

Workshop Report

Participatory Design

Workshop held on January 12th , 2025

Group 7



UNIVERSITÀ
DI TRENTO

Title	Design the future of Meal Planning
Subject	Social Robots & Nutrition
Timeframe	16:00-18:00
Location	Mayer Residence [Study room 1]
Number of participants	10

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Trento, January 2025

1. Introduction	4
1.1 Background	4
1.2 Objective	5
1.3 Scope	6
1.4 Relevance	7
2. Methodology	8
2.1 Workshop Design	8
2.1.1 Workshop Structure and Timeline	8
2.1.2 Activity Selection and Rationale	8
Meal plan creation	9
Brainstorming and Prototyping	9
Role-playing	9
2.1.3 Schedule Overview	10
2.2 Participants	11
2.2.1 Recruitment Strategy	11
2.2.2 Demographic Composition	11
2.2.3 Participant Preparation	12
2.3 Materials and Tools	15
2.3.1 Materials	15
Documentation and prototyping materials	15
Instructional material	15
Snacks	16
2.3.2 Tools	16
Prototyping and documentation tools	16
Support tools	16
2.3.3 Workshop space and setup	18
2.4 Facilitation	19
Facilitator Roles and Responsibilities	19
2.5 Theoretical Basis	20
3. Workshop Activities and Process	21

3.1 Detailed Description	21
3.1.1 Presentation round	21
3.1.2 Ice breaker: Physical Kahoot	21
3.1.3 Team Creation	23
3.1.4 Meal Plan Creation	24
3.1.5 Brainstorming	26
3.1.6 Prototyping	28
3.1.7 Final Presentation	30
3.1.8 Discussion	30
3.1.9 Reflections	31
3.2 Participants Interaction	32
3.2.1 Before starting	32
3.2.1 During the workshop	32
3.2.2 After the workshop	33
3.3 Challenges	33
3.3.1 Difficulties encountered	33
3.3.1 Real time adjustments	34
4. Results	34
4.1 Key Outcomes	34
4.2 Themes or Patterns	39
4.3 Participant Feedback	41
5. Analysis and Discussion	42
5.1 Critical Reflection	42
5.2 Implications	44
6. Conclusion	46
7. References	47
8. Appendices	48
Appendice 1 - Meal plan template	48
Appendice 2 - Consent form	49
Appendice 3 - Photo folder of the workshop	50

1. Introduction

The following section introduces the background related to the workshop conducted, the main goals and objectives of such workshop conducted, as well as the scope and relevance of it.

1.1 Background

When our team started thinking about how a social robot could help people stick to a meal plan, we realized how common this struggle really is. For students especially, keeping up with a healthy diet or any structured meal plan can feel like an uphill battle. With so many other things to focus on—like attending classes, working on assignments, and balancing personal responsibilities—it's easy to see why meal planning often gets pushed aside. Even for those who try, sticking to a meal plan isn't always easy. Unexpected things, like a busy day, running out of ingredients, or even just feeling too tired to cook, can make it hard to follow through.

Thinking about these challenges, we wanted to dig deeper into why meal planning feels so difficult and what could actually make it easier. We decided to break our research into three parts—observations, interviews, and a focus group—to make sure we explored this problem from different perspectives. Each step gave us new insights into what people face every day when it comes to planning and preparing their meals.

In the first phase, we observed people in everyday food-related settings, like canteens, restaurants, and grocery stores. Our goal was to see how people actually make decisions about food. What do they choose? What seems to influence those choices? Are they making quick decisions based on time, or are they considering other factors like cost or preferences? Watching these behaviors helped us get a clearer idea of the real challenges people face when making food choices.

Next, we moved on to interviews. Here, we had the chance to really hear about people's personal experiences. We asked about their eating habits, their approach to meal planning, and whether they'd ever tried using technology, like apps or AI, to help with it. What stood out in these conversations was how different everyone's experiences were. Some people felt confident about planning meals, while others said it felt overwhelming or time-consuming.

Many participants also talked about how hard it can be to balance everything—like cost, time, and nutrition—and how this often stops them from sticking to a plan.

Finally, we brought everything together in the focus group. This step was especially important because it gave participants the chance to share their thoughts in a collaborative setting. The group discussed how a social robot might help with meal planning and what features they thought were most important. Ideas like personalization, flexibility, and real-time adaptability came up a lot. Participants also debated whether they'd trust a robot or app over a human nutritionist and shared their concerns about accuracy and usability. Despite some skepticism, there was a lot of enthusiasm for the potential of technology to make meal planning simpler and more engaging.

By the end of this process, it was clear that meal planning is much more than just deciding what to eat. It's about balancing personal preferences, social influences, and real-life constraints. For a social robot to truly help, it would need to adapt to the user's lifestyle, provide support that feels empathetic and helpful, and make the process of planning and sticking to meals feel like something achievable—even enjoyable. These insights became the foundation for exploring how we could design a tool that truly works for users.

1.2 Objective

When we were planning this workshop, we wanted to create an environment where participants could help us understand how to design a solution that makes meal planning easier. Meal planning often sounds simple, but as we explored earlier, it's hard to stick to due to issues like tight schedules, lack of motivation, or even not knowing where to start. Our goal was to see how participants would approach these challenges and what kind of ideas they could come up with for using a social robot in this context.

One of the main objectives was to learn more about what people actually need when it comes to meal planning. We wanted to know if they'd prefer simple reminders or something more interactive, like a tool that adapts to their daily habits and routines. This wasn't just about collecting generic feedback—it was about diving deeper into what features could actually make meal planning practical and appealing.

Another important aim of the workshop was to encourage collaboration. By having participants work in teams, we hoped to see how they approached the problem creatively,

shared ideas, and built on each other's thoughts. We also wanted to explore how people prioritize certain features, like flexibility, ease of use, or even emotional support, when designing solutions.

At the end of the day, this workshop was about understanding the user's perspective better. By combining individual insights with collaborative brainstorming, we hoped to get closer to designing a social robot that could genuinely help people follow a meal plan and stay healthier.

1.3 Scope

The scope of this workshop was intentionally kept focused and practical. We knew that most of the participants wouldn't have expertise in nutrition or robotics, so we wanted the activities to feel approachable while still encouraging creativity. At the same time, we didn't want to overwhelm them with overly complex tasks, so we designed the workshop to fit within two hours and made sure each activity had a clear purpose.

The workshop began with an icebreaker to help participants feel comfortable and ready to share their ideas. After that, we moved into activities like meal plan creation, brainstorming, and prototyping. Each task was carefully structured to make participants think critically about the challenges of meal planning and how a social robot could address them. For example, the brainstorming session asked participants to identify potential issues with meal plans and come up with solutions, while the prototyping phase allowed them to translate those ideas into tangible designs.

The workshop also focused on exploring different perspectives. By bringing together participants with diverse backgrounds and experiences, we could uncover insights that might not have come up otherwise. This diversity was important because meal planning isn't a one-size-fits-all problem—different people face different challenges, and we wanted to capture that variety.

While the workshop was short, it gave us a chance to collect valuable input directly from users. The scope wasn't about finding perfect solutions or creating a finished product—it was about gaining a better understanding of what works, what doesn't, and what users truly need. These insights will help us shape the next steps in designing a social robot that makes meal planning more accessible and realistic.

1.4 Relevance

We think this workshop is really relevant to the field of Participatory Design because it shows how involving people in the process can lead to interesting and practical solutions. Meal planning is something almost everyone can relate to, so using this as a context to explore how social robots can help felt like a good fit. It also gave us the chance to see how technology can be designed to feel more human and empathetic, which is an important part of making tools people actually want to use.

2. Methodology

The following section explains the methodology the workshop followed, the participant demographics, materials and tools used in such workshops and insights about the facilitation and theoretical basis involved.

