IoT Concept Proposal

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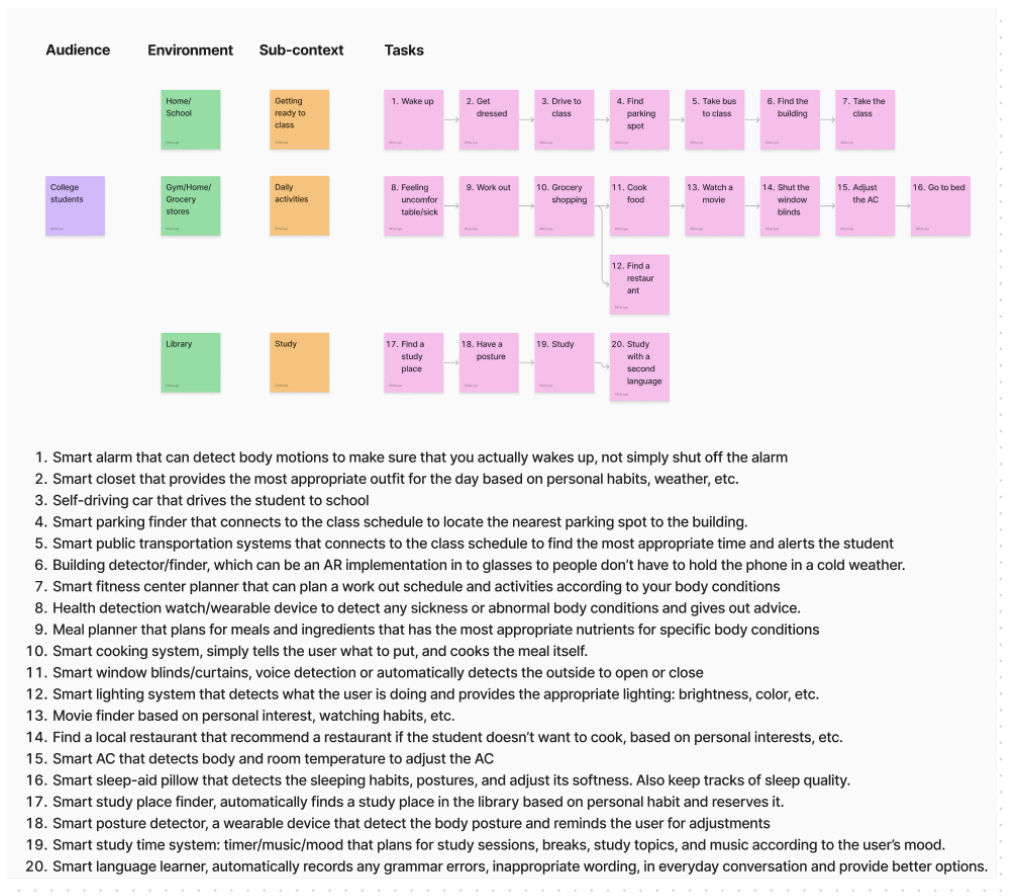
SI 612

