



UNIVERSITÀ DEGLI STUDI DI SALERNO

Smart Cooktop



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Introduction

In this presentation, the domestic context, in particular the kitchen area, has been analyzed with the aim of simplifying the main task that is performed in a kitchen, namely the execution of a recipe, using an IoT system.





Physical Space

The physical space that we will analyze is the **kitchen area**.

Objects commonly found in that space are oven, refrigerator, dishwasher, microwave oven, coffee maker, stove, blender, and any type of household appliances. In addition, there may be a table, chairs, sideboards, television, and other types of objects.

Potential users

Potential users of this IoT System:

- can be between the ages of **18 and 60**;
- can have any kind of **cooking experience**.

In addition, a basic knowledge of the **technology** is required.



Scenario Analysis



Recipe is searched and read in a book or on the internet.

Timers are entered and displayed using external devices and in the case of multiple timers it is difficult to distinguish between them.

Weighing ingredients is complicated as one must first read the quantity needed and then weigh it on the scale.

It is very easy to make mistakes by getting confused with recipe steps.



Scenario Analysis

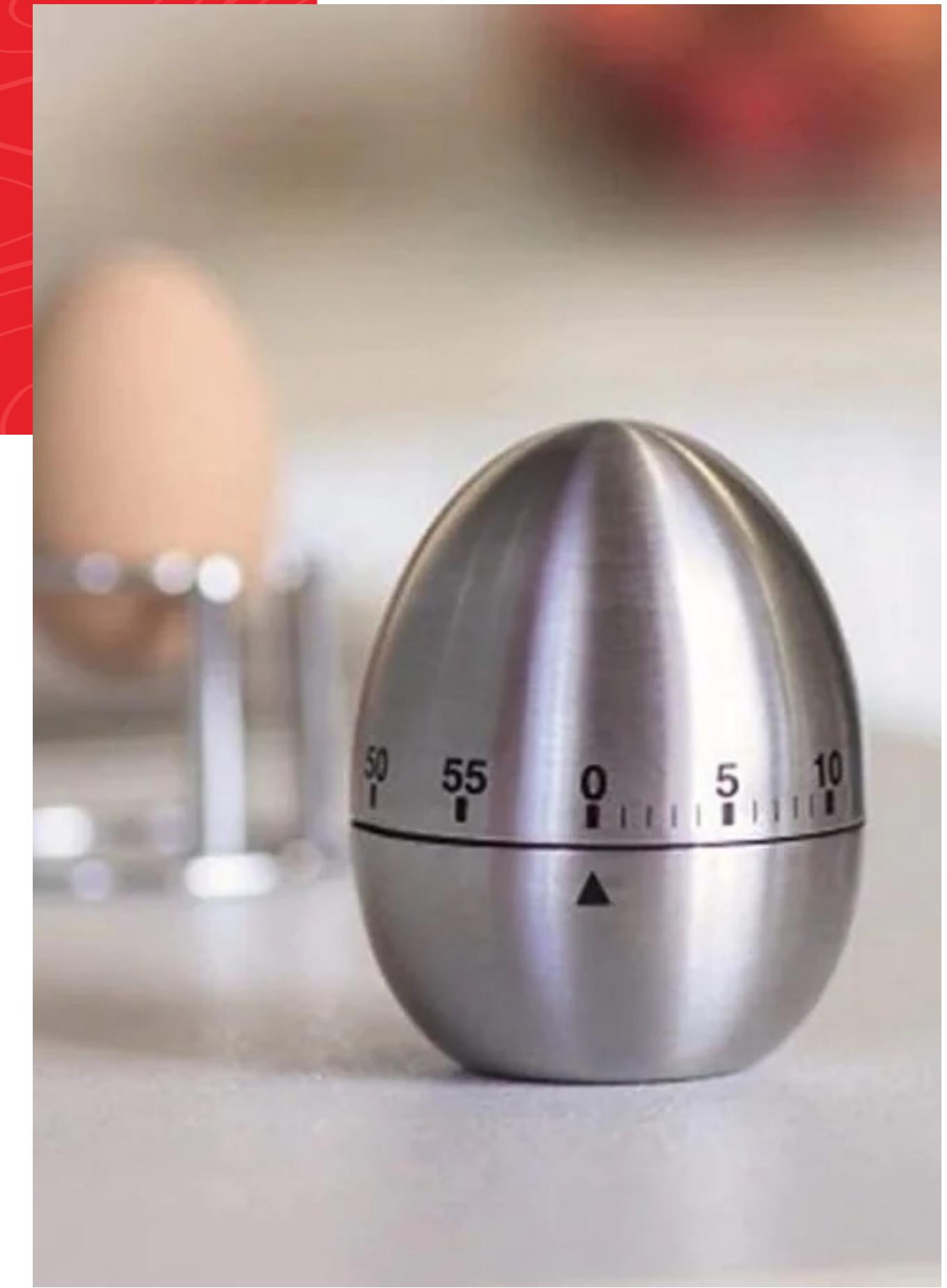
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UX requirements elicitation

As data collection sources for requirements definition, we used:

- **Cognitive maps;**
- **Field visits;**
- **Generative methods.**

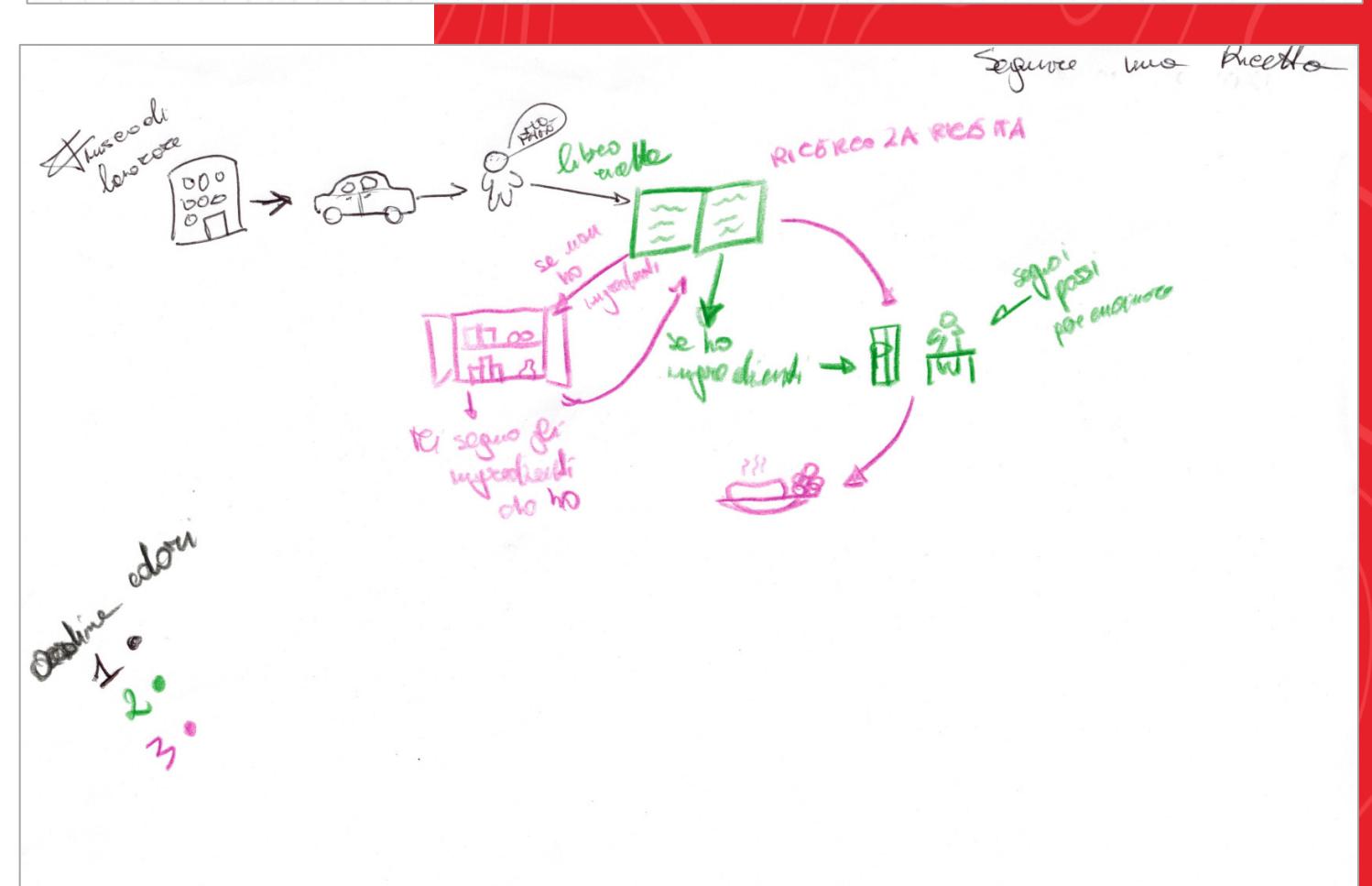
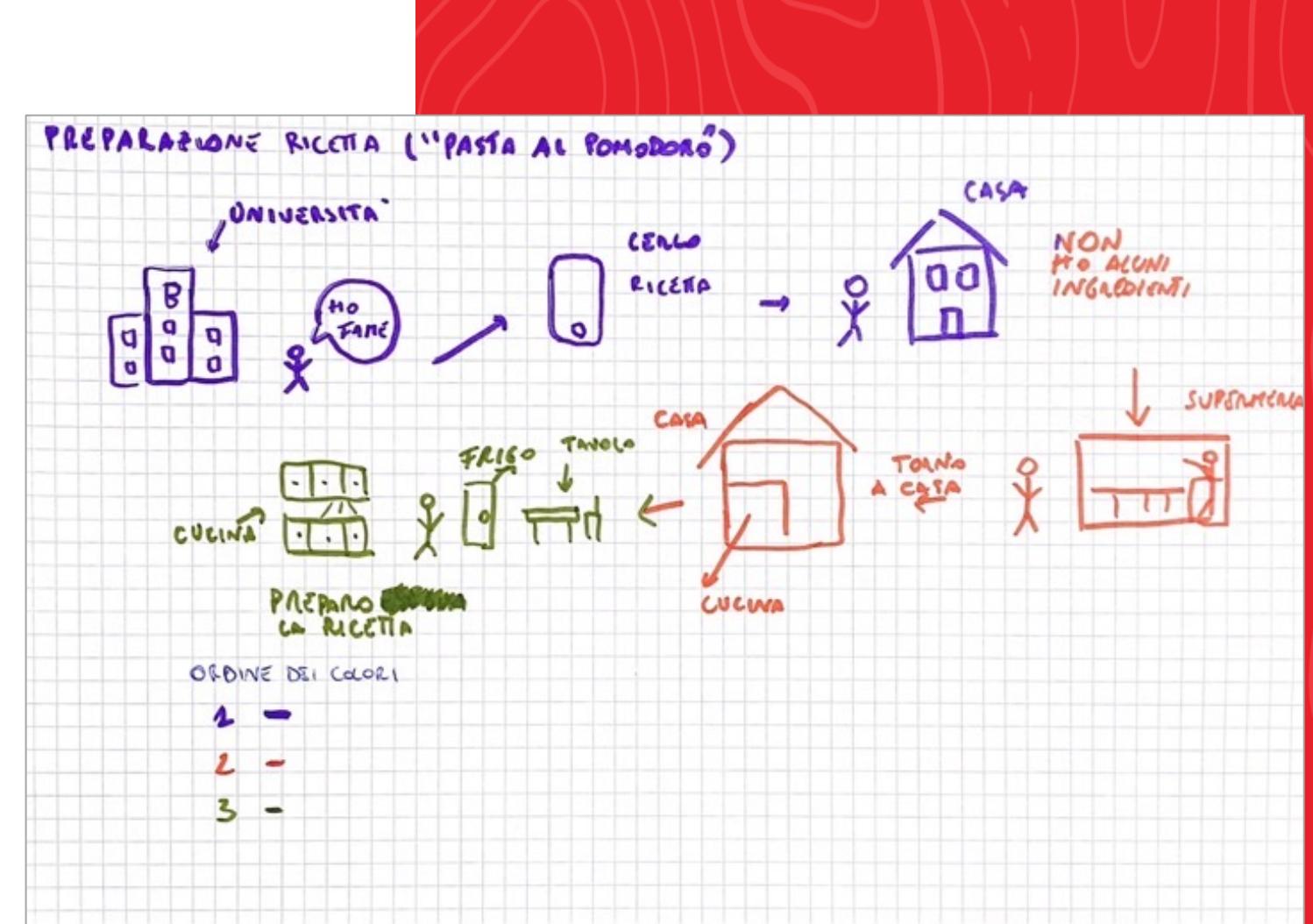