2.1 Workshop Design

We started the discussion around designing our workshop having in mind that participants were probably not going to be experts in the field of nutrition and social robots. This is not the ideal scenario, but we still wanted to perform our workshop in a way that allowed us to gain valuable insight from them..

2.1.1 Workshop Structure and Timeline

From our previous experience with facilitating a workshop, we knew that exceeding 2 hours of time was not going to be a wise choice. That is why we decided to assign the maximum duration of our workshop at around **2 hours**. In any case, we decided not to be too specific about the timing in our communication with the participants, thinking that they would be scared and not come, but this might have turned on us as we will see in *Section 3.1.6*.

Since the goal of this project was to obtain multiple prototypes from the participants, the rest of our planning rotated around this: having them perform a creative and informed prototyping session, providing them with the tools and materials needed to do that.

2.1.2 Activity Selection and Rationale

We opted to have the following activities make up the body of our workshop:

- **Familiarization** activity (Meal plan creation)
- **Brainstorming** activity
- **Prototyping** activity

In performing this choice, we purposefully avoided selecting activities that required too much comprehension, because we wanted simple activities that could be easily understood by the participants. This is also why we decided not to rely on role-playing too much.

Meal plan creation

We crafted a specific activity to get participants in the context of meal planning, further activating them and making them question about what they were doing. The goal of this activity was also to make any doubt arise so that the prosecution of the workshop would be more linear in the later more important stages.

We envisioned the participants filling a meal plan as they were nutritionists, to also replicate the human component of the tool that we would have liked them to prototype. In this tool, users receive a meal plan from another human, and then get assisted by a social robot in following it.

Brainstorming and Prototyping

These two activities were strictly tied to each other, since the first would have fueled the second. During the brainstorming phase, we envisioned the participants bringing up issues with following the meal plan provided, grouping them under common themes. Under the second phase of brainstorming, we wanted them to think of a solution involving a social robot to mitigate or solve these issues.

During the prototyping phase we wanted them to physically build this tool: this way they would also have more time to think about it and feel what problematics might arise, further specifying the tool.

Role-playing

Role-playing in this workshop had just the role of conveying some constraints in a more flexible way: we wanted to influence the participants, but not to completely constrain them, as it happens in real life. In fact, one can always bend around self-imposed rules.

Role playing was used to convey constraints in the meal plan creation, to have more varied results. *Examples of meal plan role-play constraint: Weight loss; Muscle gain.*

Another instance of the usage of role-play was after receiving the meal plan. Participants would have to imagine that they have different habits as given to them, to influence their perception of the meal plan and generate new struggles that they might face. *Examples of habits given to the groups: likes eating out (restaurants); hate repetition, suck at cooking (technical).*

These constraints were first generally explained, and then a card as seen in Section 2.3.1 was handed out.

2.1.3 Schedule Overview

Table 2.1 describes the schedule planned for the workshop.

Activity	Estimated time (minutes)
Initial timing slack to wait for late comers	
Workshop introduction	<5
Presentations and Icebreaker	10
Agenda explanation and meal plan template handout	5
Meal plan creation and sharing	15
Break	5
Brainstorming and prototyping	50
Break	10
Prototype sharing with other groups	10
Participants reflections on prototypes	15
Feedback gathering	5
Total	130

Table 2.1: Agenda breakdown

2.2 Participants

2.2.1 Recruitment Strategy

For the recruitment strategy for this workshop, we opted to follow a **convenience sampling**. All of the members of the group sent a recruitment message in group chats with lots of university students or other smaller community members. A flyer was also designed to go along with the message. This flyer served also the double purpose of, in case we needed to, being hung around university campuses to recruit more participants.

To collect possible participants' demographics and experience level with meal planning, we used a structured questionnaire on Google Forms. This allowed us to collect the data directly in an Excel spreadsheet useful for further analysis and organization.

A few days before the workshop, we contacted respondents to ask for confirmation of their participation. This turned out to be very useful since we could better understand the commitment of the participants, and the final dropoff rate revealed to be around **8%**. If we didn't ask for confirmation, we would have had a whopping **37%** dropoff rate.

We opted to directly message participants instead of creating a group, for a specific reason: we were fearing that if a group was to be created, participants would see when someone else was denying his presence, thus making it more acceptable for themselves not to come too. This had the downside of having to handle multiple conversations while asking for confirmation, but revealed to be useful anyhow.

2.2.2 Demographic Composition

The workshop brought together 10 participants from diverse backgrounds. The gender composition showed a female majority (7 participants, 70%) and male minority (4 participants, 30%) as shown in Figure 2.4. The age distribution spanned across three brackets: 18-24 years (4 participants), 25-34 years (5 participants), and 35-44 years (1 participant), with most participants falling in the 25-34 age range as shown in Figure 2.2.

In terms of occupational status, the participants represented varied backgrounds: five students (one Bachelor's and four Master's level), one post-doctoral researcher, one homemaker, and 2 working professionals as shown in Figure 2.3. These different occupations probably meant different lifestyles, which we hoped to leverage to see their different perspectives on meal planning.

We also managed to have diverse cultural backgrounds and nationalities. This was made easier by the composition of our group, already international. Contacting our peers it was easier to be in contact with different areas of the world. Although we did not survey for nationality, we can definitely say because we got to know the participants, that their countries of origin were: USA, Netherlands, Poland, Ecuador, India, Palestine and Spain.

2.2.3 Participant Preparation

The only preparation participants endured, happened during the Workshop itself, right after the icebreaker. We focused on 2 main topics:

- **Meal planning**

For this, the facilitators proceeded to explain what we defined as a meal plan and what we meant by “following a meal plan”.

- **Social robots**

We explained what a Social robot is and how it might be useful in this context, without being too guiding. We also gave real world examples of social robots. This was not a concept as straight-forward to understand for the participants as we saw.



