Project

Name student

Sophie Storm van 's Gravesande

Student number

4,868,609

PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT

Complete all fields, keep information clear, specific and concise

Project title

Designing an intervention for a sustainable food system for Erasmus MC Sophia Children's hospital

Please state the title of your graduation project (above). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

Introduction

Describe the context of your project here; What is the domain in which your project takes place? Who are the main stakeholders and what interests are at stake? Describe the opportunities (and limitations) in this domain to better serve the stakeholder interests. (max 250 words)

Hospitals play a vital role in promoting health, yet they are significant contributors to the climate crisis. The Dutch healthcare sector accounts for 7% of the national CO2 footprint, 4% of waste, and consumes 13% of the country's raw materials. The Green Deal Duurzame Zorg (Green Deal DZ) aims to transition University Medical Centers (UMCs) toward sustainability, with the food system as one of the focus points (Green Deal DZ, 2023).

This project takes place in Sophia Children's Hospital the largest children's hospital in the Netherlands, which is part of Erasmus Medical Centre (Erasmus MC), serving over 659,000 patients annually. Key stakeholders include doctors, dietitians, caterers, suppliers, and the patients themselves. Doctors and dietitians ensure that meals meet strict nutritional standards for patient health, while suppliers and caterers manage food delivery and preparation. To meet the goals of Green Deal DZ, the hospital aims to increase plant-based proteins from 20% to 60% by 2030 and reduce food waste from 40% to 20%, contributing to a 50% reduction in total hospital emissions by 2030.

Opportunities include the hospital's large-scale influence on food systems in Rotterdam, meaning successful implementation could have wider regional effects. Since multiple studies confirm the nutritional benefits of plant-based food, this project does not need to validate these (Health Council of the Netherlands, 2023; Patel, 2017). However, strict health regulations in hospital environments present limitations, making large-scale changes challenging to implement quickly.

This project will co-design for systemic interventions and behavioral change towards a more sustainable food system for patients of Sophia Children's Hospital, focusing on plant-based food aiming to reduce the CO2 footprint, the amount of waste and to improve health.

→ space available for images / figures on next page

introduction (continued): space for images

A complex stakeholder map titled "Planet Earth" showing a network of interconnected nodes. The nodes represent various stakeholders and their interests, including Patients, Doctors, Dietitians, Suppliers, Caterers, and the Hospital. The map is organized into concentric circles, with the most central nodes being Patients and Doctors. The outer nodes represent external stakeholders like Suppliers and Caterers. The map is color-coded by stakeholder type: Patients (blue), Doctors (red), Dietitians (green), Suppliers (yellow), Caterers (purple), and Hospital (orange). The map is surrounded by a legend titled "Primary function of food to be" with icons for Healthy, Sustainable, and other functions.

image / figure 1 Stakeholder map

A hierarchical diagram titled "Key factors influencing sustainable meals in hospitals". The central node is "Sustainable meal". It branches into four main categories: "Micro plant-based meals", "Lowering the amount of food wasted", "Local products", and "Seasonal products". Each of these categories further branches into more specific sub-factors. For example, "Micro plant-based meals" branches into "Reducing meat" and "Reducing proteins". "Lowering the amount of food wasted" branches into "Targeted purchases", "Preparation methods", "Feeding the food to the patient", and "Identifying access food on waste". "Local products" and "Seasonal products" are shown as single nodes without further sub-factors.

image / figure 2 Key factors Influencing sustainable meals in hospitals

Appendix A - Project brief



 Personal Project Brief – IDE Master Graduation Project

Problem Definition

What problem do you want to solve in the context described in the introduction, and within the available time frame of 100 working days? (= Master Graduation Project of 30 EC). What opportunities do you see to create added value for the described stakeholders? Substantiate your choice.
(max 200 words)

At Erasmus MC and globally, the health benefits of sustainable meals are not widely recognized. Many believe that eliminating animal-based products can cause nutrient deficiencies, especially for ill children. However, with the right ingredients, plant-based meals can be healthier and more environmentally friendly (Health Council of the Netherlands, 2023; Eat-Lancet, 2024; Patel, 2017). Currently, 40% of food at Erasmus MC is wasted, largely before reaching patients, due to poor timing, leftovers, and expired products. Food choices significantly contribute to the hospital's high CO2 emissions, which are considerable on a national scale.