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Introduction

As a team we aimed to explore and identify high-potential (IoT) opportunities based on initial ideation and comprehensive research. Each individual was to create at least 10 different IoT opportunities which were then discussed and narrowed down to three main IoT opportunities. Pervasive Interaction Designconsists of different stages such as conceptualization, development, and implementation of user interfaces. The goal is to make our way to a smooth implementation of an IoT opportunity as we work through the research and conceptualization part.
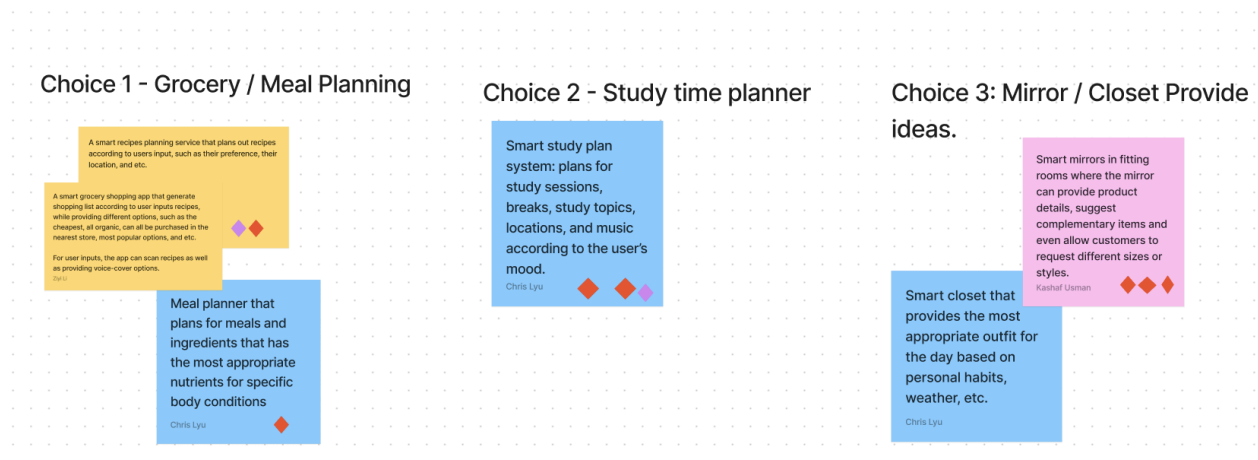
Individual Ideation Process

We used the 10x10 matrix process as done in class where we brainstormed problems or topics for which we wanted to generate ideas. For example, given the environment of a smart kitchen, we were able to brainstorm different problems in the space and create ideas to tackle those problems. The 10x10 matrix was the best ideation process as it allows for a more detailed exploration of the problem space as well as generating a wide array of ideas. We created a matrix in FigJame In each cell of the matrix, we brainstormed ideas that align with the corresponding category.

As seen in the figure below, using the 10x10 matrix process we were able to each create at least 15 different ideas. We created an affinity wall in Figma, categorized the different ideas into clusters.

1. Smart alarm that can detect body motions to make sure that you actually wakes up, not simply shut off the alarm
2. Smart closet that provides the most appropriate outfit for the day based on personal habits, weather, etc.
3. Self-driving car that drives the student to school
4. Smart parking finder that connects to the class schedule to locate the nearest parking spot to the building.
5. Smart public transportation systems that connects to the class schedule to find the most appropriate time and alerts the student
6. Building detector/finder, which can be an AR implementation in to glasses to people don't have to hold the phone in a cold weather.
7. Smart fitness center planner that can plan a work out schedule and activities according to your body conditions
8. Health detection watch/wearable device to detect any sickness or abnormal body conditions and gives out advice.
9. Meal planner that plans for meals and ingredients that has the most appropriate nutrients for specific body conditions
10. Smart cooking system, simply tells the user what to put, and cooks the meal itself.
11. Smart window blinds/curtains, voice detection or automatically detects the outside to open or close
12. Smart lighting system that detects what the user is doing and provides the appropriate lighting: brightness, color, etc.
13. Movie finder based on personal interest, watching habits, etc.
14. Find a local restaurant that recommend a restaurant if the student doesn't want to cook, based on personal interests, etc.
15. Smart AC that detects body and room temperature to adjust the AC
16. Smart sleep-aid pillow that detects the sleeping habits, postures, and adjust its softness. Also keep tracks of sleep quality.
17. Smart study place finder, automatically finds a study place in the library based on personal habit and reserves it.
18. Smart posture detector, a wearable device that detect the body posture and reminds the user for adjustments
19. Smart study time system: timer/music/mood that plans for study sessions, breaks, study topics, and music according to the user's mood.
20. Smart language learner, automatically records any grammar errors, inappropriate wording, in everyday conversation and provide better options.