Figure 2.1: message and flyer used for recruitment of participants

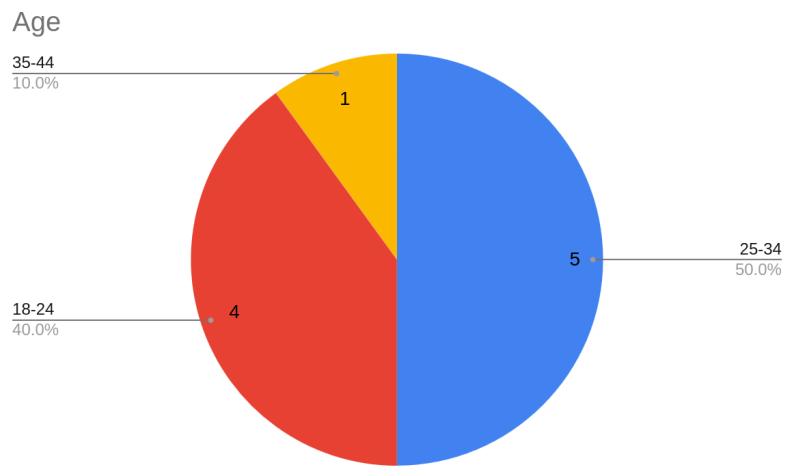


Figure 2.2: participants age distribution

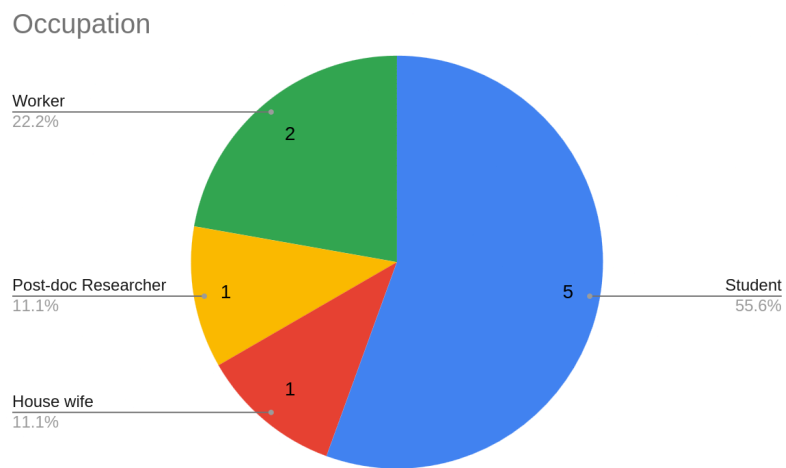


Figure 2.3: participants occupations

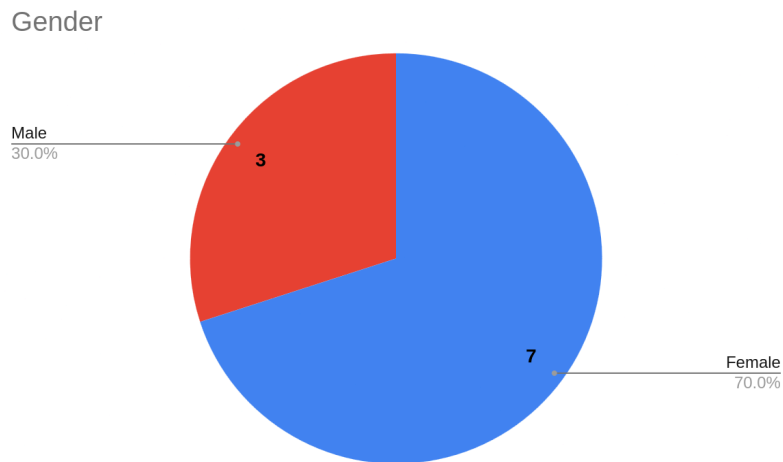


Figure 2.4: participants gender

2.3 Materials and Tools

Since this workshop was oriented towards the production of a physical prototype, most of the materials and tools were physical too.

2.3.1 Materials

Documentation and prototyping materials

- **A4 Papers**, used to jot down ideas or brainstorm, also useful to prototype
- **Post-its**, arguably the most important brainstorming material we could provide. Also, useful for collecting opinions about the prototype in the “Discussion” activity.
- **Bag of random objects** which contained all sorts of things, from very small to medium-sized objects. These can be useful to spark creativity while prototyping and also simplify the process of building a prototype.
- **Play-Doh** was also provided for the prototype building. Since it can take up any shape, it becomes very very useful. Can also be used as a bonding agent for paper.

Instructional material

- **Meal plan template**, an A4 paper template with an empty table to fill to create a meal plan. Team name was written here. See **Appendice 1**.

- **Meal plan goal cards**, every meal plan had to have an objective. It was provided with a handout card. Examples of the cards are shown in Figure 2.5.
- **Habit cards**, to signal constraints in the brainstorming process. Examples of the cards are shown in Figure 2.6.
- **Workshop room sign** used to signal room to our participants and deter non-participants from entering the room
- **Team card** to split participants into teams

When referring to a *card* we mean a small piece of paper, credit card sized and glued to another piece to give it more strength.

Snacks

Another material we made sure was available were snacks. While not being essential for the workshop, they provide a very pleasurable excuse for the participants to hang out while waiting or while having a break. For this reason we provided the participants with some soft drinks, mandarin oranges, bananas, popcorn and some sweets. Sugar is also known to help with concentration, and that is another reason while all of our snacks were sweet and not savory.

2.3.2 Tools

Prototyping and documentation tools

- **Pens, pencils, markers**, all of various colors and thickness, were provided to write, draw or color
- **Scotch tape and glue** to provide the possibility of bonding other materials together during the prototype phase. Scotch was also used to create signage towards the workshop venue and attaching other sheets to the walls

Support tools

- **PC** that was used to present the slides and jot down notes
- **Mobile phone**, used to take pictures of the workshop. All the photos recollected are in the Google Drive folder link shared in **Appendix 3**.
- **TV** used to show the slides to the participants since no projector was available
- **Google Form** to digitally record any feedback from the participants who did not want to share directly but preferred to be anonymous

- **Consent Form** to collect permission from attendees to take photos and explain the procedure

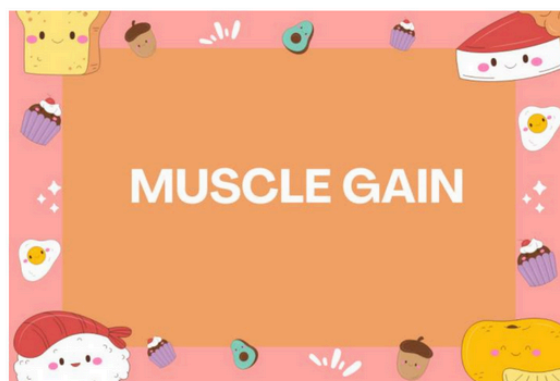
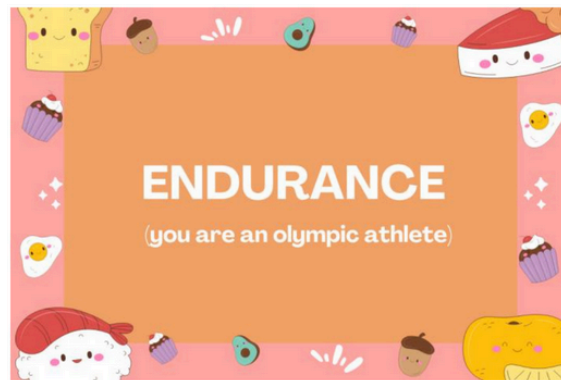


Figure 2.5: example goal cards

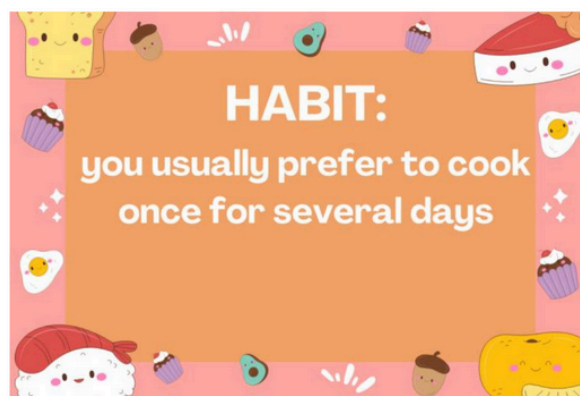


Figure 2.6: example habit cards

2.3.3 Workshop space and setup

We decided to host the workshop at one of Trento's student housing complex, Residenza Mayer. Given that one of our members is resident there, we could book a room for our exclusive use. We went to see the room prior to booking it and we found it suitable for the workshop. Windows on the long walls made it very luminous, and tables with wheels meant we could rearrange them very easily as we wanted. There were also plenty of chairs and a TV we could connect to, so this seemed the perfect place.

We arranged the space so that the snacks table was right by the entrance. Coincidentally, this is also where we laid out the consent form for the participants to sign.

We created a place where participants could leave their jackets, freeing them of the burden of handling them during the workshop, and also moved the biggest table to the front of the tv to create a sort of stage for us to present from. In this table we also laid out the material so that it was easier to retrieve during the workshop.

Another important table was the one we designed as a "Tools and materials depot" to be used during the further phases of the workshop so that everyone could retrieve more specialized tools that we did not have for every group.