UX requirements elicitation

Cognitive maps

We started with the question : "**Follow a recipe**".

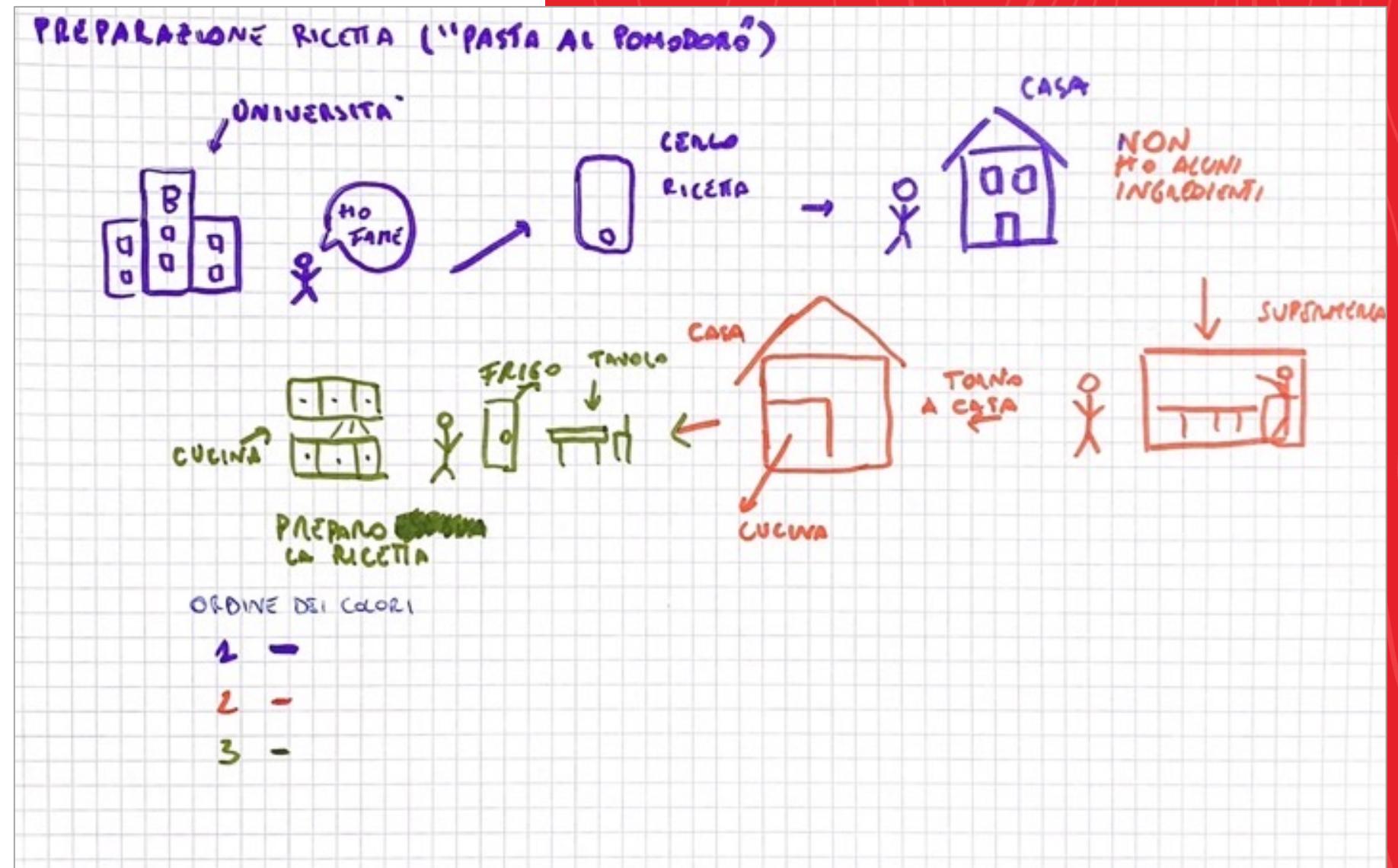
To carry out this activity, we gave **2 minutes** for each color.



Cognitive maps

First user.

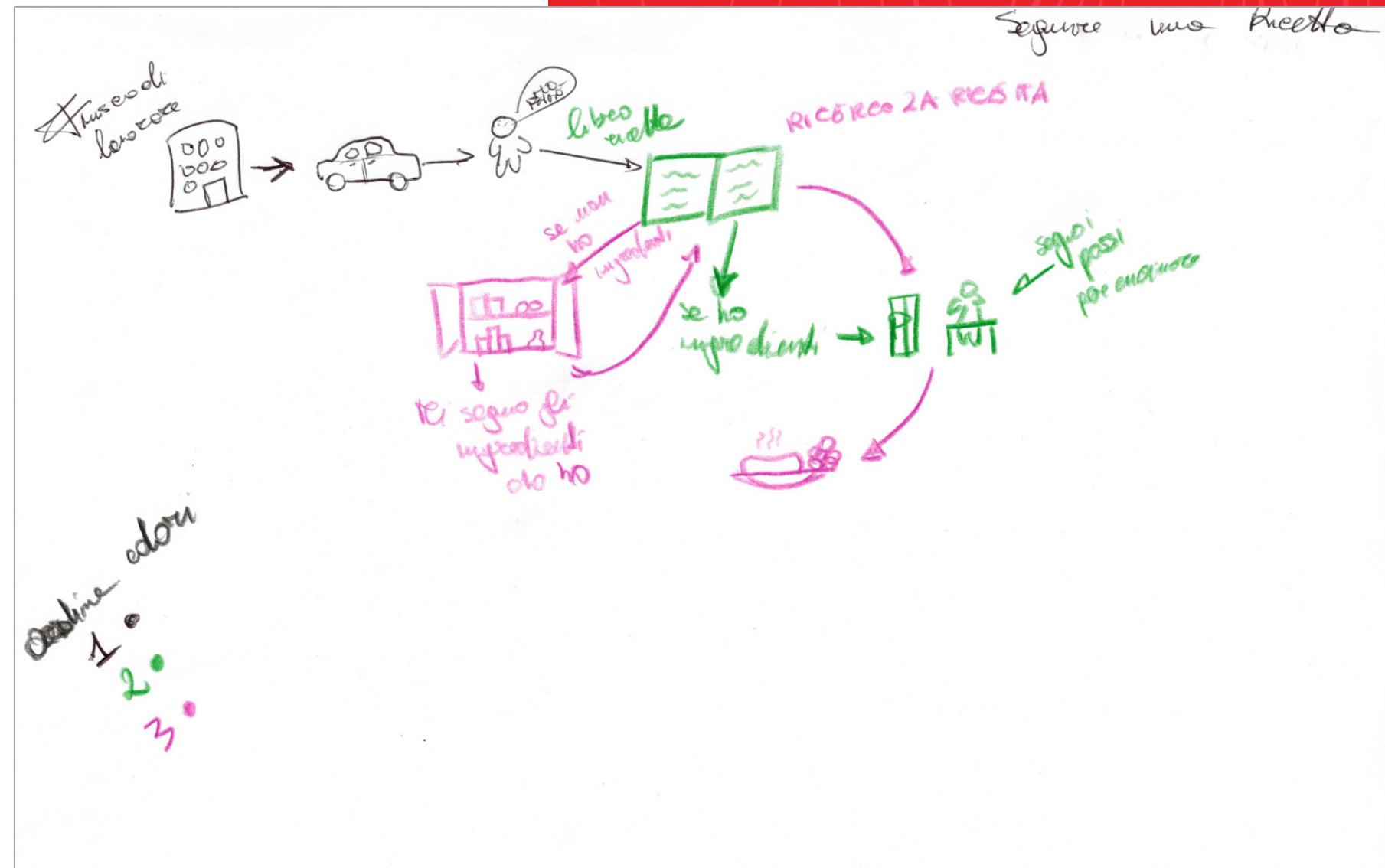
- The user **looks up the recipe before going home**, and it is important to be able to **save it on a device**.
- Once he gets home **he checks if he has all the necessary ingredients** and if not, he moves to the supermarket to buy them.
- Finally he returns home, moves to the **kitchen**, which is the main place where the action takes place, and after getting the ingredients starts with the recipe.



Cognitive maps

Second user.