Next to that, only 20% of proteins in hospital meals are plant-based, well below the 60% target set by the GreenDeal Duurzame Zorg (2023) for 2030. As academic hospitals can lead sustainable food transitions, there is an opportunity to adjust menus and menus to meet these goals. This shift could reduce food waste and CO2 emissions while encouraging healthier diets, potentially influencing patients' food choices at home. Collaboration and alignment between doctors, dietitians, caterers, and suppliers are crucial to driving the transition towards a more sustainable and health-conscious food system. To support this shift, I will focus on designing interventions that facilitate the transition to more plant-based protein options and reduce food waste within the hospital.

Assignment

*This is the most important part of the project brief because it will give a clear direction of what you are heading for.
Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence)
As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create)
and you may use the green text format:*

Designing an intervention to increase the acceptance of more sustainable food choices for patients at Sophia Children's Hospital

Then explain your project approach to carrying out your graduation project and what research and design methods you plan to use to generate your design solution (max 150 words)

In order to fulfill the assignment, I will follow the four phases of the systemic design framework of Design Council which is based on the Double Diamond (explore, reframe, create, catalyse). This expands the design process to include 'invisible activities' such as orientation and vision setting, connections and relationships, leadership and storytelling, and continuing the journey.

To clarify the current situation and identify the pain points that have made the system difficult to change, I will create a system map that includes all stakeholders. This will be done through desk research and interviews with hospital employees, food experts, and sustainable transition specialists. The map will also help identify who is responsible for decisions about food distribution across Erasmus MC and who to contact. It will further enable the selection of a diverse range of participants for co-creation sessions at different stages of the design process. This approach will help gather information about the problem and uncover potential interventions. The interventions will be tested at Sophia Children's Hospital and, together with a strategy, will form the outcome of the project.

Project planning and key moments

*To make visible how you plan to spend your time, you must make a planning for the full project. You are advised to use a Gantt chart format to show the different phases of your project, deliverables you have in mind, meetings and in-between deadlines. Keep in mind that all activities should fit within the given run time of 100 working days. Your planning should include a **kick-off meeting**, **mid-term evaluation meeting**, **green light meeting** and **graduation ceremony**. Please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any (for instance because of holidays or parallel course activities).*

*Make sure to attach the full plan to this project brief.
The four key moment dates must be filled in below*

Kick off meeting 20 sept 2024

Mid-term evaluation 3 dec 2024

Green light meeting 7 feb 2025

Graduation ceremony 7 mrt 2025

In exceptional cases (part of) the Graduation Project may need to be scheduled part-time. Indicate here if such applies to your project

Part of project scheduled part-time	✓
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For how many project weeks 10

Number of project days per week 4,0

Comments:

Due to RSI complaints I will start with 4 days a week while going to a physiotherapist. If possible, I will change to 5 days a week after the midterm.

Motivation and personal ambitions

Explain why you wish to start this project, what competencies you want to prove or develop (e.g. competencies acquired in your MSc programme, electives, extra-curricular activities or other).

Optionally, describe whether you have some personal learning ambitions which you explicitly want to address in this project, on top of the learning objectives of the Graduation Project itself. You might think of e.g. acquiring in depth knowledge on a specific subject, broadening your competencies or experimenting with a specific tool or methodology. Personal learning ambitions are limited to a maximum number of five.
(200 words max)

I chose this project because of the complexity of stakeholders and the fact that EMC's challenges reflect a broader societal struggle. The solution lies not in a single action but in a behavioral shift toward a sustainable future, which aligns with my interests in design and what I want to pursue in my career.

Through this project, I aim to improve my facilitation skills by organizing co-creation sessions. I also want to enhance my ability to involve diverse stakeholders by approaching each in a way that suits their role. Additionally, I hope to develop skills in designing testable, physical interventions. In my SPD master's program, I sometimes felt the lack of user testing in real contexts, as projects often ended with future implementation plans and recommendations for companies to test themselves. This approach risks leaving solutions unimplemented, which I find unfortunate. I believe showing the impact of certain solutions within the project will make them more likely to succeed. Lastly, I look forward to gaining experience in applying strategic thinking within a large organization, which I believe will be helpful for my future career.