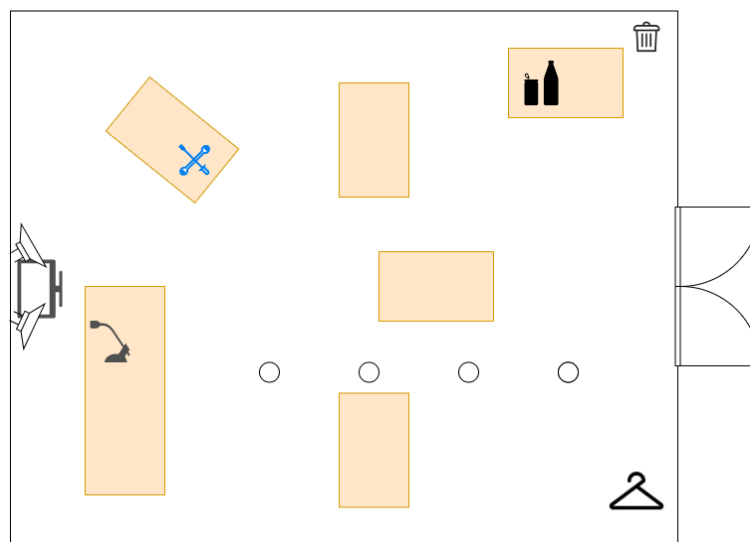


Figure 2.7: room diagram

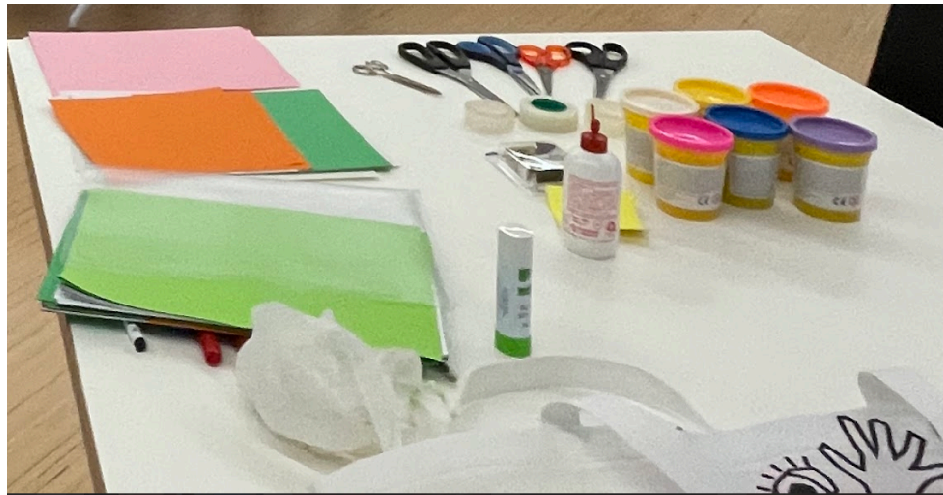


Figure 2.8: tools and materials depot

2.4 Facilitation

Facilitator Roles and Responsibilities

The workshop was facilitated by 4 people, the entirety of our group. We had assigned different roles to ensure that there would not be overlap and that everything could be performed efficiently. Two of us had the role of primary facilitator, while the other two were supporting them with crucial tasks.

Specific responsibilities were distributed as follows:

- Primary Facilitator: Activity introduction and guidance, discussion moderation, ensuring participation balance
- Support Facilitator: Photography, note-taking, technical support, material distribution, Schedule adherence, break coordination, activity transitions

These roles were a reference, meaning that if the situation allowed, designated primary facilitators could help support facilitators with their tasks, if required.

2.5 Theoretical Basis

The design and organization of the workshop drew heavily on principles of Participatory Design (PD), with three key ideas guiding our approach:

Co-Creation and Involvement

We embraced the idea of "designing with" participants, as highlighted by (Elizarova & Dowd, 2017). Direct involvement of stakeholders makes it easier to uncover meaningful insights and come up with fresh ideas. To encourage this, we provided open-ended materials and guided participants through hands-on prototyping activities. This approach created space for creativity and collaboration.

Contextual Techniques

To make the workshop engaging and effective, we used role-playing and constraint cards—methods described by (Elizarova & Dowd, 2017). These tools gave participants the chance to dive deeper into the design challenges and rethink them together, leading to more thoughtful solutions.

Managing Time Constraints

(Kraff & Jernsand, 2023) point out how time is often a barrier in participatory design, with different participants facing different limits on their availability. We wanted to address this by carefully scheduling the workshop to suit a range of lifestyles.

By holding the event on a weekend, we made it easier for people with busy schedules—like students, professionals, or homemakers—to take part. This decision was a practical way to reduce participation barriers and include as many voices as possible.

3. Workshop Activities and Process

The following section provides a more detailed description of how each activity was carried out on the day of the workshop, how the participants interacted before and during the activities, and the challenges encountered in all the process of organizing and doing the workshop.

3.1 Detailed Description

Each activity will be explained in the following sections.

3.1.1 Presentation round

This was the first activity after a brief introduction of the workshop. We added this activity because we wanted participants to know the other participants' names and we also participated presenting ourselves as facilitators. It only took a few minutes where each participant mentioned their name and one more description about them.

3.1.2 Ice breaker: Physical Kahoot

Then we started with the icebreaker. The activity was designed as a "Physical Kahoot," which differed from the traditional virtual game format. Instead of participants answering questions on their devices, we placed four letters (A, B, C, and D) in separate columns around the room. Ten random questions, along with their multiple-choice answers, were displayed on a TV screen, as shown in Figure 3.1. These questions were intentionally unrelated to the workshop's topic.

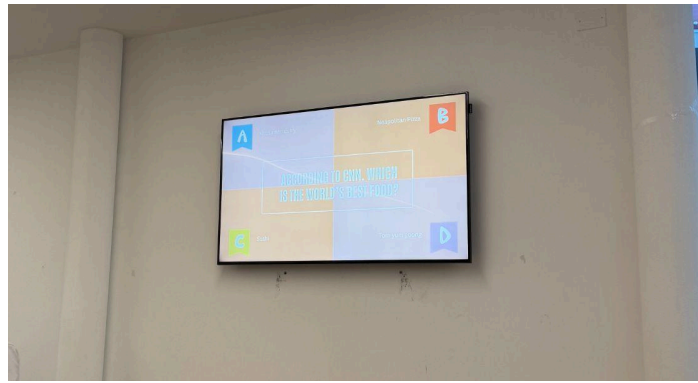


Figure 3.1: Presentation of the questions

This idea was chosen because the workshop took place on a Sunday afternoon, and we wanted to create an engaging and dynamic start to the session. The goal was to help participants move around, interact, and establish a relaxed atmosphere without focusing too heavily on nutrition (see Figure 3.2).



Figure 3.2: Participants playing the Physical Kahoot

The activity successfully achieved this goal. Participants enjoyed reading each question, deciding where to move, and observing others' choices. In some instances, individuals followed the majority, while others chose to move with friends or people they knew. Overall, the activity fostered a positive and lively mood, effectively preparing participants for the subsequent workshop activities. Figure 3.3 illustrates moments when the majority of participants gathered in the same column.



Figure 3.3: Participants playing the Physical Kahoot

3.1.3 Team Creation

After finishing the icebreaker, we started creating the teams. Initially, we planned to divide participants into teams based on the points they earned during the Physical Kahoot. To prepare, we had materials ready for up to five teams but intended to adjust the number of teams depending on the number of participants. We created five team names related to the workshop's theme: Vitamin-C, Gluten-Free, Calorie, Protein, and International.

Ideally, we aimed to form four to five teams with two to three participants each. This setup would encourage active participation from everyone and allow for more teams to contribute to the final solution. The team names were designed to add a humorous touch while maintaining relevance to the nutrition topic.

Ultimately, we formed four teams of two to three participants. The International team name was not used, and we opted not to group participants based on the Kahoot scoreboard. Instead, we considered personal dynamics, as two couples attended the workshop together, and we wanted them to feel comfortable. Additionally, one of the couples informed us they would leave early, so we grouped them together to simplify logistics. Table 3.1 presents the teams and the number of participants in each.

Team Name	Number of participants
Vitamin C	3
Gluten-free	3
Calorie	2

Protein	2
---------	---

Table 3.1: Teams created

The only issue with the team names was that they caused some confusion for participants during the activities.

3.1.4 Meal Plan Creation

The first team activity was to create a meal plan. We provided each team with a weekly meal plan template, which included seven rows for the days of the week and four columns for breakfast, lunch, dinner, and snacks. The task was to complete the meal plan based on a specific goal assigned to each team. Participants had to consider which meals best fit their assigned goal.