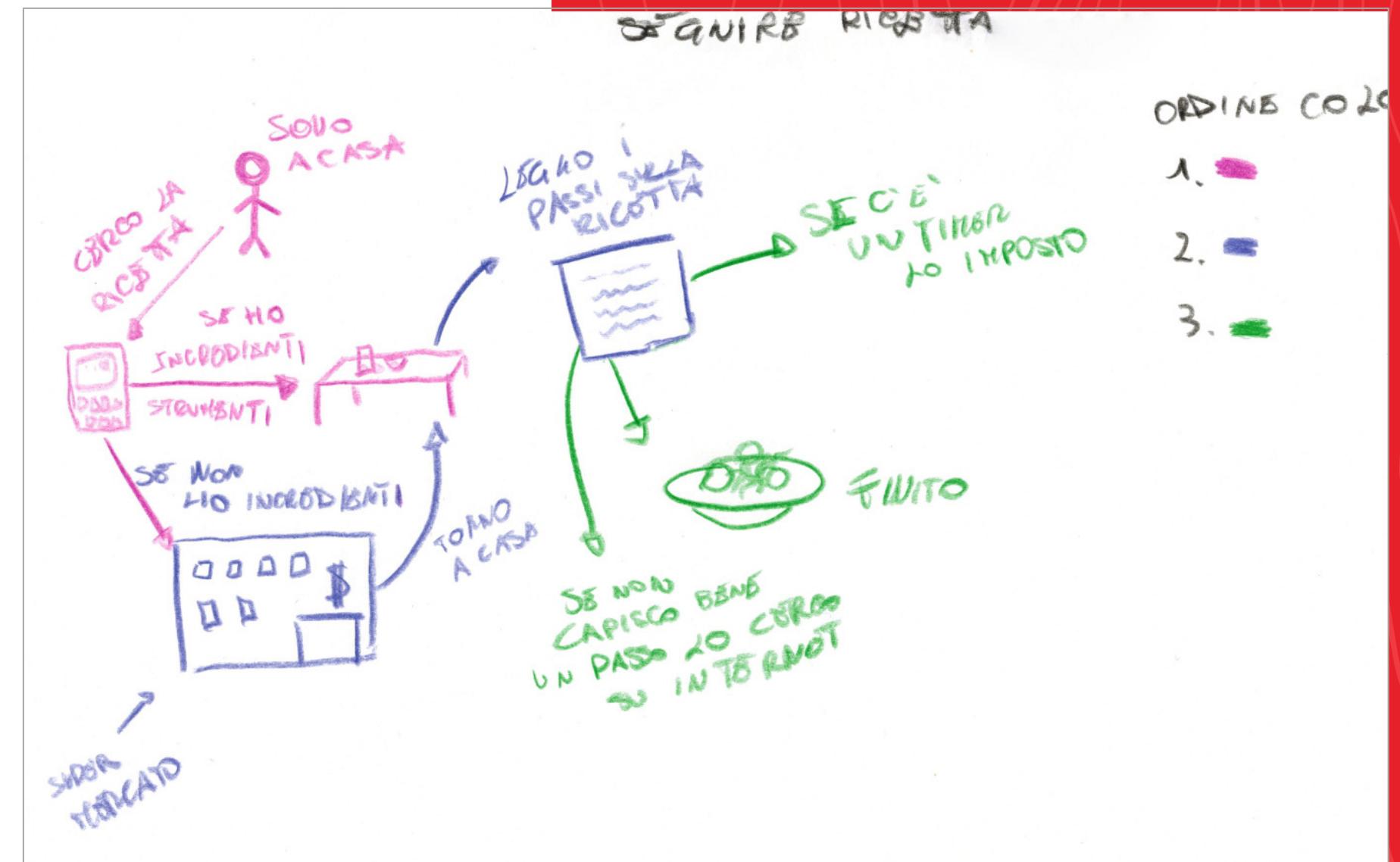
- The **user searches for the recipe only after returning home**, which suggests to us that is where the action takes place.
- It is important to note that **first he chooses the recipe and only then does he check if he has the necessary ingredients** to make it.
- Afterwards if he has the ingredients then he starts with the recipe, otherwise he changes recipe. From this we can guess that his intention is to view only those recipes that he can make.



Cognitive maps

Third user.

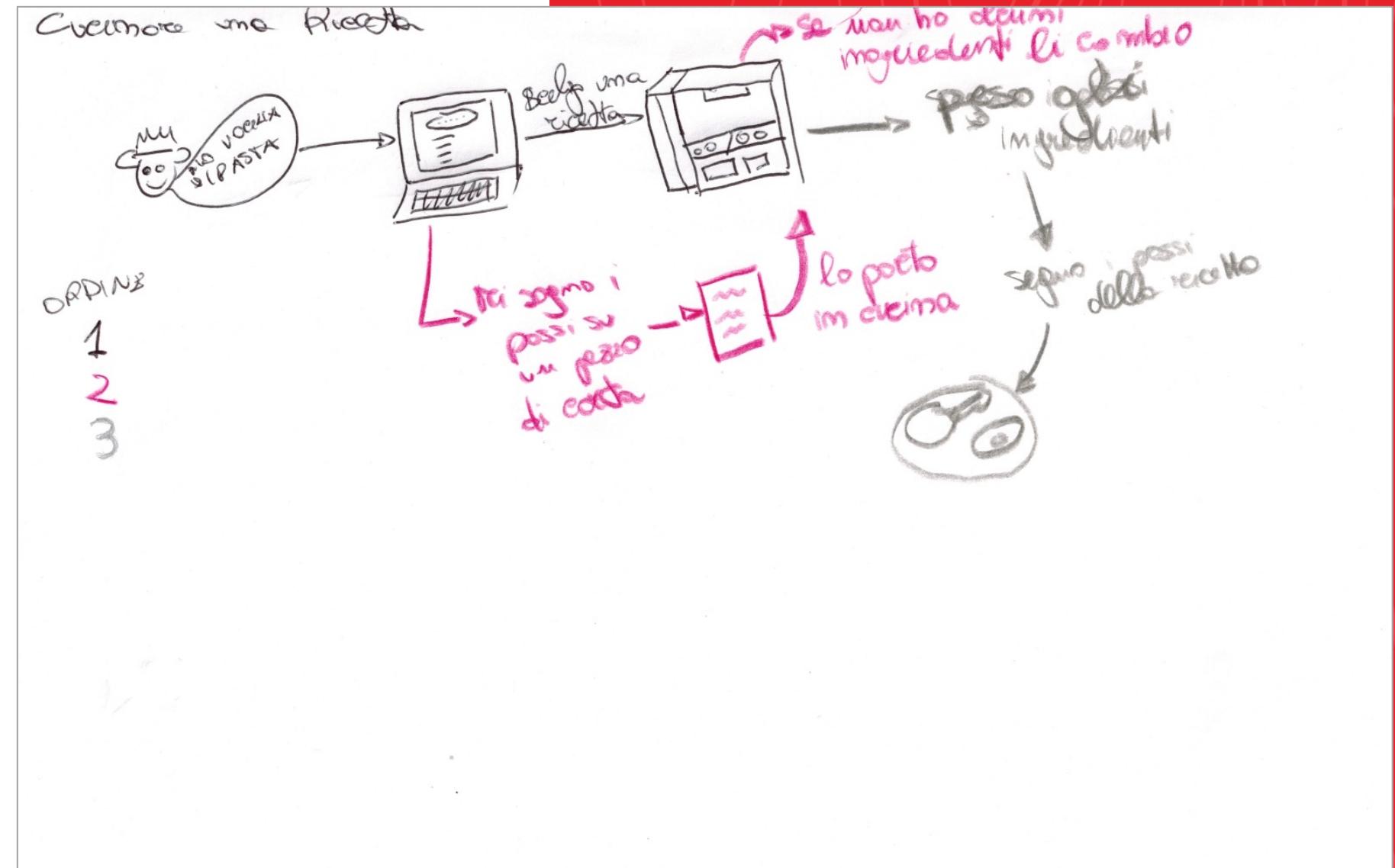
- The place where the story takes place is one's own home.
- The User **uses a device to search for the recipe**.
- The first action that is taken is to **check the ingredients and tools needed**.
- If he does not have the ingredients, he goes to purchase them.
- **The recipe shows the timers to be set**, which will be set by the user manually.
- If some steps in the recipe are not understood by the user, the user will look them up online.



Cognitive maps

Fourth user.

- The place where the event takes place is one's own home.
- The User **searches for the recipe on a computer** and then reports on paper all the steps to be followed and the necessary ingredients.
- If he doesn't have the ingredients he changes them to his preference, which suggests to us that he has a good knowledge of the art of cooking.
- **He then weighs the ingredients and follows the steps to cook the recipe.**



UX requirements elicitation

Field visits

Because our potential users can have any kind of cooking experience, we made two field visits:

- **Pierpaolo, student;**
- **Carlo Cracco, chef;**



Field visits

Pierpaolo, student.

During this activity, we were responsible for viewing Pierpaolo, an out-of-state student, during the **execution of the recipe "Pasta with meat sauce"**.

- Pierpaolo **looked up the recipe just before lunch** on his smartphone;
- Pierpaolo **checked the pantry and refrigerator** to see if he had everything he needed;
- He then proceeded to **follow the steps in the recipe**, weighing the ingredients step by step. There was also a bit of confusion in this procedure, as he has to go back up to the ingredients section each time to read the amount needed and then go back down to the step he was performing previously;
- **During the procedure he entered two timers using the smartphone.** Because he had not set a name to the timers we noticed that when the first one expired he had to check on smartphone which one it was.



Field visits

Carlo Cracco, chef.

During this activity, we were responsible for viewing a video of chef Carlo Cracco during which he cooks a **porcini mushroom and licorice risotto**.