[illegible]

Appendix B - Estimating the share of patient meals on the total amount of meals in SCH

By giving input on data from EMC’s website and the interview with the Manager Food and Drinks, ChatGPT made the following estimation.

- 1. Patiënten
 - Opgenomen patiënten krijgen al hun maaltijden in het ziekenhuis.
 - Met ~205.166 patiëntdagen per jaar en drie maaltijden per dag betekent dit ongeveer 615.500 ziekenhuismaaltijden per jaar voor patiënten.
- 2. Medewerkers
 - Niet alle medewerkers eten dagelijks in het ziekenhuisrestaurant.
 - Stel dat 30% van de 16.180 medewerkers dagelijks in het ziekenhuis eet (bijvoorbeeld lunch of avondeten in de kantine).
 - Met 220 werkdagen per jaar betekent dat ongeveer 1.066.000 maaltijden per jaar voor medewerkers.
- 3. Bezoekers en studenten
 - Bezoekers en studenten dragen ook bij aan de consumptie. Stel dat dagelijks 1.000 maaltijden aan bezoekers en studenten worden verkocht, dan komen we op 365.000 maaltijden per jaar.

Herziene schatting van de verdeling van voedselconsumptie binnen het Erasmus MC:

- Patiënten: ~33% (615.500 maaltijden)
- Medewerkers: ~56% (1.066.000 maaltijden)
- Bezoekers & studenten: ~11% (365.000 maaltijden)

Dit blijft een ruwe inschatting, maar geeft een beter beeld dan de eerdere berekening. Wil je een nauwkeurigere schatting, dan zou je de daadwerkelijke verkoopcijfers van de ziekenhuiscatering moeten opvragen.

Appendix C - EMC compared to other health institutions transitioning to a more plant-based meal