Group Ideation Process

On the affinity wall we used a voting system, the first step was to brainstorm individually and read and understand each other's ideas. Secondly, we started to generate central themes, where if we saw similar ideas we put them in an umbrella. From there, when we had a clear idea of each opportunity present on the board, we each used three votes and voted on the opportunities that would be more viable and attractive to us as a team. Each opportunity with more than 2 votes was separated and a second voting took place where we were able to narrow down to the top three opportunities. As seen in the figure below, these three opportunities had the most votes as well as the most interest.

Choice 1 - Grocery / Meal Planning

A smart recipes planning service that plans out recipes according to users input, such as their preference, their location, and etc.

A smart grocery shopping app that generate shopping list according to user inputs recipes, while providing different options, such as the cheapest, all organic, can all be purchased in the nearest store, most popular options, and etc.

For user inputs, the app can scan recipes as well as providing voice-cover options.
Ziri Li

Meal planner that plans for meals and ingredients that has the most appropriate nutrients for specific body conditions
Chris Lyu

Choice 2 - Study time planner

Smart study plan system: plans for study sessions, breaks, study topics, locations, and music according to the user's mood.
Chris Lyu

Choice 3: Mirror / Closet Provide ideas.

Smart mirrors in fitting rooms where the mirror can provide product details, suggest complementary items and even allow customers to request different sizes or styles.
Kashaf Usman

Smart closet that provides the most appropriate outfit for the day based on personal habits, weather, etc.
Chris Lyu

Contextual Inquiry Overview

Contextual Inquiry is a user research method that involves observing and interviewing users. The goal is to gain a deep understanding of users' needs, behaviors, and challenges. Here are the key elements of Contextual Inquiry:

- User interviews to understand goals, motivations, and challenges.
- Task breakdown to analyze each step of user activity
- Examining other related elements, both physical and digital

Contextual inquiry is important at this step because it allows us to

- Understand users' behavior and what they need in real-world contexts
- Get insights into how people interact with proposed solutions
- Decide our design process based on potential users' feedback

Qualitative vs Quantitative:

- Qualitative research (how does the product fit into people's lives? What goals to motivate people use this product?)

Number of participants ideal for this method

- 5-10 people are ideal for this research

Contextual Inquiry for each opportunity

Opportunity #1 - Grocery / Meal Plan

Participants: 3

Recruiting criteria

- Familiar with technology
- Cook at home
- Have experience with meal planning or grocery shopping

Participant Demographics

- Participant 1:
  - Student at Seattle, WA
  - Oftenly cook at home and enjoys cooking
  - How you located/recruited them: Meet on Zoom
- Participant 2:
  - Engineer at San Francisco, CA
  - Oftenly cook at home and prefer meals that need shorter preparation time
  - How you located/recruited them: Meet on Zoom
- Participant 3:
  - Graduate student at UMich
  - New to cooking and meal planning
  - How you located/recruited them: In person

Logistics: Zoom

Participant's session: 10 minutes one-to-one interviews

Ethical Considerations: Since we conducted the interviews on Zoom, we have contactless interviews. In terms of privacy concerns, we always ask participants whether we have their consent to record the sessions or not.

Contextual Inquiry Results:

According to the contextual inquiry results, we think this is a good opportunity to pursue M2. Participants, when asked to rate their comfort level on a scale of 1 to 10, with 1 being extremely uncomfortable and 10 being extremely comfortable, provided an average rating of 9 out of 10 regarding the incorporation of IoT technology into their meal planning routines.

Throughout the user interviews, we learned that our participants mostly use social media platforms to determine and explore recipes. All the participants claimed that they use technology such as smartphones and computers for meal planning. In terms of how they make decisions on which recipes to choose, one participant stated that "Generally, I just see which one is easy to cook and which does not require ingredients that I don't have." One participant expressed frustration with online recipes planning tools, noting that some recipes often require them to purchase ingredients that are unavailable at their local grocery stores.