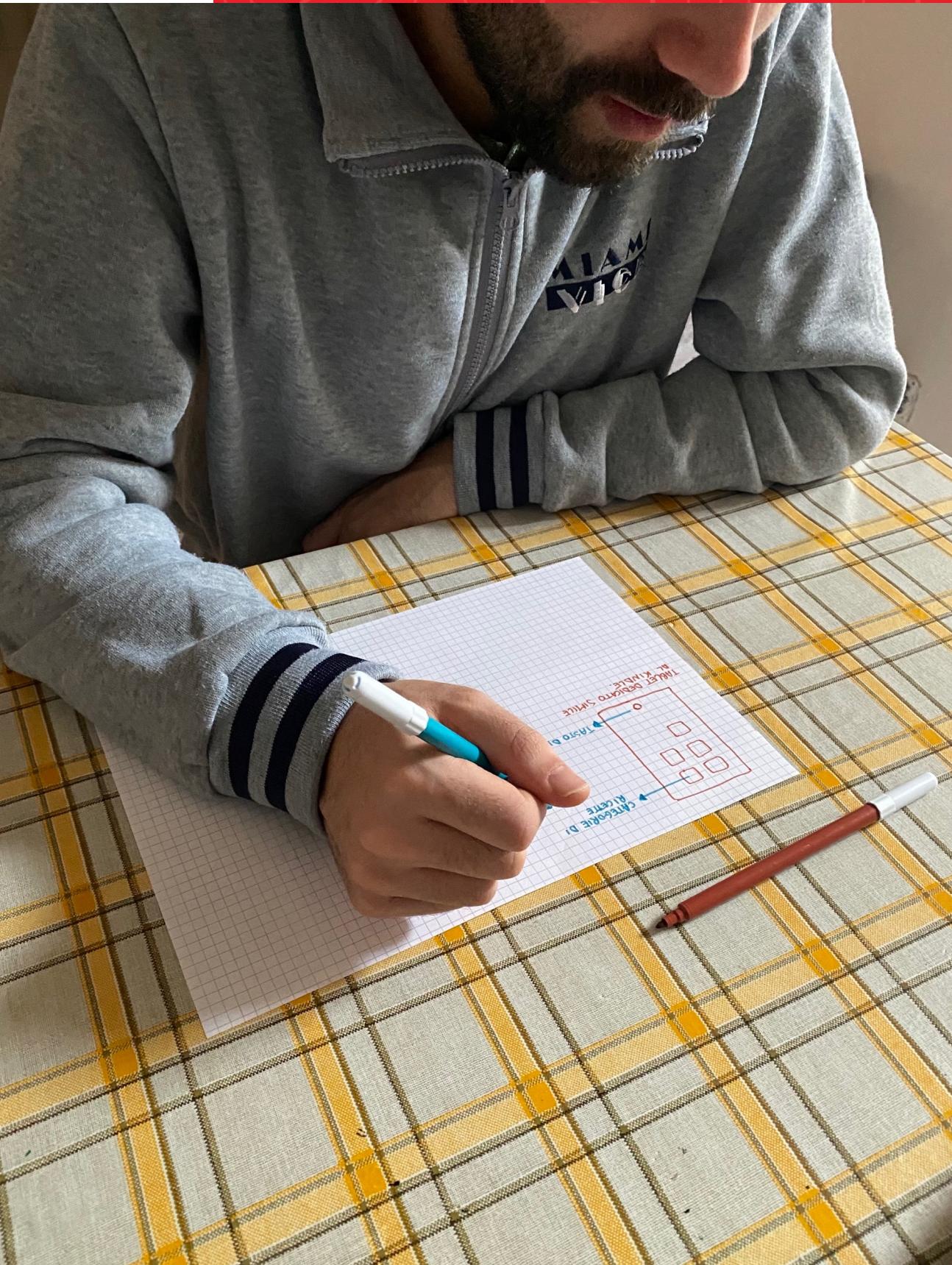
- Before he starts cooking, **the chef takes all the necessary tools, weighs all the ingredients**, and places them on the kitchen counter.
- Being a starred chef, he does not look up the recipe, but it can be seen that he follows precise steps and in a certain order to achieve the final result.
- While carrying out the recipe he does not use timers, but it can be inferred that **he can figure out the cooking times based on the appearance of food, all dictated by the chef's experience**.



UX requirements elicitation

Generative methods

During this activity we did two co-design workshops, involving directly **two users**.



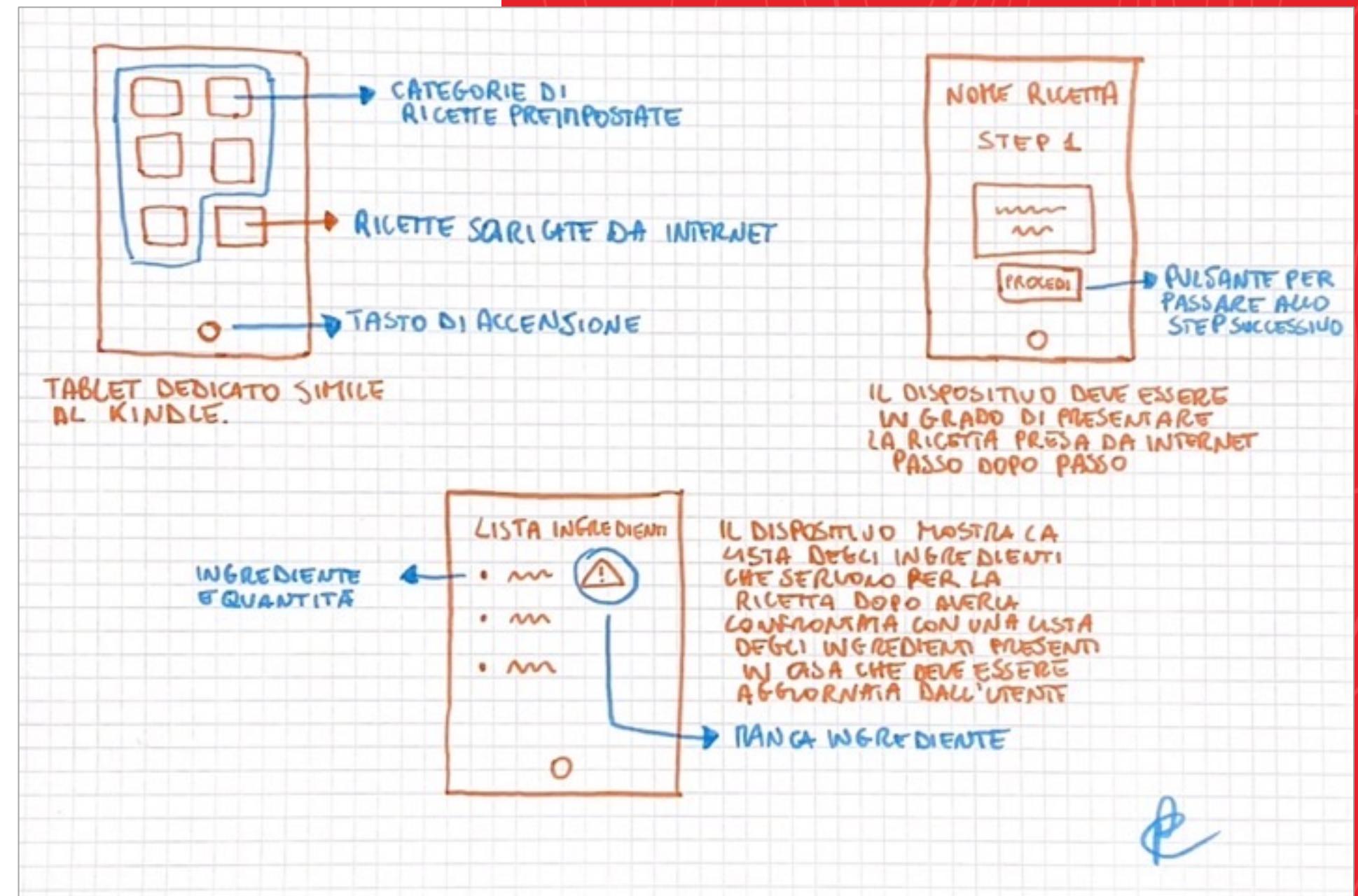
Generative methods

First user.

As we can see, his solution is a dedicated device, **similar to a "Kindle," that provides several recipes** by default and offers the ability to search them on the Internet and save them.

The device offers precise formatting of any recipe, so that first the ingredients and then individual steps of the recipe can be shown.

For the "Ingredient List" section, the device offers the ability to compare it with the list of foods in your home to check if you have the necessary ingredients. The list of ingredients in the house must be updated manually by the user.



Generative methods

Second user.

A dedicated **tablet** that shows on the main screen the recipes for which you have the ingredients to cook them.

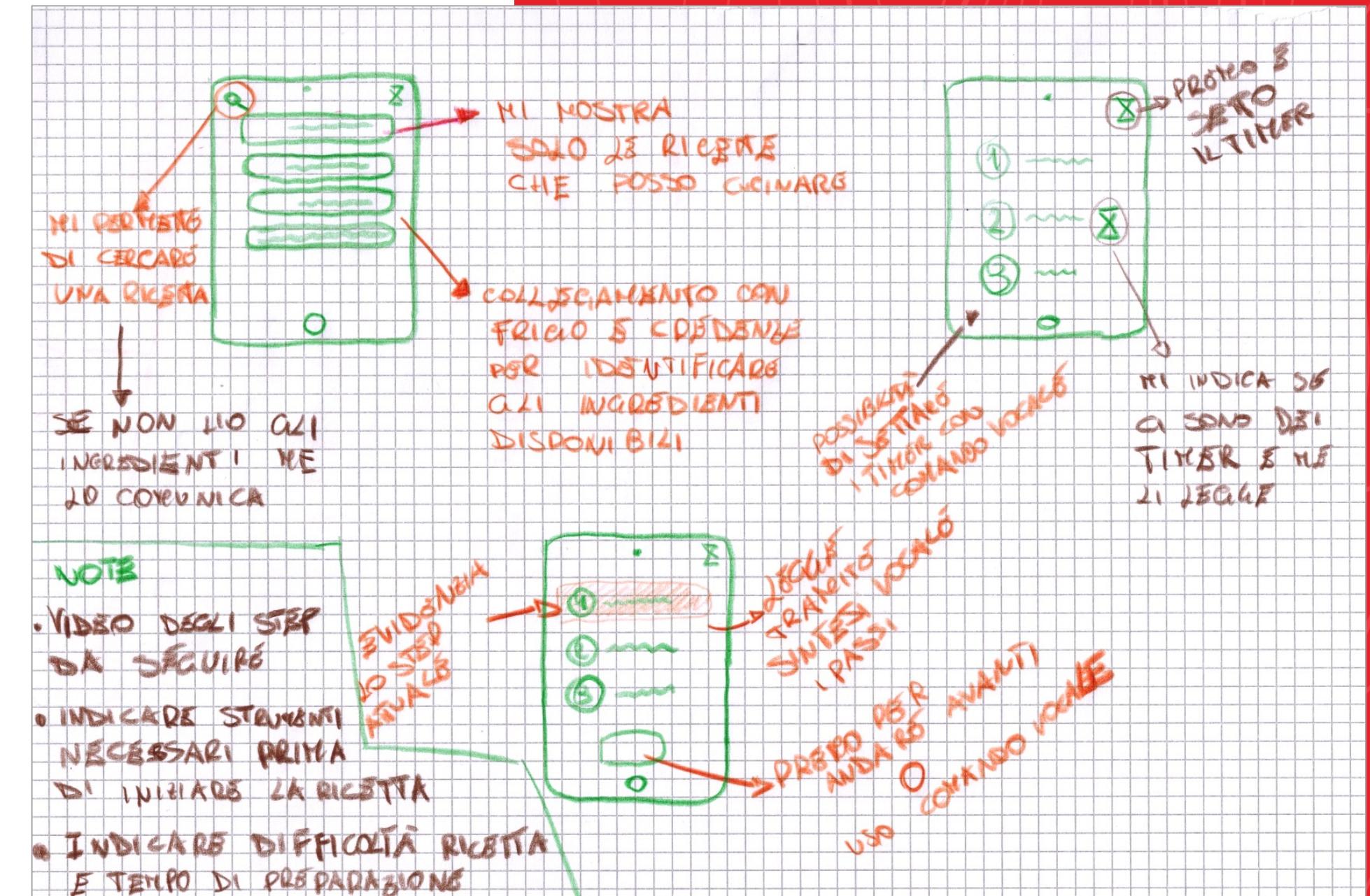
It's possible to **search for a recipe** and in case you do not have the necessary ingredients it tells you so.