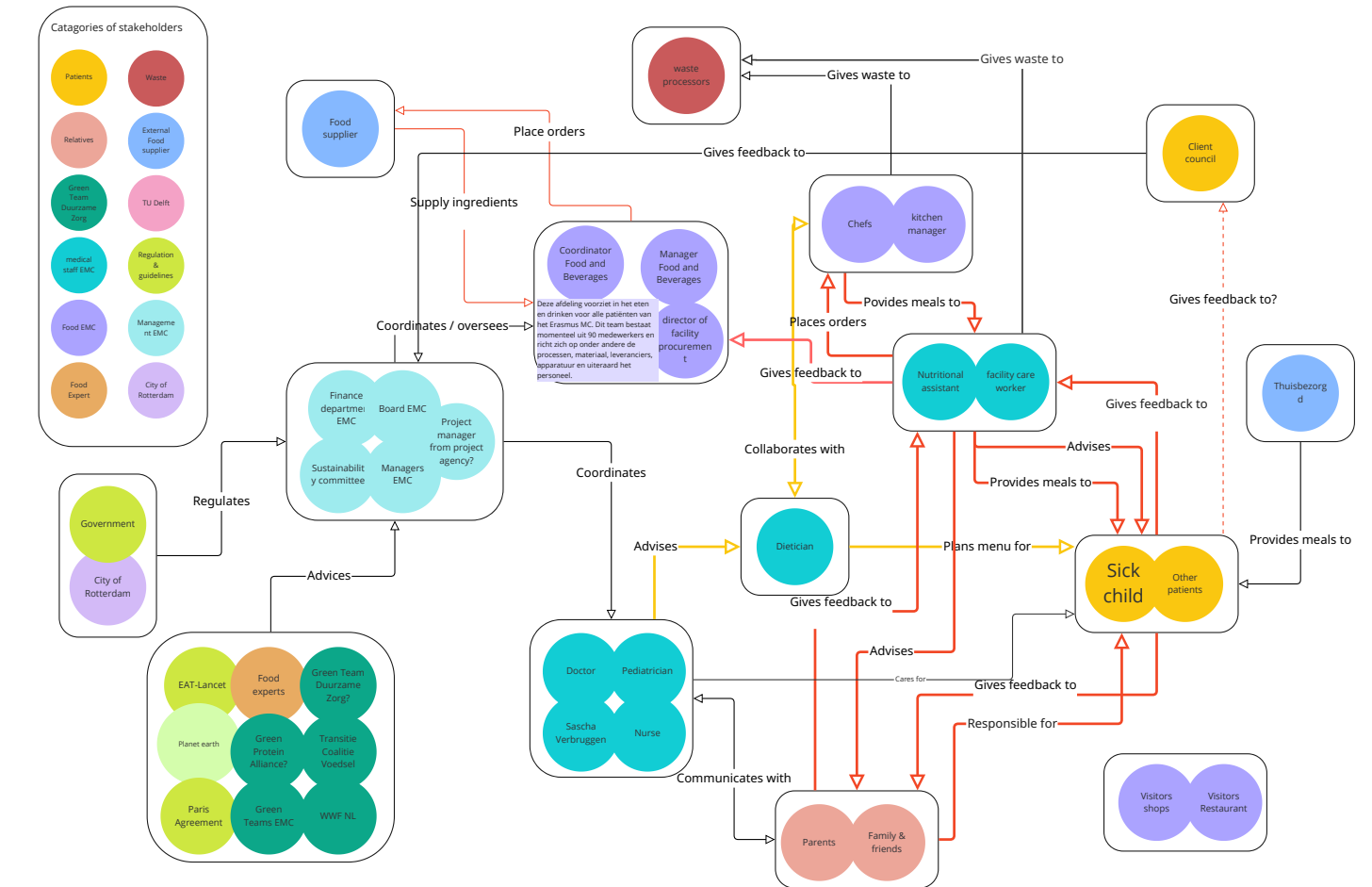
					
Amount of patients	1250 beds	1065 beds	770 beds	92 beds	No specific data found, but 850.00 vegan meals yearly
Kind of care	University medical centres	University medical centres	Clinical hospital	rehabilitation centre	Clinical Hospitals
Location	Rotterdam	Nijmegen	hospital organisation with locations in Alkmaar, Den Helder, Heerhugowaard, Limmen, Schagen and Texel	Amsterdam	11 hospitals in New York City
Sustainable food steps taken	See chapter XX	offers vegetarian meals as the default for employees, with meat available only upon request, and focuses on protein-rich and healthy meals for patients.	provides two vegetarian meal options on patient menus, along with customizable meat-based dishes. 75% of the patients choose one of the vegetarian options.	moving towards plant-based offerings, by now having plant-centred meals.	serve vegan meals by default for lunch and dinner, resulting in a 36% reduction in food-related emissions, cost savings, and over 95% patient satisfaction.
Biggest barrier	See chapter XX	Reaching wished protein goals	Time needed for patients and NAs to adjust to new flavours, strong initial opposition	Staff needed to be very actively involved to gain acceptance	Minimal reported barriers