Moreover, one participant mentioned that they have used a mobile application called "MyFitnessPal" to calculate calories and plan meals. But they dislike how the app is a bit complex to use. Our participants reported that they currently spend about 30 minutes every week to plan meals and discover recipes. During the interview, we asked our participants to brainstorm some ideas or features that would be most helpful for them in an IoT-based meal planning product. They provided many ideas: features that can sync with their class schedules; real-time inventory tracking of ingredients at their homes; customizable dietary preferences; options to plan meals collaboratively with family; and weekly meal prep reminders.
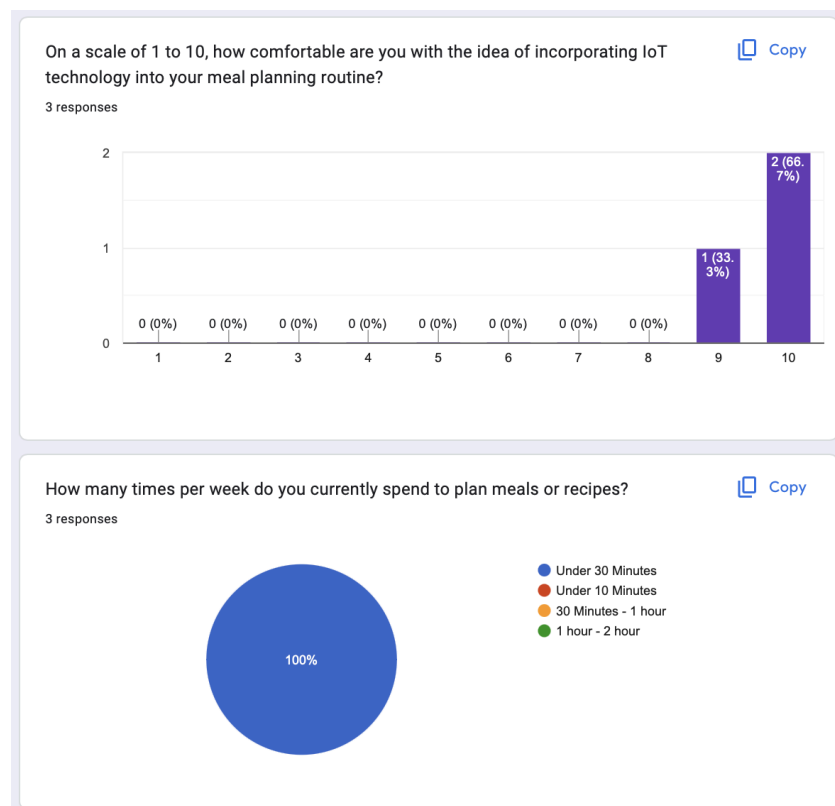
Opportunity #2 Smart study/work plan

Participants: 2

Recruiting criteria

- Students or professionals
- People looking forward to enhancing their productivity
- Have basic knowledge of technology

Participant Demographics

- Participant 1:
  - Students at the University of Michigan
  - Contact via Zoom
  - Often go to the library for study
- Participant 2:
  - Analyst preparing for CFA
  - Contact via Zoom
  - SF, CA

Logistics: Zoom

Participant's session: 10 minutes one-to-one interviews

- Ask participants to walk me through their study/work routine
- Inquire about the methods participants currently use to plan their study or work sessions. This could include physical planners, digital calendars, or other tools
- Explore how participants currently incorporate breaks into their study or work sessions

Ethical Considerations: Since we conducted the interviews on Zoom, we have contactless interviews. In terms of privacy concerns, we always ask participants whether we have their consent to record the sessions or not.

Contextual Inquiry Results:

- Participants expressed common challenges related to time management, difficulty in prioritizing tasks, and managing study or work sessions efficiently. They express a need for a better study plan.
- Participants relied on a mix of physical planners, digital calendars, and reminders on their devices.
- Participants varied in their preferences for breaks, with some favoring short breaks for physical activity and others preferring longer breaks for relaxation.
- A desire for music during study sessions was prevalent, with varied preferences ranging from calming instrumental to upbeat tunes.