The device offers **precise formatting** for the recipe and highlights the step that is being performed.

The device offers a **dedicated section regarding timers** that will be set by the user himself when necessary and communicated by the device.

The **communication** with the device can be done **using the voice**.

The notes also include a request to include videos related to each step, and to indicate, before starting with the steps, the tools needed and the preparation time for the recipe.



User goal

- The user would like to search a recipe on the internet, from different places, using different devices, storing them in the same place.
- Users would like the possibility of checking the availability of ingredients needed for the recipe.
- Users would like to automatically set timers, and in the case of multiple timers a way to distinguish between them.
- Users would like the recipe to be shown step by step.
- Users would like support during the initial step, in which the ingredients are weighed.



Personas

Luigi Bronzo is a 20-year-old boy, tall and muscular with curly brown hair. Luigi attends college. He doesn't know how to cook very well but he likes to try to prepare culinary recipes. To do this he picks up his phone and searches for video recipes online. He always watches the video entirely but cannot entirely remember the steps to perform, so he is forced to pause the video at each step to succeed in preparing the recipe.

User Goal: Luigi would like to search a recipe using the smartphone and that the recipe to be shown step by step.



Personas

Lucia Bianchi is a 45-year-old lady, tall and thin with wavy black hair. She works in a law studio all day until late in the evening.

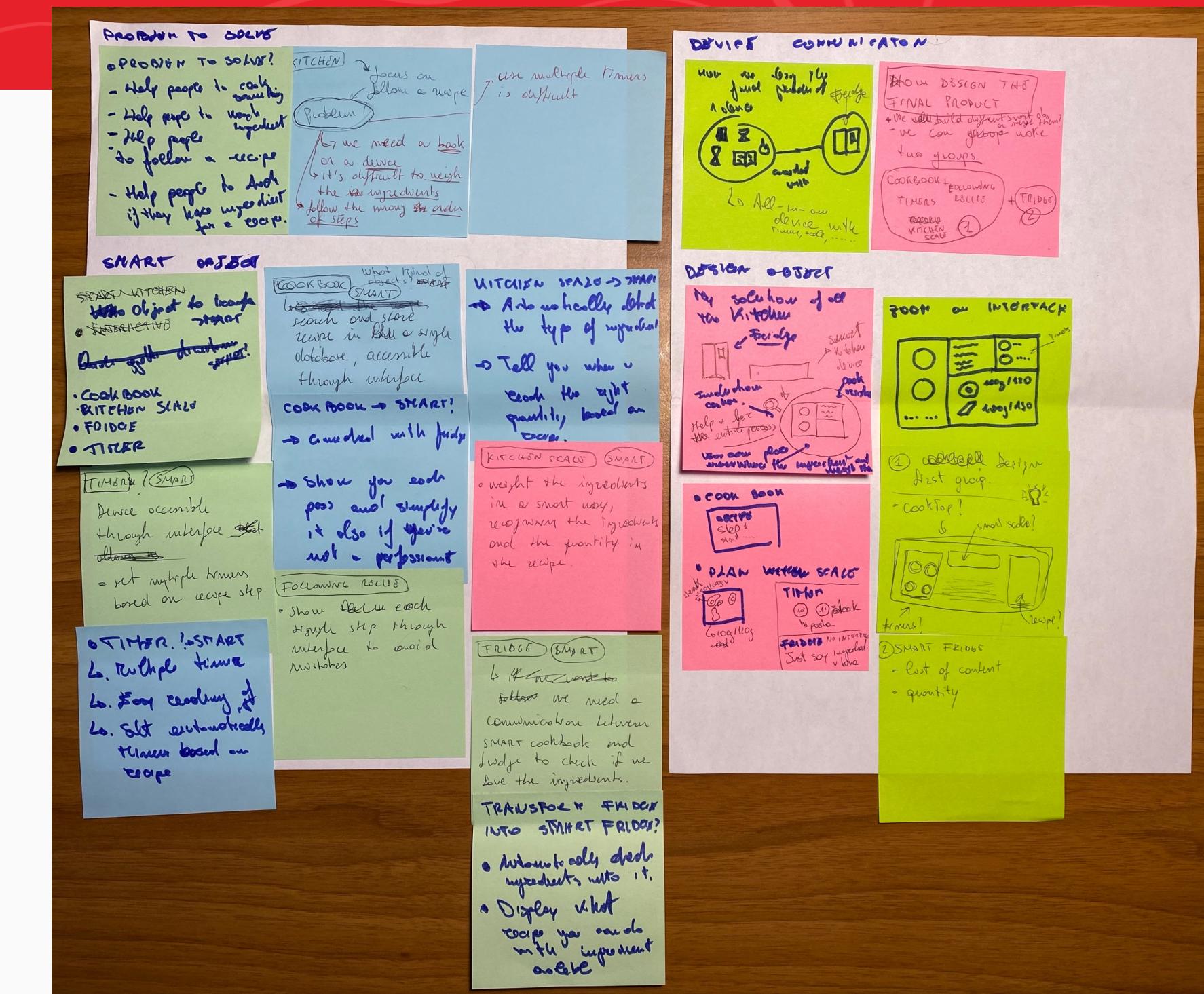
She follows several accounts that offer cooking content on social networks and when she comes home she always tries to replicate them. Because of her job, she is only able to go food shopping once a week and often finds herself having to give up cooking a recipe due to lack of ingredients.

User Goal: Users would like the possibility of checking the availability of ingredients needed for the recipe.



Brainstorming

- What are the problems to be solved?
- What objects can become smart and how?
- What might communication between devices look like?
- How do you imagine the design of the objects?



Smart object transformation

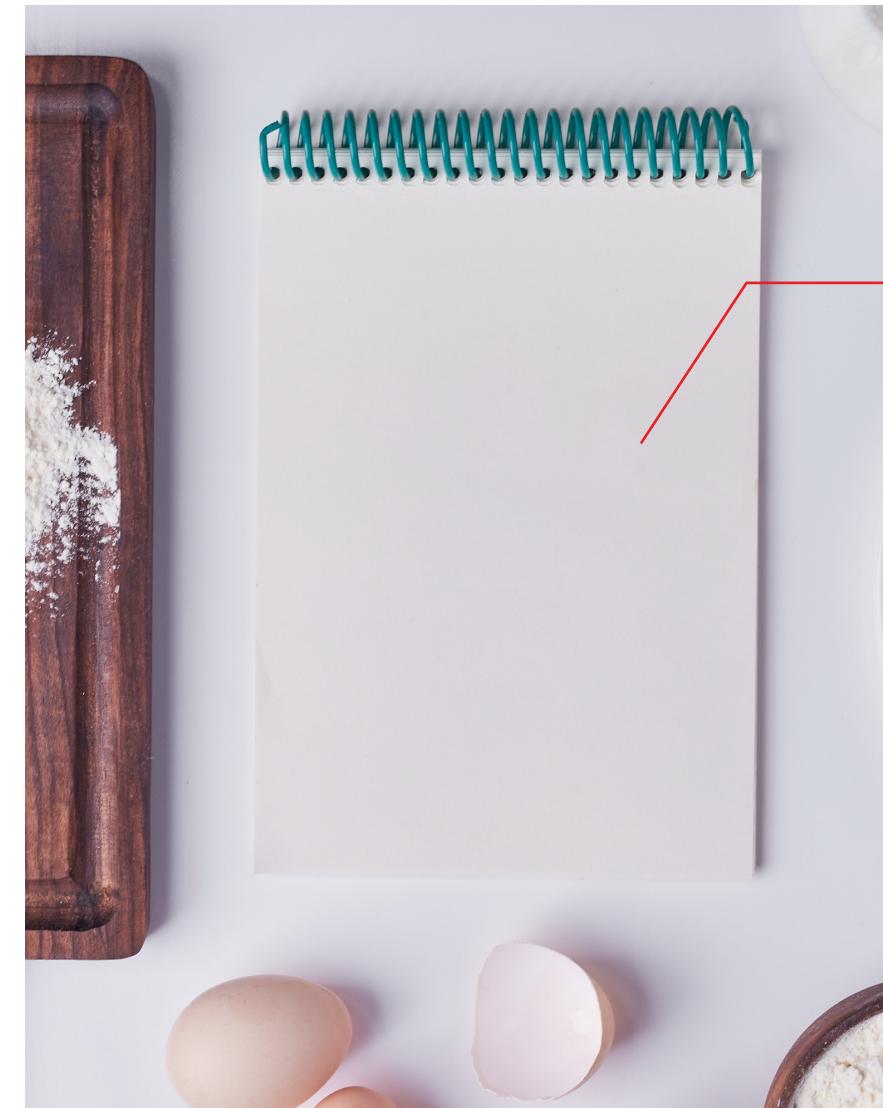


CookBook

Refrigerator

Kitchen scale

Timer



Database accessible
through interface

Smart object transformation

CookBook



Refrigerator

Kitchen scale

Timer



Database with the list
of ingredients and
their quantities

Smart object transformation

CookBook

Refrigerator



Kitchen scale

Timer



After receiving the necessary ingredients from the cookbook it recognizes them using an AI and monitors their weight