Appendix D - SCH patient rooms

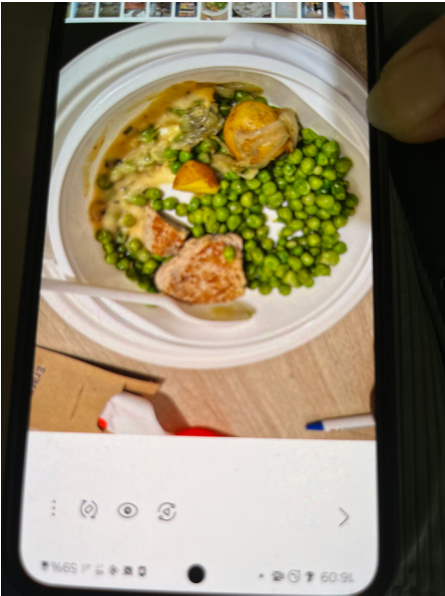


Appendix E - Extended stakeholder map

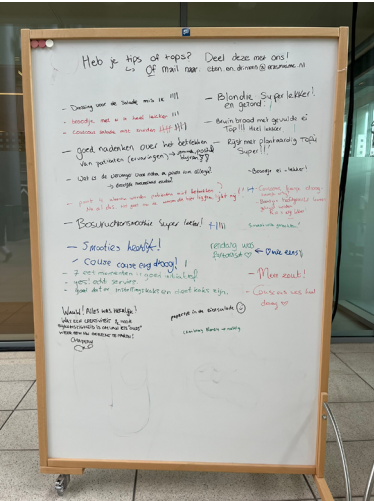
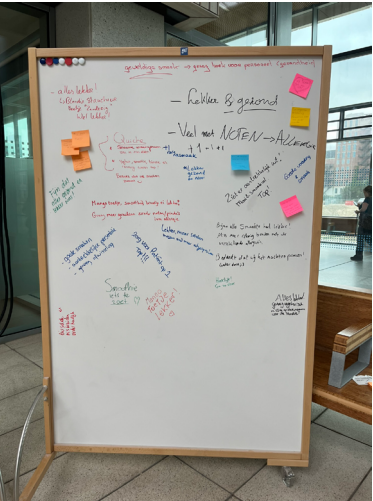
This extended version of the stakeholder map breaks down the departments into more specific functions. Created around the midterm, it is important to note that some details may have since changed. Red lines indicate the relationships that were prioritised for focus, while yellow lines represent those that were partially considered. The legend on the right explains the colour coding of the circles.



Appendix F - Meals on wheels and parent meal



Appendix G - Nutrition Day



Appendix H - Values ranked by stakeholders

Interviews revealed a range of values held by key stakeholders that were frequently mentioned suggesting their importance to stakeholders (row on the left in Figure XX). To quantify these priorities, the main stakeholders were asked to rank these values from most to least important in response to the question: *“What is important to you in a children’s patient meal?”*

In the images, the highest-ranked item (marked with ‘+’) appears at the top of the notes, while the lowest-ranked item (marked with ‘-’) is also listed at the top under the negative rankings.

It is important to note that this list does not include values deemed entirely unimportant, meaning the lowest-ranked values are simply the least prioritized among those mentioned, rather than the least important overall.

 Sick child + Tasty - No extra work for healthcare staff + Comfort - Sustainable + Nicely served + Freedom of choice - Protein rich	 Family + Comfort - No extra work for healthcare staff + Within habits - Sustainable + Quick recovery - Protein rich	 Nutritional assistant + Comfort - + freedom of choice - Protein rich + Nicely served - Sustainable	 Paediatrician + Tasty - No extra work for healthcare staff + Healthy - Protein rich + Sustainable - nicely served
 Dietician + Within habits - + Protein rich - + Quick recovery -	 Food & Beverage manager + Freedom of choice - No extra work for healthcare staff + Allergy adjustable - Quick recovery + Tasty - Rich in proteins	 Operational manager food + Tasty - No extra work for healthcare staff + freedom of choice - Rich in proteins / Allergy adjustable + within habits - nicely served	 Hospital chef + Tasty -Sustainable + Healthy - No extra work for healthcare staff + Nicely served -
 Supplier van Hoeckel + Tasty - No extra work for healthcare staff + Healthy - Nicely served + Within habits - Rich in proteins	 Hospital restaurant chef + Comfort - No extra work for healthcare staff + Freedom of choice - Rich in proteins + Fresh experience - Quick recovery	 PhD plant-based food transition + Sustainable + Comfort / within habits + Tasty	What is important to you in a children's patient meal? Tasty Comfort Freedom of choice Quick recovery of the patient Healthy Falls within habits Nicely served Fresh Sustainable Allergy adjustable Protein rich No extra work for healthcare staff
 Dietician Radboud UMC + Protein rich - + Comfort - + Quick recovery - Sustainable	 Food & Beverage manager NoordWest ziekenhuis + Quick recovery - No extra work for healthcare staff + Sustainable - Allergy adjustable + Fresh - nicely served		