We chose this activity to immerse participants in the workshop topic and to highlight the differences in individual preferences and decisions when creating meal plans. The goals assigned to each team were designed to demonstrate the variety of reasons for creating meal plans beyond the common belief that they are solely for weight loss, as discussed in our focus group. Table 3.2 outlines the goals assigned to each team.

Team name	Goal
Vitamin C	Muscle gain
Gluten-free	Weight loss
Calorie	Endurance
Protein	Balance Diet

Table 3.2: Goals assigned to the teams

For this activity, teams sat together at tables and began working after receiving their materials. We clarified that completing the snack column was optional and that meal options could be repeated. Participants engaged actively, sharing ideas and collaborating effectively. Overall, the group dynamics were smooth, and they required minimal assistance. The only challenge encountered was the lack of appropriate pens for writing on the templates. Some groups used markers instead, which made their writing harder to read. Figure 3.4 shows participants working on their meal plans.



Figure 3.4: Participants completing the meal plan template

This activity did not seem overly challenging for participants. Most templates were fully completed, though some meal options were repeated, and two teams chose not to complete the snack column. Figure 3.5 presents the meal plan created by Group Calorie.

MEAL PLANNER
GROUP CALORIE

	BREAKFAST	LUNCH	DINNER	SNACKS
MONDAY	Eggs Toast Fruit	Rice chicken	Sushi	chocolate
TUESDAY	Eggs Toast Fruit	Pasta Steak	Pizza Pizza	Fruits Nuts
WEDNESDAY	Yogurt Fruit granola	Potato chicken	Salad Shrimp	Almonds Fruits
THURSDAY	Eggs Toast Fruit	Rice Fish salad	Potato steak	Popcorn
FRIDAY	Yogurt granola	Rice Meat salad	chicken salad	Peanuts
SATURDAY	Bacon Eggs Biscuits	Pasta with seafood (Tuna)	Burger fries	chocolate cake
SUNDAY	Bacon Eggs Mashed potato	Potato Ribs	Pizza Large	Fruits Lots

Figure 3.5: Meal plan created by the Calorie team

3.1.5 Brainstorming

After completing the meal plan activity, participants were given a five-minute break before starting the next part of the workshop. The second activity involved brainstorming challenges and solutions related to the meal plans. To facilitate this, we collected the meal plans created earlier and redistributed them randomly among the teams. Additionally, we provided each team with cards describing various habits that could complicate following a meal plan.

The goal of this activity was for participants to identify potential problems they might encounter when following another team's meal plan, considering the habit assigned to them. Once they had identified some challenges, they were tasked with brainstorming solutions to address these issues.

We believed that random distribution of meal plans and habits would encourage a wider range of problems and creative thinking. Participants needed to take time to read the meal plans, and even without the assigned habit, they could begin to identify potential difficulties in preparing or following certain meals. Table 3.3 presents the habits assigned to each group, which were derived from insights gathered during our interviews and focus groups, along with additional constraints we devised to make the activity more engaging.

Team name	Habit
Vitamin C	You enjoy eating out in restaurants
Gluten-free	You are a stressed professor who has little time to cook
Calorie	Usually prefer to cook one for several days
Protein	You hate repeating meals and you are not very skilled cooking

Table 3.3: Habits assigned to the teams

This activity proved to be somewhat confusing at first. After the initial explanation, participants had numerous questions about what to do. We provided additional clarification after the meal plans were exchanged. However, the process of recollecting and redistributing

the plans felt disorganized, and some participants appeared unsure about what was happening.

Once the activity began, groups varied in their ability to generate ideas. Some teams produced more ideas than others. Participants also struggled to understand what to write in the solutions section. We explained that solutions should focus on technological approaches, such as applications, systems, or tools related to social robots. While some participants understood this concept, others found the idea of social robots more difficult to grasp.

Figures 3.6 and 3.7 illustrate teams working on this activity. Despite the initial confusion, the brainstorming session generated valuable discussions. The results of this activity are presented in the Results section.



Figure 3.6: Vitamin-C team working on the brainstorming activity

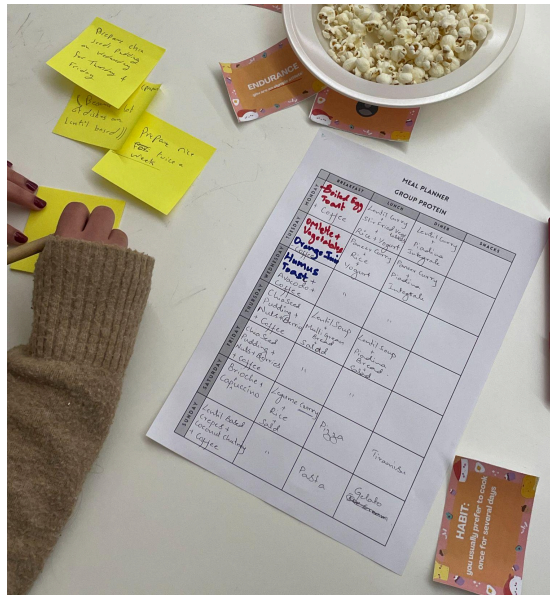


Figure 3.7: Calorie team working on the brainstorming activity

3.1.6 Prototyping

As the brainstorming activity was nearing completion, one participant informed us that they needed to leave. Although we had anticipated losing one team, it turned out that four participants needed to leave. This required us to reorganize the teams and collect all inputs from the departing groups. One participant from the Gluten-Free team joined the Calorie team, resulting in the dissolution of the Gluten-Free and Protein teams.

Subsequently, we explained the prototype activity. The objective was to create a prototype based on the solutions proposed during the brainstorming session. To facilitate this, we arranged materials on a table, including basic supplies such as cardboard, colored paper, and play-doh. Teams were free to use any of these materials for their prototypes.

The two remaining teams appeared to enjoy this activity as they collaborated and created their prototypes. As they had already developed ideas during the brainstorming session, they required less time than expected to complete the prototypes. Figures 3.8 and 3.9 show the two teams working on their solutions. The results of this activity are presented in the Results section.



Figure 3.8: Vitamin-C team working on the prototyping activity



Figure 3.9: Calorie team working on the prototyping activity

3.1.7 Final Presentation

Initially, we had planned a five-minute break before the final presentation. However, since the previous activity took less time than expected and participants had already taken a break to talk and grab food, we decided to proceed directly to the presentations.

During the final presentation, each team showcased their prototype, explained their design process, and discussed how their solution addressed the identified problems. This segment provided an opportunity for participants to share their insights and for other teams to ask questions.

The presentations were concise, and every team member had an opportunity to contribute. This session allowed participants to reflect on the challenges of following meal plans and the innovative solutions they developed.

3.1.8 Discussion

The final activity of the workshop was the discussion segment. We planned five sections where each participant could tell us more about their opinions in relation to the different prototypes presented. Table 3.4 lists these sections along with brief descriptions. For this activity, we placed signs corresponding to each section and provided post-it notes for participants to write down their thoughts and feedback.

Letter	Section	Description
A	Must	Features that a social robot must have for this case
B	Favorites & Why	Favorite features of the prototypes presented in the previous activity with the reason for their choice
C	Won't Include	Features that are not necessary for a social robot in this case
D	Missed	Features that could be included in the prototypes

		but no teams included them in their prototypes
E	Type of interaction preferred	The preferred interaction for a social robot in this case. This can be a physical device, an app, a wearable device. It can also refer to the form of communication, such as haptic or voice.

Table 3.4: Discussion section division

We chose this approach to encourage diverse opinions and guide the discussion in a structured manner. This method was more effective than a traditional voting system, as it allowed participants to elaborate on their views. These inputs will inform the next phase of our research.