Smart object transformation

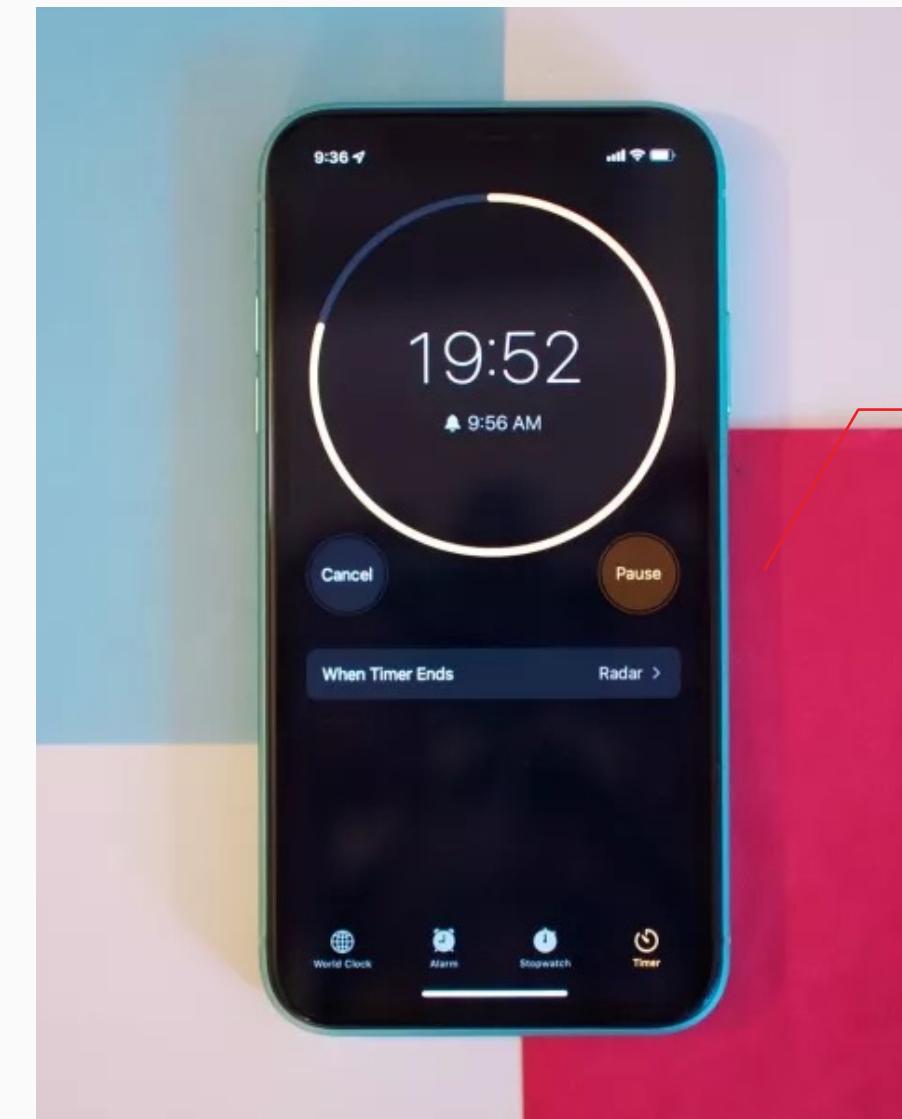
CookBook

Refrigerator

Kitchen scale



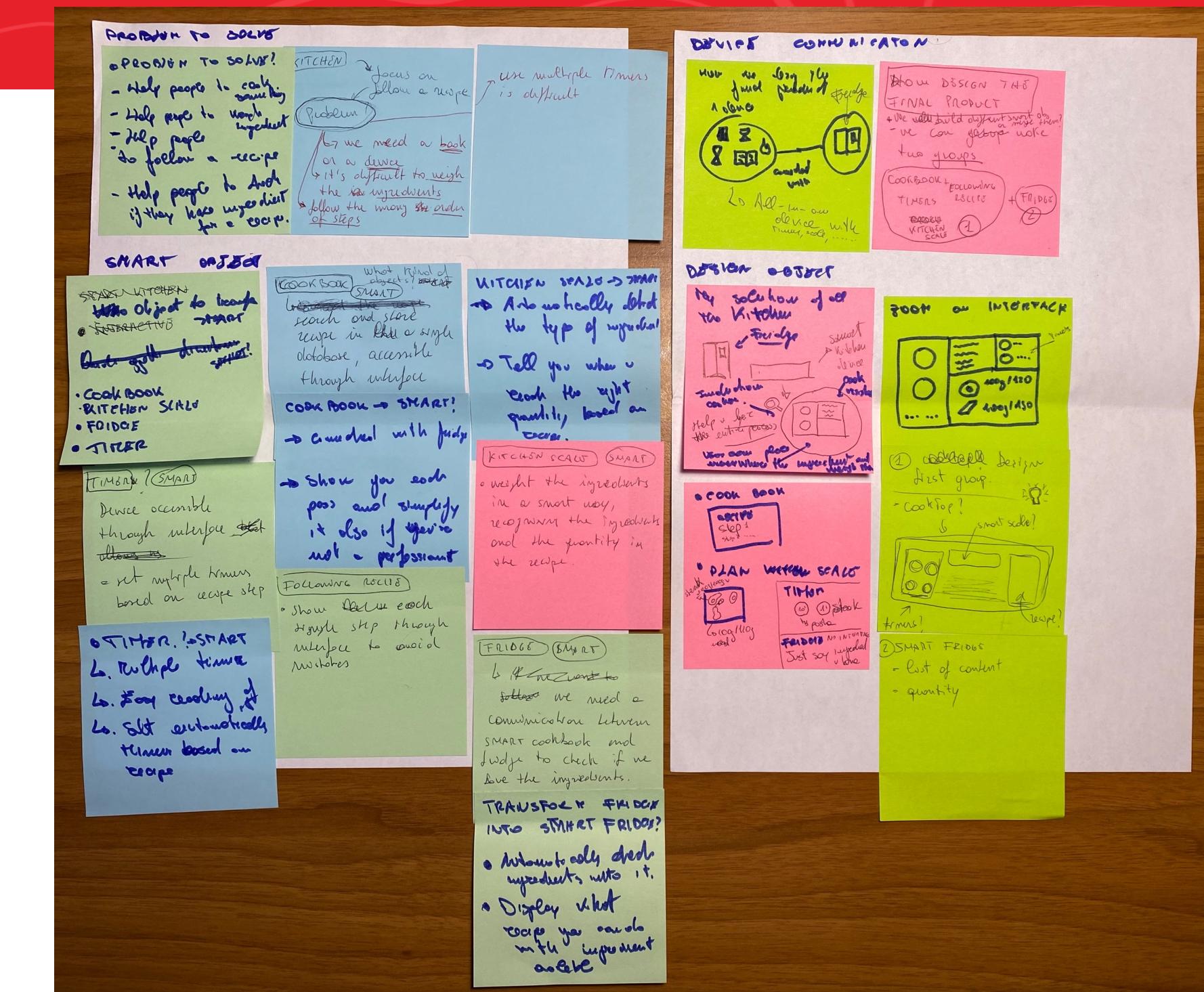
Timer



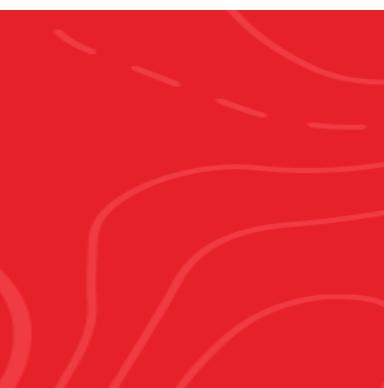
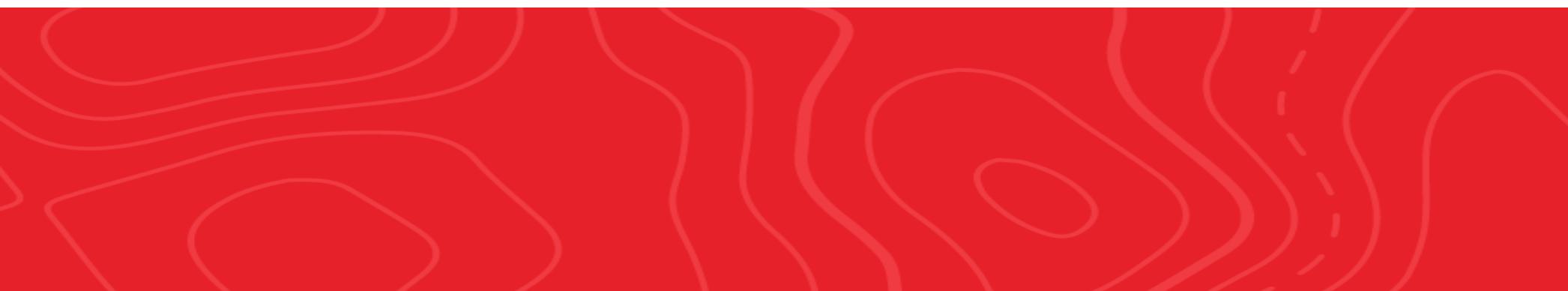
Allows you to enter multiple timers and if specific timers are indicated in the recipe it automatically sets them