Appendix I - Problems identified with sources

Nutritional & Health concerns	Logistical Challenges	Communication & Feedback issues	Behavioral & Cultural Barriers
Plant-based options require larger portions High amounts of protein is needed for recovery Medical concerns for protein deficiencies Meat alternatives lack nutritional balance	Broodwagen accessibility issue to rooms Implementation of Changes is slow Balancing order timing and feasibility Resources for transition are limited Long distances affect food freshness Outside food is brought in	Nutrition assistants' influence -> not specifically trained yet Feedback is not structurally gathered and there is no plan to do so Children's meal requirements lack essential personalized approaches. Kitchen staff does not see what is(n't) eaten Tracking patients intake is lacking Limited engagement with staff and patients Lack of co-creation in decision-making Staff is afraid of (negative) feedback Feedback is not communicated on a regular basis to staff	Aversion to restrictions Hospital food is poorly perceived Sustainability is not a priority for patients and staff Compassionate feeding by parents Established (eating) patterns are hard to change Unknown makes unloved Plant-based food has a Negative image (Sick) children are picky eaters Cultural habits??

- Literature
- Dieticians
- Food & Beverage management
- Patients
- Doctors
- Supplier
- Nutrition assistants
- Food transition experts
- Own conclusion

Appendix J - Results co-creation session

Goal: Gain diverse perspectives and kick-start the flow of idea generation, aiming to quickly develop three inspiring concepts. These concepts should not only spark creativity but also encourage thinking beyond the constraints of the hospital environment, children's preferences in that setting, and the existing system limitations identified through research.

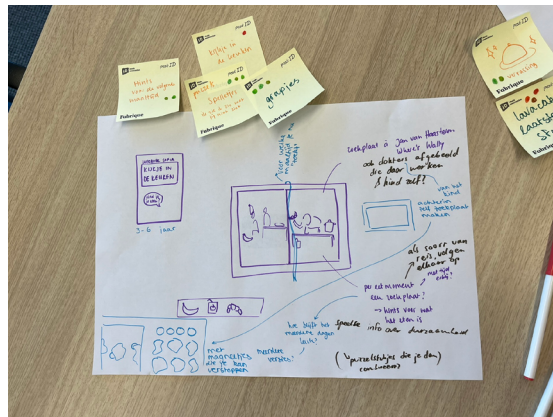
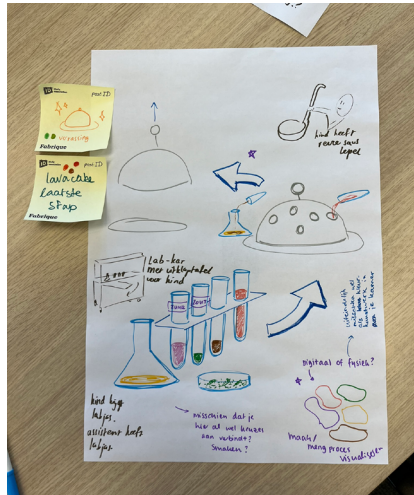
Participants: One Integrated Product Design student, two Design for Interaction students

Problem Statement: How can selecting the sustainable meal option be made into an enjoyable and engaging experience?

Setting: Meeting room at the Faculty of Industrial Design Engineering

Duration: 1 hour

Techniques Used: Collaborative brainstorming on four “How To” questions (one at a time), Hits or Dots selection method, individual concept development, peer feedback, and final concept presentation.



Appendix K - Possible design directions

Design direction 1: Make the act of choosing meals an enjoyable and engaging

experience: The new menu will contain a higher proportion of vegetarian and plant-based options. To achieve the intended sustainability impact, it is important that patients actively choose these options over animal-based ones—ensuring that the set 55:45 plant-based (PB) to animal-based (AB) ratio materializes in practice.

- For lunch and dinner, animal-based components will not be prepared if they are not selected, reducing unnecessary production.
- For breakfast and snacks, the PB-to-AB offering can be adjusted over time if trends show a decline in AB choices within the first few months.