The section "Favorites & Why" was removed because there were only two teams remaining, making it unnecessary to select a favorite between the two. All participants engaged in the discussion, though not everyone provided feedback for every section. Nevertheless, we gathered a wide range of perspectives, which are discussed in the Results section.

3.1.9 Reflections

To conclude the workshop, we sought feedback from participants about their experience. We opted for a vocal feedback session, allowing participants to share their opinions verbally. For those who preferred not to speak, we prepared a written feedback form as an alternative.

The vocal feedback session worked well, as nearly all participants were willing to share their thoughts. As a result, the written feedback form was not used. The opinions and reflections shared by participants will be presented in the Results section.

3.2 Participants Interaction

In this section, the participants' interaction before, during and after the workshop will be described by explaining the dynamics, collaboration patterns, or conflicts observed.

3.2.1 Before starting

People started coming around some minutes after 4pm. Before starting with the workshop we had almost all our participants. We were just missing two of them. They came some minutes after starting the workshop previous the presentation round. We had three people from our class, four people who knew each other and three new people who integrated well.

The people who knew each other talked more to each other and people that did not know any of the participants talked more to the facilitators. They all seemed to be in a good mood, relaxed, and calm.

3.2.1 During the workshop

During the activities people were participating actively. As mentioned before, the icebreaker was the start to make participants move around the space and recharge their energies to then continue with the following tasks. Some of them helped move the tables before starting with this activity.

In the other activities where they had to work in teams, they were concentrated and communicated actively inside their teams and with the facilitators when they had any question. It was not difficult for people who did not know anyone at the workshop to integrate into their assigned teams. The participants who had to leave early were very polite and expressed their apologies.

One interesting pattern observed was that participants that had participated in workshops before knew how to work in the activities and they resolved them faster than people that did not have this experience before.

Furthermore, we can mention that the workshop ended well and it created a safe place where people felt free to talk as we had many opinions in the oral feedback.

3.2.2 After the workshop

The workshop ended after an hour and a half and people seemed joyful and maybe a little tired because of the time. They expressed gratitude for the organization and some of them wanted to know more about the future steps.

3.3 Challenges

In this section, difficulties and real time adjustments encountered during the planification and development of the workshop will be discussed.

3.3.1 Difficulties encountered

The difficulties encountered are listed below:

- One day before the workshop we had more answers in our recruitment form so we did not know what to expect about how many people were going to come. For that reason, we planned how we would arrange the groups if we had between 9 to 15 people.
- All our activities were with physical materials so the participants did not need to use their cellphones, but that meant that we would not have the activities outcomes instantly saved. For that reason, we planned to listen carefully and took photos about everything to not lose any input of the participants.
- We reviewed our participants list and we noticed that we did not know all of them as happened in the class workshop. For that reason, we added a presentation round before the ice breaker so we could listen to all the names.
- The place for the workshop was the study room on the first floor of Mayer Residence and it could be a little difficult to find it. For that reason, one facilitator was at the residence entrance to guide the participants and we added a sign outside the door so other students could know that we were doing a workshop there.

3.3.1 Real time adjustments

The real time adjustment are listed below:

- We started the workshop five minutes later than planned.
- We formed the teams in a different way as mentioned above.
- We decided how to reorder the groups after four people left the workshop. We ended up moving the participant that was left alone to the other team of two people.
- We lost two teams so we collected their post-its from the brainstorming to have some of their ideas.
- We added some minutes for the brainstorming activity because some people were confused after the explanation.
- We skipped the second break and reduced time when needed
- We did not use the form for the feedback or the QR. It was just oral feedback.

4. Results

The following section describes the results and the interpretation of the such obtained from the activities carried out during the workshop and the qualitative feedback provided by the participants.

4.1 Key Outcomes

During the workshop, three main sources of information/outcomes relevant to our research were produced:

- Difficulties & solutions of following a meal plan (brainstorming activity prior to prototyping)
- Prototypes generated (prototyping activity)
- Discussion notes

The struggles of following a meal plan (generated from other team and given a new limitation) are summarised below:

Team Name	Team Vitamin C
Habit	Enjoy eating out in restaurants
Struggles	• Cooking takes too long • Lack of nutritional information • Food is not 'restaurant-worthy' • Expensive
Solutions	• Track what you eat in an app • Limit eating out to once a week • Make food more tasty • Go to cheaper places • Meal prepping • Cook bigger meals for social events

Table 4.1: Brainstorming from Team Vitamin C

Team Name	Team Calorie
Habit	Usually prefer to cook once for several days
Struggles	
Solutions	• Cook meals that last more than one day • Upload a photograph of fridge food, so it knows how to create new meal plans • A cooking machine for eggs • A multi-grain cooker for legumes

Table 4.2: Brainstorming from Team Vitamin C

Team Name	Team Gluten-free
Habit	Stressed professor with little time to cook.
Struggles	• Need of making groceries takes off time
Solutions	• Heavy lunch options to skip a meal • Heavy dinners

Table 4.3: Brainstorming from Team Vitamin C

Team Name	Team Protein
Habit	Hate repeating meals, little skill with cooking.
Struggles	• Lacking skill for cooking pizza • Lacking skill for doing sushi
Solutions	• Order online • Buy frozen food • Use external sources (internet, youtube) to learn

Table 4.4: Brainstorming from Team Vitamin C

As appreciated, some groups neglected or did not place too much focus on the 'struggles' section, yet came up with plenty of solutions. Most possible solutions diverge given the difference in habits and meal plans, which was something we were looking for as different people will have a number of unlike struggles as our research in the qualitative research methodology course proved us.

As mentioned previously, four participants left right after the brainstorming session, which meant that there would be only two out of the four groups remaining for the prototype and discussion parts. Such groups would be Team Calorie and Team Vitamin C. The prototypes generated are the following:



Figure 4.1: Prototype of Team Vitamin C



Figure 4.2: Prototype of Team Calorie

The first prototype (*Figure 4.1*) created by team Vitamin C includes a wearable device (a bracelet that serves as a personal nutrition advisor), which provides recommendations depending on the user's schedule and nearest grocery location. Moreover, this group included a device in the form of a flower which is intended to stay in the user's personal kitchen and provide suggestions while the user is cooking.

The second prototype (*Figure 4.2*) produced by team Calorie is intended to be a machine prepping food (given the habit of preference of cooking for several days assigned to the team), that would be connected to the meal plan they were assigned to, hence requiring less inputs from the user's side. Additionally, they suggested the creation of an application that would take photographs of the fridge, and suggest recipes upon this or, alternatively, suggest the acquisition of certain ingredients.

Regarding the discussion part of the workshop, as previously mentioned, we created five sections for participants to express their thoughts (not about the workshop itself, rather the prototypes created and desired features). It is important to note that participants were encouraged to do this task freely, hence they had the opportunity to visit the location of the other team to see the prototype produced, something which was carried out especially from team Calorie's side. Moreover, as discussed, a criteria (preferred prototype) was finally eliminated due to the low number of prototypes produced.

The criteria selected for discussion, as well as the discussions themselves are the following:

Criteria	Discussions
A) Must have features	• Empathy & understanding of my emotions • Consistency • Convenient • Quick • Aesthetic • Minimize food waste • Customize storing food

Table 4.5: Must have features

Criteria	Discussions
C) Would not include features	• Too rigid • Not flexible • Not controlling • Anger

Table 4.6: Would not include features

Criteria	Discussions
D) Missed features	• Notification provider • Evidence of expertise • Inclusivity

Table 4.7: Missed features

Criteria	Discussions
E) Favourite interaction type	• Automated features • Wearable • Visual by reading & writing • Save time • Inclusivity options

Table 4.8: Favourite interaction type

As can be appreciated by the previous data, there was some confusion among participants regarding the difference of the categories, as, for instance, saving time, a discussion topic included as 'favourite interaction type (E)' could have been placed in 'must include features (A)'. This could have been due to the fact that, at this stage, there could have been some

mental fatigue by participants as the workshop had already lasted close to 120 minutes (slightly more for those that waited slightly upon the arrival of other participants. We therefore have proceeded by analysing this data taking into account such context, and therefore treating it as a whole rather than individually - switching it to a more simplistic model, where desired and undesired features are noted -.