The user's pain points include stress in balancing multiple tasks, In effective use of break, and limited adoption of existing tools. There is a strong indication that developing a Smart study/work plan system aligns well with the identified user needs and challenges. The integration of adaptive planning, mood-based recommendations, and personalized features has the potential to improve the time management and productivity of students and professionals.

Opportunity #3: Smart closet/mirror

Participants: 3

Recruiting criteria

- Someone who has less experience deciding how much clothes to wear the according to the weather
- Someone who regularly uses closets and mirrors for outfit selection
- Someone who has lot of clothes and cares about their outfit and fashion

Participant Demographics

- Participant 1:
  - Freshman at Umich (age 19)
  - Have lots of clothes in her closet
  - Struggling to decide what clothes to wear
- Participant 2:
  - Graduate student at USC (age 23)
  - Living at a place that has a large temperature difference in a day
- Participant 3:
  - Graduate student at Umich (age 24)
  - Doesn't have time in the morning for deciding outfits.

Logistics: Zoom

Participant's session: The participant was asked to answer 10 questions regarding their daily dressing routine and habits

Contextual Inquiry Results

According to the results from the 3 contextual inquiry sessions, the participants decide their outfit for the day depending on multiple factors, such as temperature, time available in the morning, daily activities(any special occasions?), and whether clothes fit each other. If a participant has too many clothes in the closet, it would cost a significant amount of time to decide on a satisfactory outfit. As one of the participants said in the interview "I would like more time in the morning to decide my outfit, but most of the time, mornings would be a rush for me. I would just put on random clothes."

Additionally, all of the participants have problems with the unexpected weather change during the day. For instance, if it suddenly rains, it would not be frustrating wearing white shoes or pants. Another one of the major frustrations is not being able to decide on a fashionable outfit. One of the participants said: "I lack fashion sense but I do want to look good when I'm outside."

All of the participants believed that our IoT opportunity of a smart closet/would be a good idea, that would make their life a lot easier. Based on the data we collected from each participant, our smart closet should be able to: predict precise weather and possible weather change, decide outfits based on the user's mood, personal habits, color styles, texture, makeups, hair styles, etc, locate the clothes, and show the outfit in the mirror in AR or other equivalent forms of technology.

Overall Feedback

We have received many positive feedbacks for our opportunity #1 and opportunity #3. Many people mentioned that this design can be helpful for a wide range of people which means it will have a large amount of target audience. One classmate said that "I know several people who struggle to plan and commit to a diet for losing weight because they don't know what recipes to cook." Many classmates mentioned that they also experience challenges in finding recipes and planning meals. One comment suggests the possibility of displaying it on a fridge component, such as a small counter screen, which is a great idea that we can think about for future design ideas. On the other hand, we also received suggestions that there are similar existing smart products for meal planning and calories calculators. We may need to conduct competitor analysis to determine how our product can be different and help users to reach their goals and needs. Some classmates expressed interest in our idea of a smart mirror to help people brainstorm what to wear for the day, while pointing out that it may be difficult to create an actual prototype.

Product Scope

Our major target audience is college students, with an overall goal of making their life easier in the aspect of healthy eating. College students mostly use social media platforms to determine and explore recipes, and they usually have limited time planning for ideal dietary recipes. The current online recipes planning sometimes provide recipes that require them to purchase ingredients that are unavailable at their local grocery stores. Therefore, we would offer an IoT solution, which involves the features that can sync with their class schedules; real-time inventory tracking of ingredients at their homes; customizable dietary preferences; options to plan meals collaboratively with family; and weekly meal prep reminders. The major environment that will be augmented/automated is a home environment. It can be apartments, dormitories, houses, or any places a student might live in.