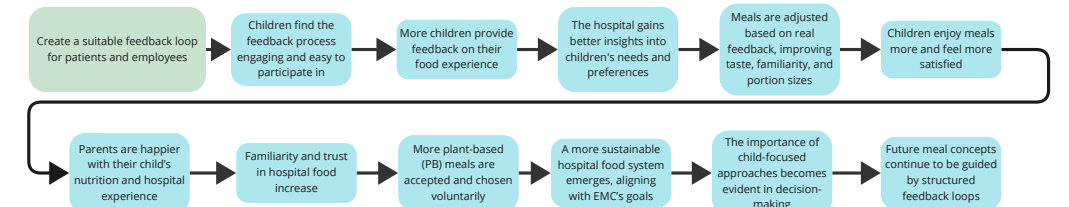
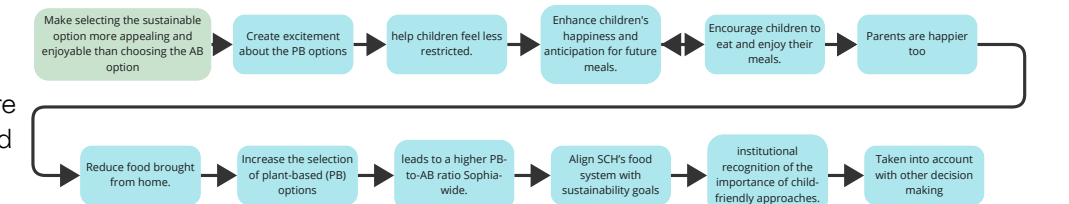
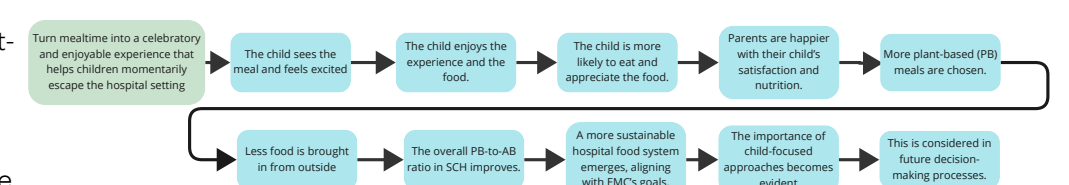
Note from author: This direction was initially favoured. However, nudging children toward plant-based options using methods beyond subtle choice architecture—such as incentives or small rewards—raised ethical concerns. Hospitalized children should not be restricted in a way that could negatively affect their comfort or experience. Due to these considerations, this direction was ultimately not pursued.

Design direction 2: Turn meal times into a celebratory and enjoyable occasion:

The goal of this direction is to make children excited about their meals, enjoy them fully, and finish their food. Additionally, for children staying multiple days, the first meal should create a positive impression that enhances their expectations for future meals. A welcoming and enjoyable mealtime experience can also reduce stress and improve overall satisfaction.

Direction 3: Develop a framework for the creation of feedback loop for patients and employees

Explained in chapter 4.