Moreover, it is important to note that this last data is extremely reliant on the prototypes produced in the prototyping activity. As the number of participants decreased to six, and the teams Gluten-free and Protein vanished, the number of prototypes was eventually only two (*Figure 4.1 & Figure 4.2*), which potentially means that there are yet many areas, interactions and ideas that were not covered in the workshop and remain unexplored.

4.2 Themes or Patterns

Upon analysing the key outcomes presented in the previous section, we have decided to summarize the main themes that these results suggest. It should be noted that these themes referred to the combination of the previous sources of relevant information, hence repeated data is treated as highly relevant, whereas ideas expressed by participants individually and not shared by others are, despite still being interesting and relevant, not as decisive.

The first common pattern appreciated is the connection between human and technology; an already existing meal plan (human-related) which is made more 'followable' though a device (technology). The idea that a human should be behind something as important for health aligns with the data obtained from the Qualitative Research Methodology course.

Another key theme is the need for a tool which can provide a degree of flexibility. For instance, the wearable device designed to readjust the meal plan based on the user's schedule, or the idea of an application that would recognize food in the fridge are a prime example of such ideas. Participants from the workshop (as well as those that took part in the interviews and focus groups) expressed the idea that, in order to follow a meal plan, there has to be some degree of flexibility, as else it can be too hard to follow, and the way of attempting to tackle this issue flows through the exploration of designs as the ones produced.

Related to this, the expression of social robots that are less heavy in terms of feedback are required. It is not desired that the social robot that is trying to help the user follow a meal plan is constantly prompting him/her to do a task. Instead, and, as participants said and

suggested through verbal cues, it is more desired if '*casual adjustments*' are employed, similar to a virtual assistant that responds to questions.

Additionally, auditory feedback was the preferred method of communication with social robots. This, also related to the need for inclusivity expressed, can be appreciated in the two designs produced by Team Vitamin C (which were, on average, more liked than the machine created by Team Calorie). This could be due to the fact that some of the potential feedback that the social robot will give to the user will be done while the user is in some sort of context which prevents them from employing a tactile interaction (e.g. cooking, or carrying grocery items). This was something we had not encountered yet in the focus group or interviews conducted.

Moreover, the idea of creating adjustments depending on the context of the user rather than their personal preference was recurrent. In other words, using a machine's strengths (real time adjustments) is desired, as this type of adjustments (e.g. having less items in the fridge) are very hard to make by contacting a nutritionist, as it would suppose constant interaction and monitoring. This approach also allows humans to create the meal plan (based on the preference) and reduce the machine to an advisor role, something that actually has been proven to reduce aversion towards machines (Bigman & Gray, 2018, 21-34). In addition, it was expressed that it should be empathic towards users, as following a meal plan can be a stressful and mentally draining activity.

In conclusion, the key themes extracted from the workshop are the following:

- The social robot should be allowed to make slight adjustments based on the context of the user
- The social robot should be designed to make the meal plan more flexible through those adjustments
- The social robot should be empathetic towards users
- A wearable device is a preferred device, something that can be with the user and provide feedback when required
- Audition is the preferred method of interaction

4.3 Participant Feedback

After the participants provided their views about what features are most important, we allowed them to provide some verbal feedback on how the workshop went.

One participant showed interest in the practical outcomes of the workshop, as in, what are the next steps we would follow after analysing the results obtained. We explained to the participant that most likely there would not be too much to continue after the current report was done, yet there is a likelihood that, if submitted to the public, it can be used by researchers in designing prototypes to help in following a meal plan.

On the other hand some participants expressed that the connection between activities was hard to follow. For instance, they did not see a clear connection between the first activity (meal plan creation) and the second one (brainstorming & prototyping). They felt as if they were not extremely sure about the purpose of the product they were designing. Moreover, a participant who is, like the research team that has conducted this workshop, a student of Human Computer Interaction at the University of Trento, expressed that on a personal level, it was easy for her to understand what a social robot is, yet she emphasized that other participants which are not in her domain might struggle with the comprehension of it. Some of the participants agreed on that comment.

On the flipside, a participant suggested that she had a great time, especially in the Ice Breaker (real life kahoot), as the questions were 'funny' and were not as related to the topic covered. This implies that the use of gamification in Participatory Design is of great importance and high value, something already discussed in the course's reading material (Simonsen & Robertson, 2013). We therefore take this as a lesson for future workshops developed. Additionally, some participants expressed that they enjoyed participating, and that there was so much freedom in the prototyping activity (in terms of material and little pressure).

We take these comments as very important as, again, we believe that such feedback can be useful in future development of similar activities.

5. Analysis and Discussion

The following section intends to provide a reflection of the workshop explained in this document, as well as the practical implications that suppose the findings discussed in the previous section.

5.1 Critical Reflection

The workshop carried out has helped in shaping our understanding about how social robots can help in following a personalized meal plan. Most importantly, it has allowed us to envision a more practical outcome in terms of design (see section 5.3), as opposed to the theoretical component which was gathered mainly in the qualitative research methodology course.

Not only were we able to explore the outcomes participants designed, but also contrast, and increase the validity (confidence of the interpretation of results) from the observations, interviews and focus group carried out previously. Plus, and, perhaps most importantly, it has allowed us to see the difficulties of carrying out a real workshop - as the course workshop had students already familiarized with what a workshop is - and the areas where we can improve.

Firstly, our recruitment strategy could have been slightly different. We were accounting for 12-15 participants, of which 10 showed up and 6 ended up doing all the workshop. This, of course, is something hard to control, yet, when being comfortable with the number of the responses we had, we forgot to close the form, which resulted in having an unwanted increase in responses the day prior to the workshop, which meant that we had to unfortunately communicate with a couple of respondents to inform them that it was not feasible for us to have them in the workshop.

Another area where we feel we can improve is in adapting to circumstances. Throughout the workshop, we found ourselves a number of times in need of overcoming certain circumstances, which we believe we did fairly well. For example, we chose to create the groups based on the chance of participants leaving, and later adapted the teams correctly without having to drastically change the composition of the remaining teams. However, for instance, the resulting arrangement of space after the two teams were deleted (see *Figure*

5.1) was not ideal for close interaction between teams; there was too much space between them and hence not as much communication or connection. We could have, instead, moved Team Calorie to Team Gluten Free's former table.