Brainstorming

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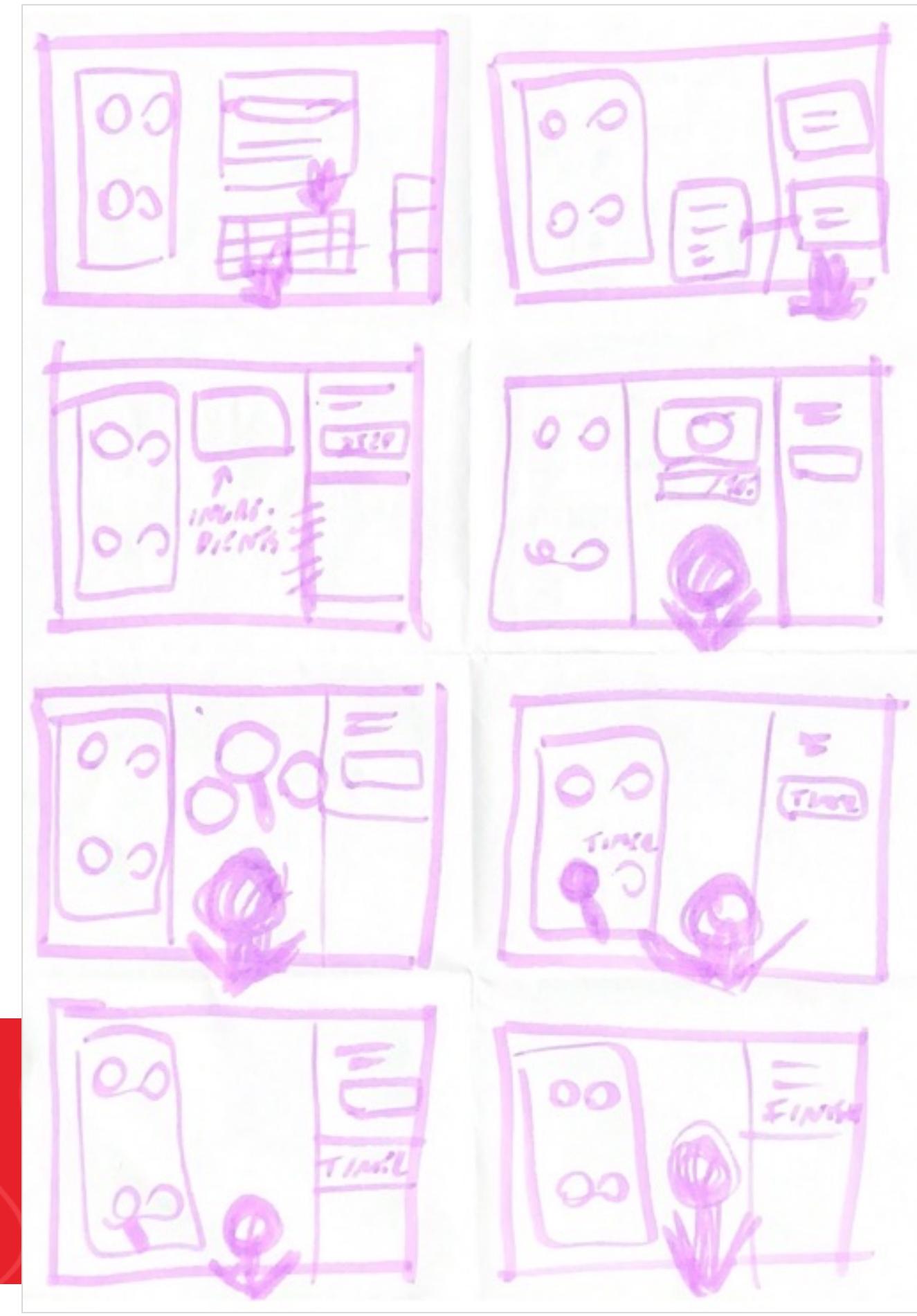
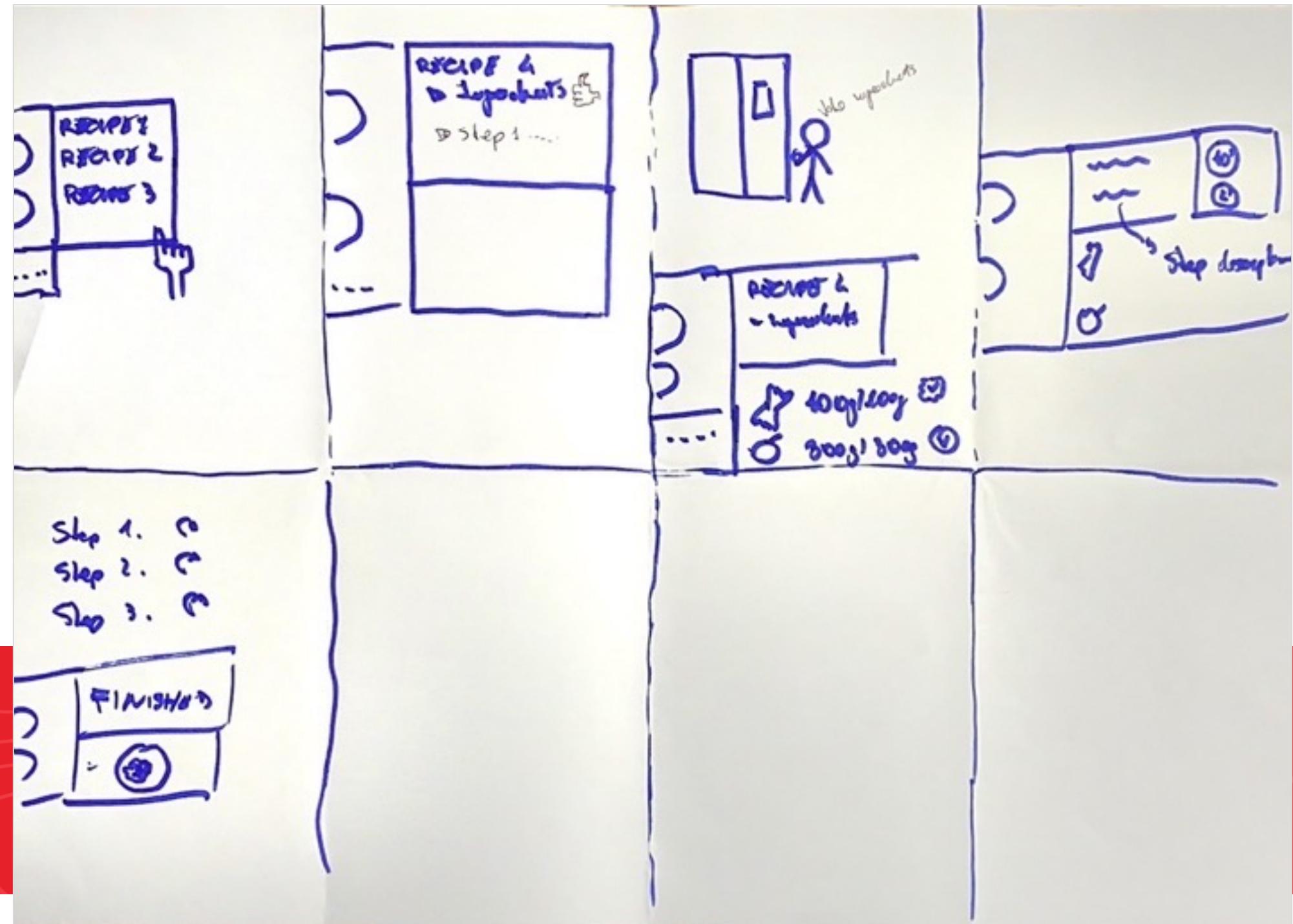