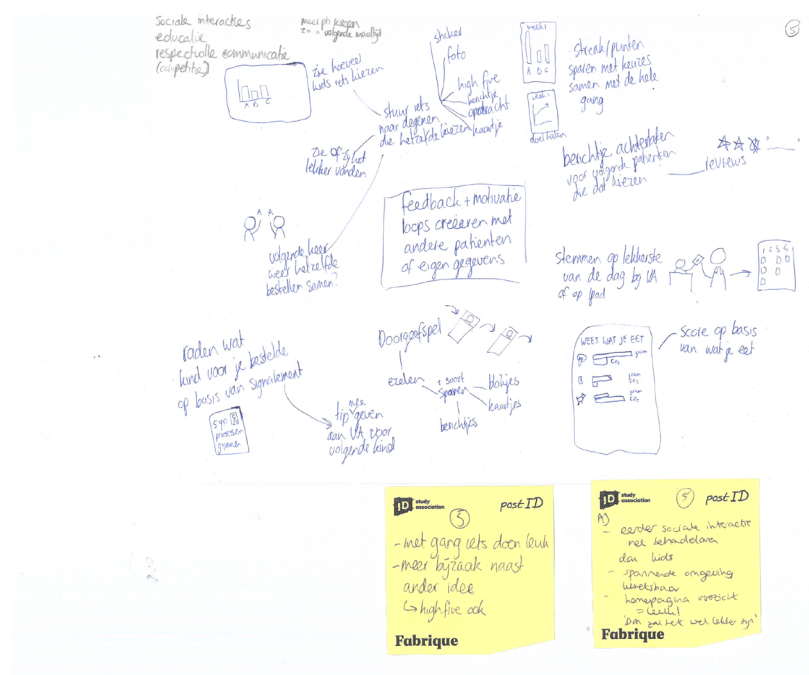
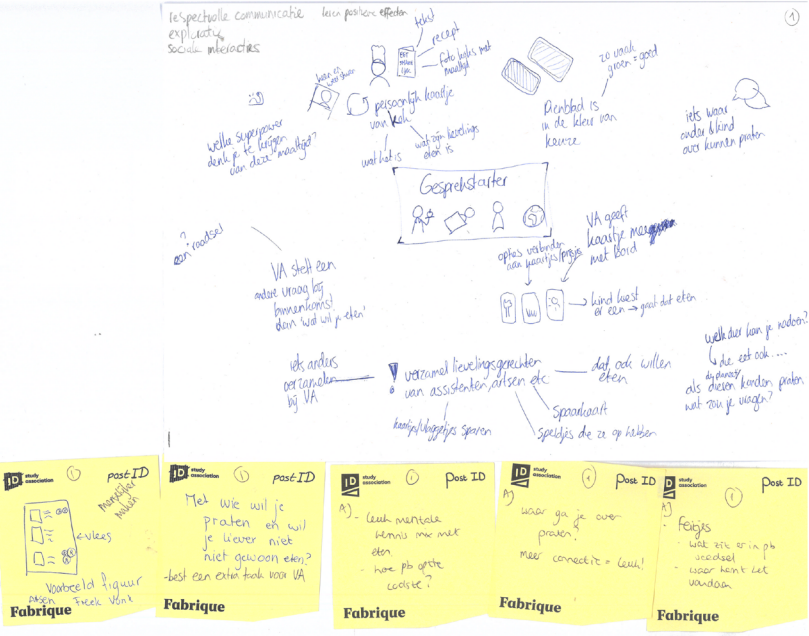
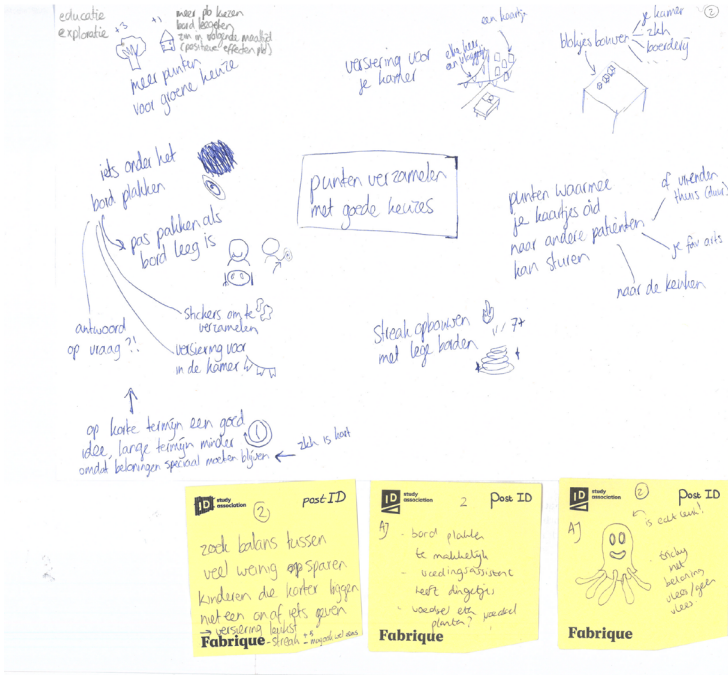


Appendix L - Ideation

Using various How To statements and working from the desired outcomes, brainstorming took place both individually and collaboratively. By continuously reviewing ideas, identifying what problems they addressed, and reconsidering the original assignment in iterative cycles, the ideas became more focused and gained depth.

From the 200+ thoughts and aspects explored, over 50 ideas were generated throughout the process. The most promising ones were selected and combined into eight concept areas or directions, each linked to patient preferences, habits, and the intended effects. These concepts were further elaborated into detailed sheets, which were then discussed with six designers. Their feedback provided insights into the potential impact of the concepts, what they found appealing, and what aspects needed further clarification.

A selection of working sheets is shown here for reference.



Appendix M - Mock-up of the system map poster