Mini Persona:

Name: Emily Garcia

Age: 20

Education: College Student

Major: Computer Science

Living Situation: Dormitory

Background:

Emily is a busy college student majoring in computer science. She juggles a full course load, part-time job, and extracurricular activities, leaving her with limited time for meal planning and preparation. She wants to maintain a balanced diet, but often finds it challenging to do so because of her busy schedule. Emily relies heavily on social media platforms to discover new recipes and meal ideas, but she's frustrated by the inconsistency of available ingredients at her local grocery store and the time cost of planning meals.

Needs and Goals:

- Emily needs a solution that allows her to eat healthily without spending too much time on it.
- She wants to customize her dietary preferences and meal plans according to her taste, health goals, and available ingredients.
- Emily requires a tool connected with her schedule and sends reminders for meals and meal prep.

Challenges:

- Balancing academic, work, and social commitments leaves Emily with minimal time for meal planning and cooking.
- She struggles to find recipes that align with the ingredients available at her local grocery store, often resulting in wasted time and effort.
- Emily prioritizes her health but finds it challenging to maintain a diet due to time constraints and limited resources.

Conclusion

We decided to select idea #1 - Grocery/Meal Plan because it addresses a fundamental need for a large segment of the population. There is a growing trend towards healthier eating habits and increasing demand for quick and healthy meal plannings. Our product can offer students with busy lifestyles with convenient, healthy, cost-effective, and time-saving solutions while supporting our users to maintain a healthy diet. We received very positive feedback from our classmates during the M0 presentation. Many classmates expressed their intention to purchase such a product, as it provides comprehensive meal planning solutions and management, aiding them in eating more healthily or reaching their fitness goals.

For M2, our first step would be to prepare a detailed plan for conducting a diary study that includes recruiting criteria, instructions for participants to follow, and duration of each session. We aim for a total of 5 participants. The main purpose of this study is to gather detailed data about participants' behaviors, experiences, and thoughts over a period of time. In diary study, the participants will be asked to record their activities, thoughts, feelings, or other relevant information in a diary or journal format about their meal planning and weating habits in a daily routine.

Based on the data we collected from the diary study, the next step would be to develop survey questions. Since the diary study has a small sample size, the data we collected would only be based on the 5 participants. A survey would be necessary to see whether this data can be applied to other users as well. This can offer us a better understanding of the problem scope in a larger sample size. The survey will be sent out, and the major audience is college students. After that, our team would analyze the data and move on to our design process.

Appendix

Figma Affinity Wall

Contextual Inquiry Interview Guide(Opportunity 1)

    a. What tools or methods do you currently use to plan your meals?
    b. How often do you currently use technology (smartphones, tablets, etc.) for meal planning or recipes finding?
    c. Can you share some of the challenges or frustrations you face when it comes to meal planning in your daily life?
    d. If you have used any existing meal planning apps or online tools, can you share any positive or negative experiences you've had with existing meal planning apps or tools
    e. Can you describe a specific situation where you felt that technology could have made your meal planning experience better or more efficient?
    f. How many times per week do you currently spend to plan meals or recipes?
    g. On a scale of 1 to 10, how comfortable are you with the idea of incorporating IoT technology into your meal planning routine?
    h. What types of information or features would be most helpful for you in an IoT-based meal planning product?

Contextual Inquiry Interview Guide(Opportunity 3)
    i. Can you describe your typical morning routine, including how you decide what to wear for the day?
    ii. How do you currently plan your outfits? Do you consider factors like weather, occasion, or personal style?
    iii. Can you walk me through the process of selecting an outfit for a specific weather, for example 23F at lowest and 32F highest?
    iv. Have you ever used any technology or apps to assist you in outfit planning or shopping? If so, what features did you find most helpful?
    v. How do you handle unexpected changes in weather or plans that require a change of outfit?
    vi. Can you describe any frustrations or challenges you encounter when selecting outfits or managing your wardrobe?
    vii. What are your thoughts on the idea of a smart closet/mirror that provides outfit recommendations based on various factors like weather, fashion trends, and personal preferences?

viii.   What features or capabilities would you like to see in a smart closet/mirror to make it useful and user-friendly for your daily routine?