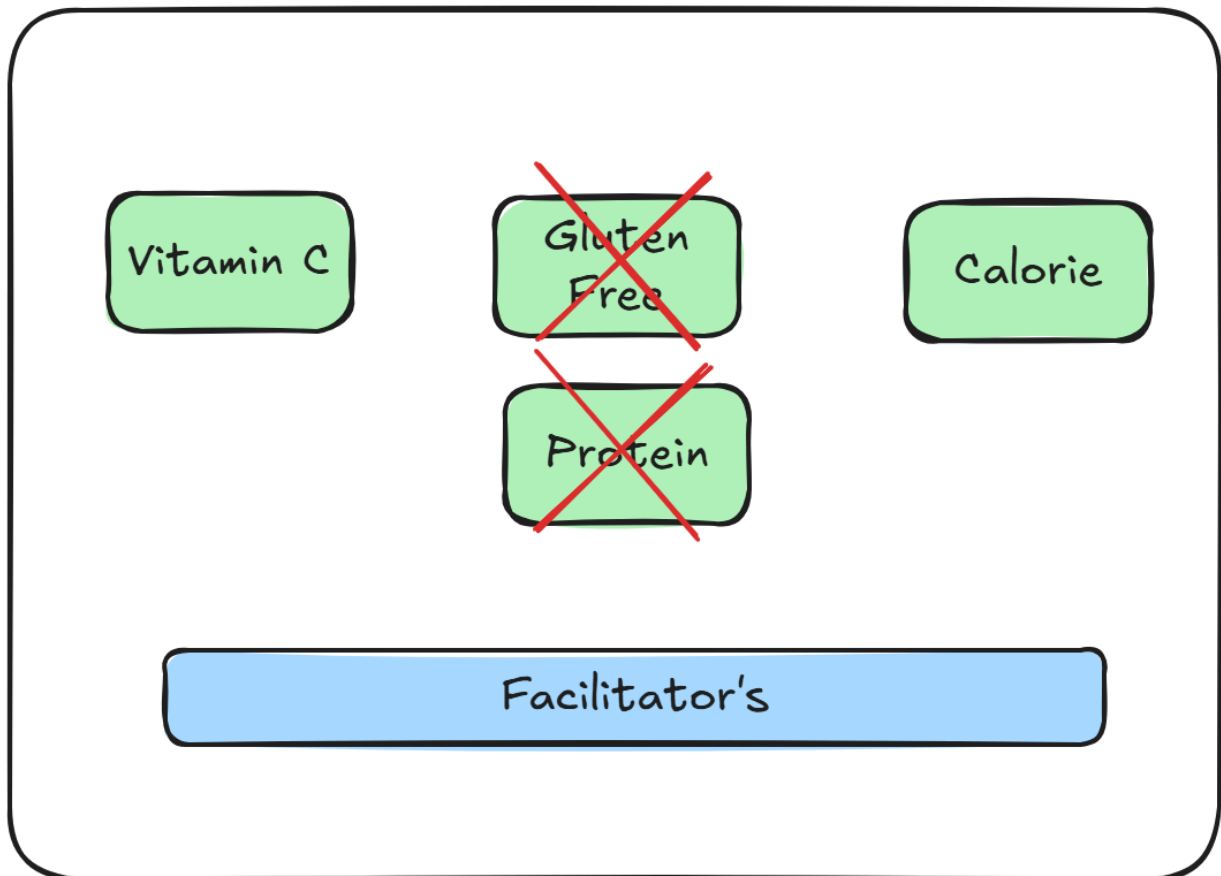


Figure 5.1: Remaining space after Team Gluten-Free and Protein were deleted

Additionally, we decided that two members of the research team would be responsible for taking notes regarding the results, changes, etc. However, when critical information was produced, such as the presentation of prototypes, we believe we could have opted for another strategy like recording the presentation, as we believe that by taking notes we missed some crucial information or visual cues that would have provided us with more knowledge.

Similarly, there are instances which we could have accounted for slightly better. Interestingly, every person who is not a resident from the residence where the workshop was conducted,

had to provide their identification at their office and leave it there before exiting the building. We were aware of this, yet we did not fully acknowledge it, and perhaps could have informed participants that this was the case, so no surprises occurred. Another example of this was the food; prior to starting the workshop we saw that perhaps the food for break was too little, so we were in the need to buy more. Unfortunately, most supermarkets close to where all the action was about to take place were closed, so a member of the research team had to dedicate more time than required to successfully find a place to buy more things.

Finally, and perhaps most importantly, we believe that, in future workshops or similar activities, we will have to think more about how participants are, unaware of the topic to be discussed, going to understand what's behind everything. In our case, such a topic was social robots, which, as described in the previous section, was hard for some people outside of HCI to understand fully, as well as the relationship between activities.

However, we believe that many things which we did are positive and therefore also applicable for future workshops. Some examples of which are:

- Entertaining icebreaker
- Adaptation to participants leaving earlier than expected
- Choice of breaks
- Time dedication for each activity
- Prior preparation of place's facilities
- Communication within members of the research team

5.2 Implications

Taking into account the results explored in Section 4.2, we have decided to propose the following study as a continuation of the workshop for future research that can be of great value.

Such study would evolve around the use of a wearable device that is linked to an already existing meal plan (with nutritional and personal data regarding allergies, objectives of meal plan and preferences) which would provide auditory feedback to the users in an empathic manner. Following on that, there would be two groups of participants:

- A control group, which would consist of participants following their personalized meal plan

- An experimental group consisting of participants who have the wearable device previously defined.

After a timeframe correctly established, metrics regarding the usage of the wearable device (how often did users try to change the meal plan), performance (if they achieved their results) and likeability (overall enjoyment of the device) would be measured and contrasted among groups, resulting in more data about the ideal interaction and to what extent can such device help in following a meal plan easier.

Of course, there are many possibilities to consider when designing a wearable device that could fit the criteria of the study, but we believe that it is worth exploring one with the capabilities listed in the previous sections.

6. Conclusion

When we started this workshop, we wanted to see how a social robot could actually help people stick to a meal plan. Throughout the process, it became clear just how hard meal planning can be for different people and how creative they got when trying to solve those problems. The participants' ideas and the prototypes they made gave us a better understanding of what features would work and what wouldn't.

We take as a valuable lesson how important it is for a solution like this to feel flexible and easy to use. People don't want something that feels controlling or rigid. Instead, they want a tool that fits into their routine without making things harder. The feedback also showed that empathy is key—users want a social robot that feels supportive and helpful, not just another piece of technology to deal with.

This workshop was just one step, but it gave us a lot to think about. We now have a clearer idea of what users need and what might actually work in real life. Moving forward, there's a lot of potential to build on these ideas and see how we can turn them into something real. Overall, this workshop reminded us how important it is to involve people in the design process. It's only by understanding their struggles and listening to their ideas that we can create something that really makes a difference.

7. References

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8. Appendices

Appendice 1 - Meal plan template

MEAL PLANNER

GROUP CALORIE

	BREAKFAST	LUNCH	DINER	SNACKS
MONDAY				
TUESDAY				
WEDNESDAY				
THURSDAY				
FRIDAY				
SATURDAY				
SUNDAY				

Appendice 2 - Consent form

Workshop consent form

Purpose

You have been invited to participate in a workshop conducted as part of an exercise for the master course in Participatory Design, given within the "Human Computer Interaction" Master, organized by the University of Trento. The purpose of this workshop is to explore the topic of AI and nutrition, how they play together or don't, and explore how a social robot can help you stick to a custom meal plan. The information gathered in this workshop will be used in an educational environment only.

Procedure

As part of this study, you will take part in activities designed by the workshop team. There will be 2 main facilitators, and members to help you with tasks. Such members will be taking pictures throughout the development of the workshop, which will be used only in the report of the workshop and will be eliminated immediately afterwards. Your identity (name) will be kept confidential.

You can choose whether or not to participate in the workshop, and you may stop at any time during the course of the study.

Please note that there are no right or wrong solutions to the tasks proposed. Out of respect, please refrain from interrupting others, and act in a respectful manner towards everyone including the research team.

Benefits and Risks

Your participation may benefit you and others with an interesting discussion and future development of a product, giving insight to the topic covered in the workshop.

The only risks identified by our research group are related to possible eating disorders discussions that might come up.

Confidentiality

Should you choose to participate, you will be asked to respect the privacy of other workshop members by not disclosing any content of the study. We as a research group will analyze the data, but—as stated above—your work will remain confidential, and no names will be included in any reports.

Contact

If you have any questions or concerns regarding this study, please contact:

michele.cazzaro@studenti.unitn.it

markel.benedicto@studenti.unitn.it

andrea.reyesburga@studenti.unitn.it

suhas.dharwad@studenti.unitn.it

Full Name:

Date:

Signature:

Appendice 3 - Photo folder of the workshop

[https://dr](https://drive.google.com/drive/folders/11CriGalk5M_znQG4yQ--ZiVsoLIJNVR?usp=sharing)

[ive.google.com/drive/folders/11CriGalk5M_znQG4yQ--ZiVsoLIJNVR?usp=sharing](https://drive.google.com/drive/folders/11CriGalk5M_znQG4yQ--ZiVsoLIJNVR?usp=sharing)