Design



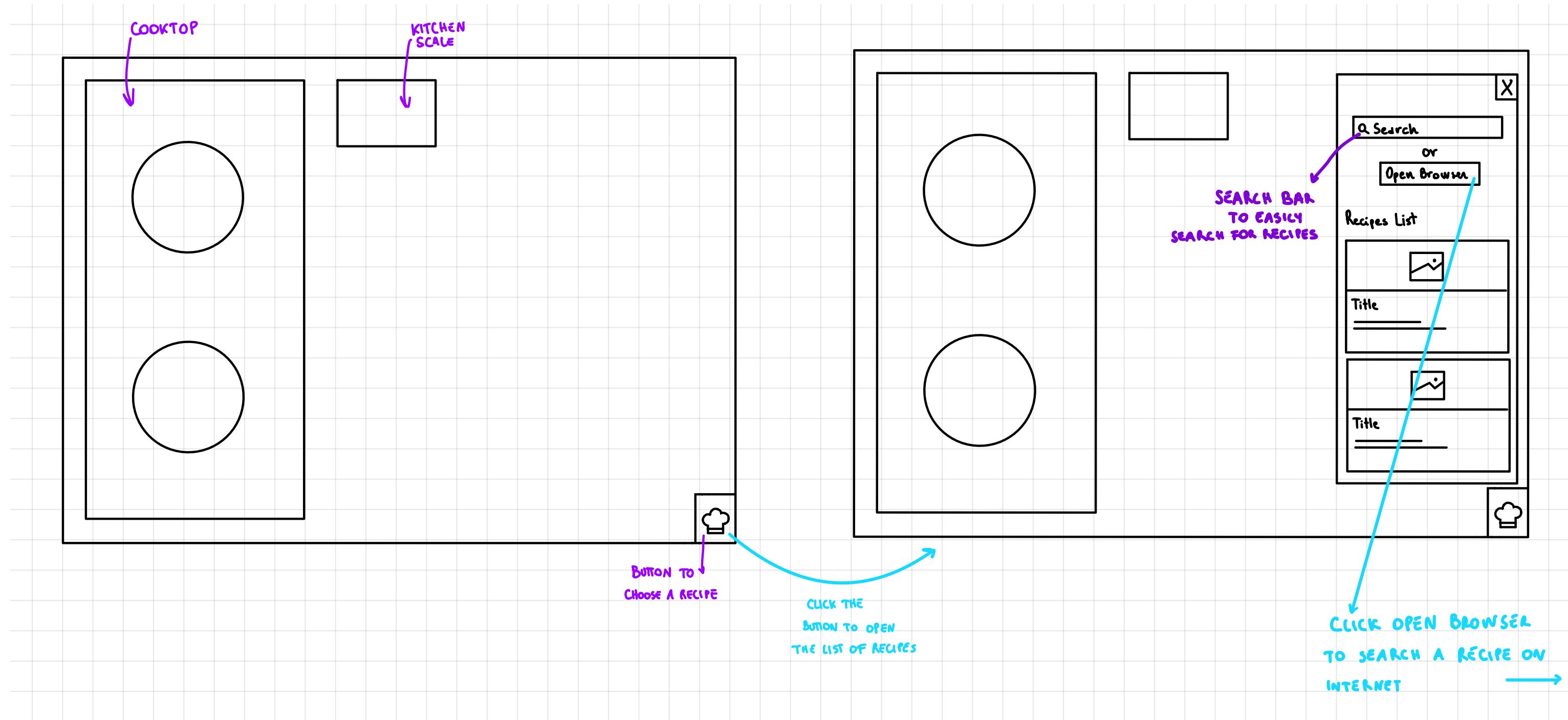
Design

Crazy 8

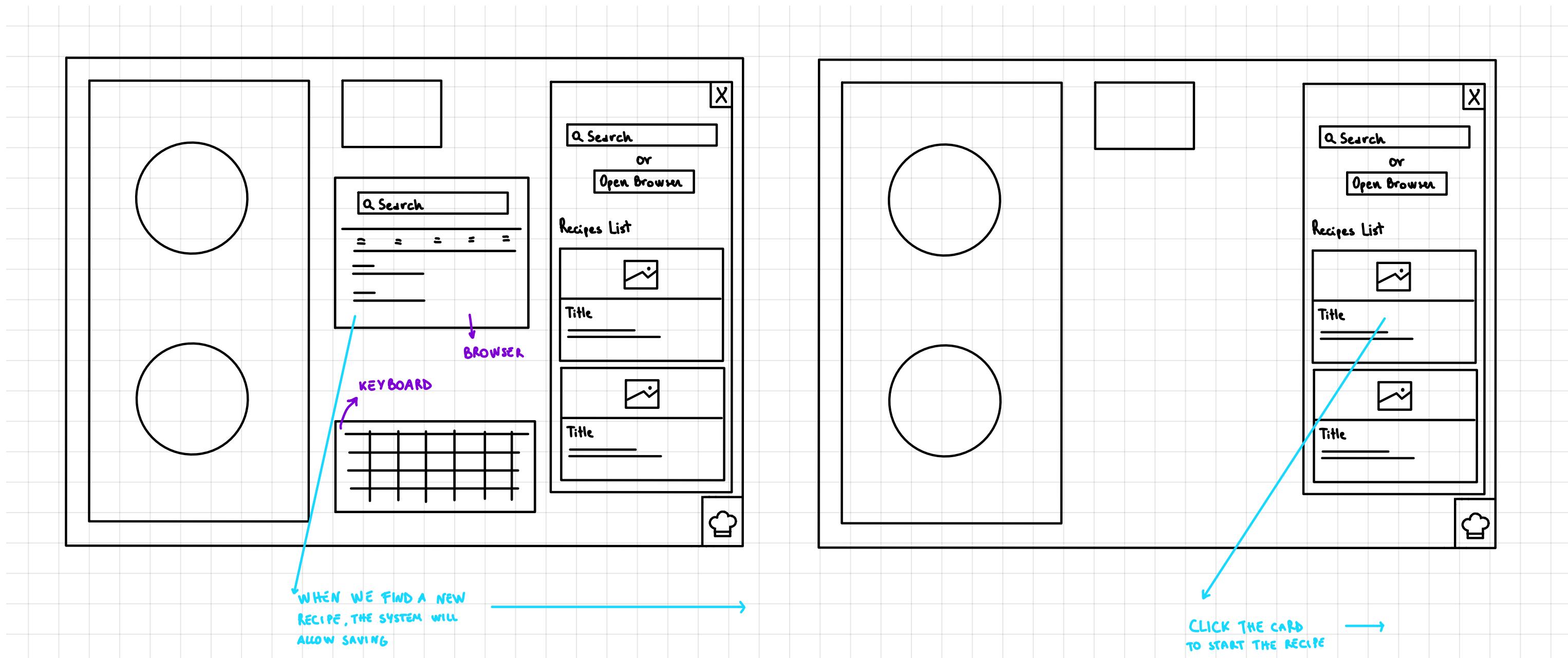


Design

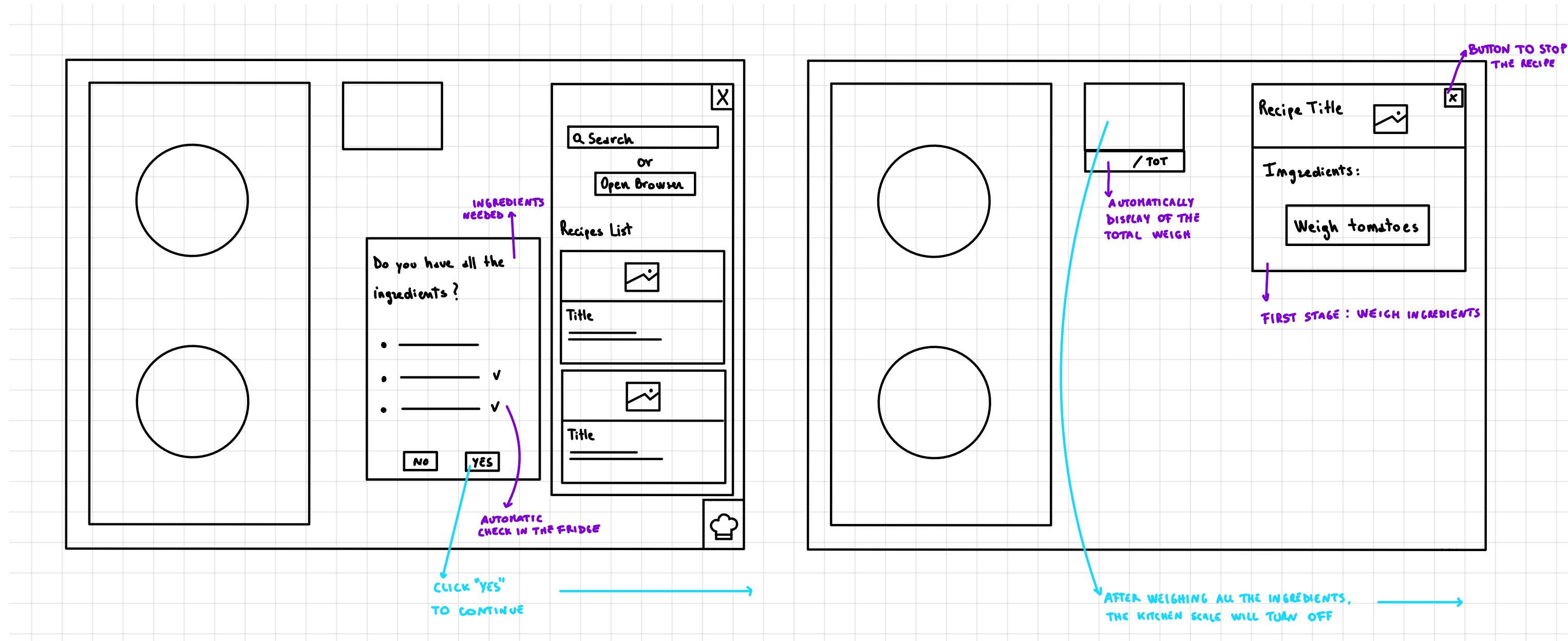
Specify an interaction



Specify an interaction

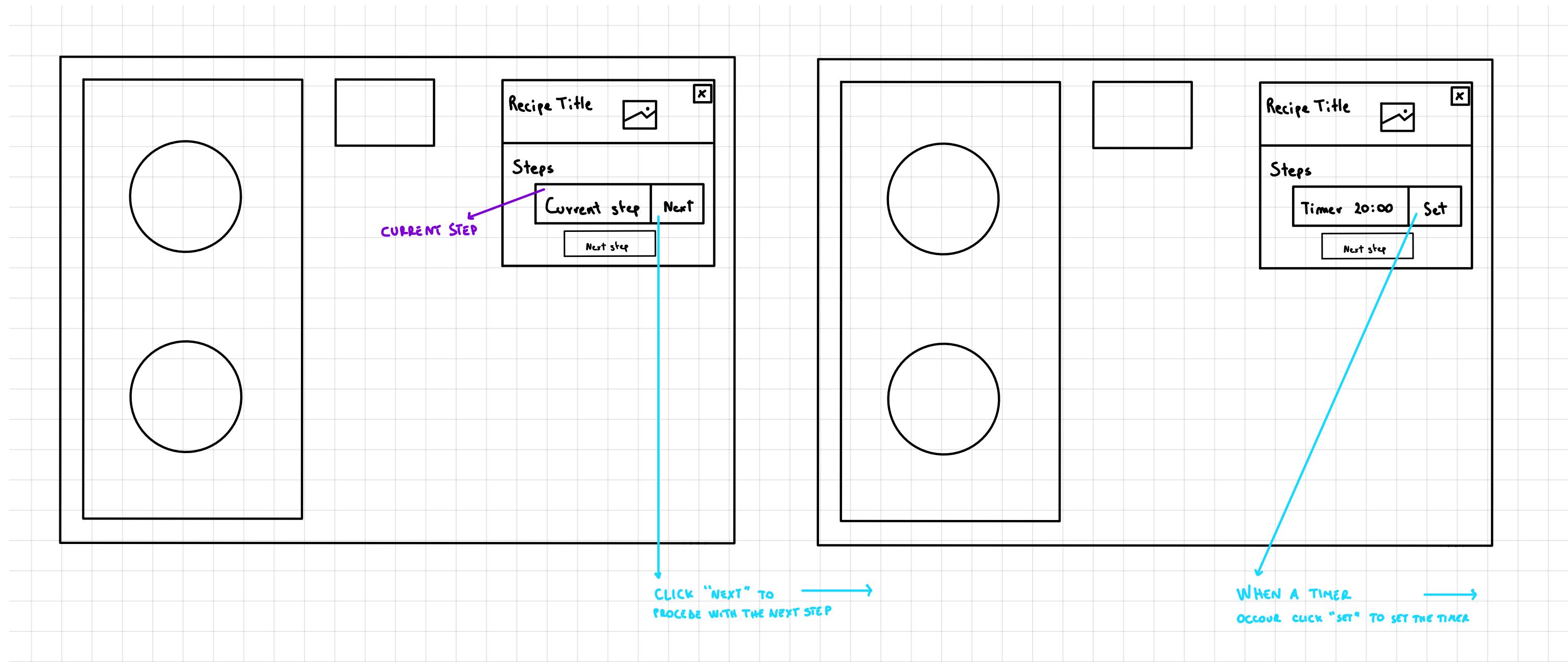


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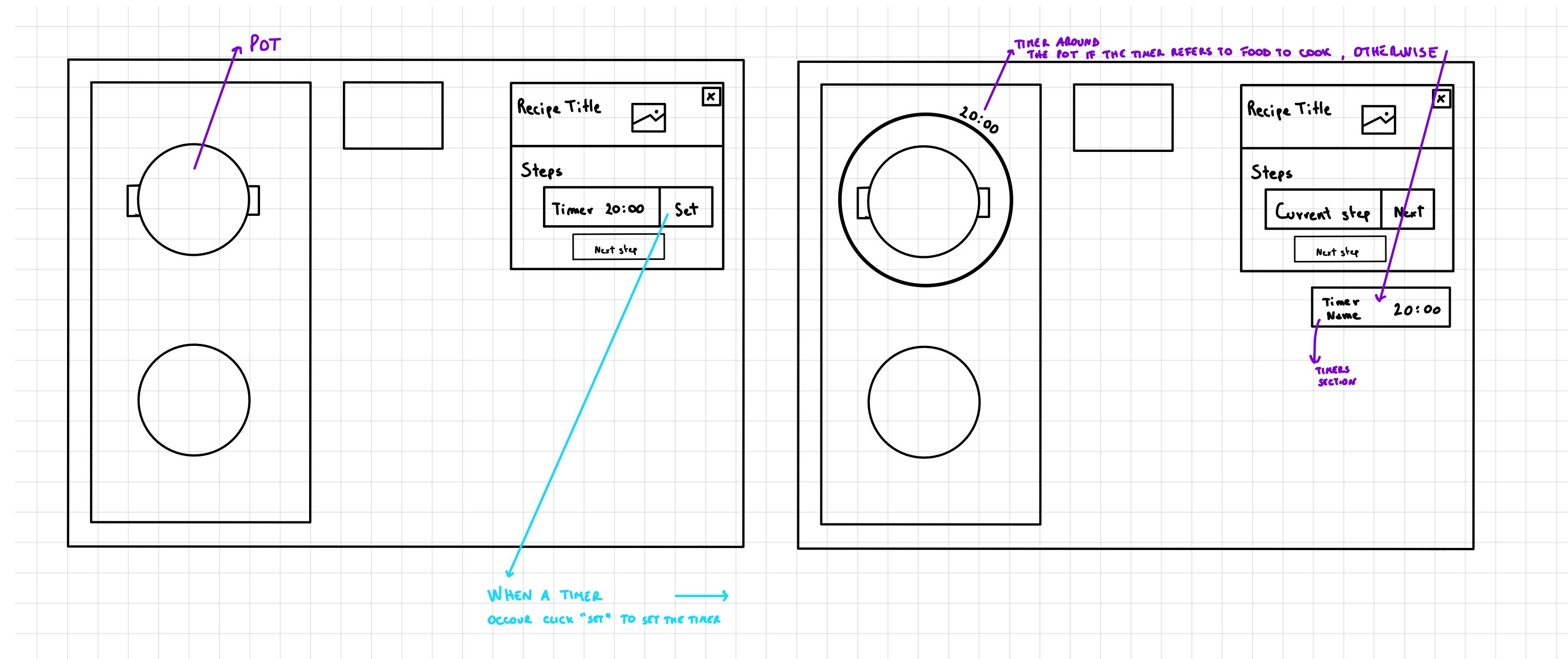
Design

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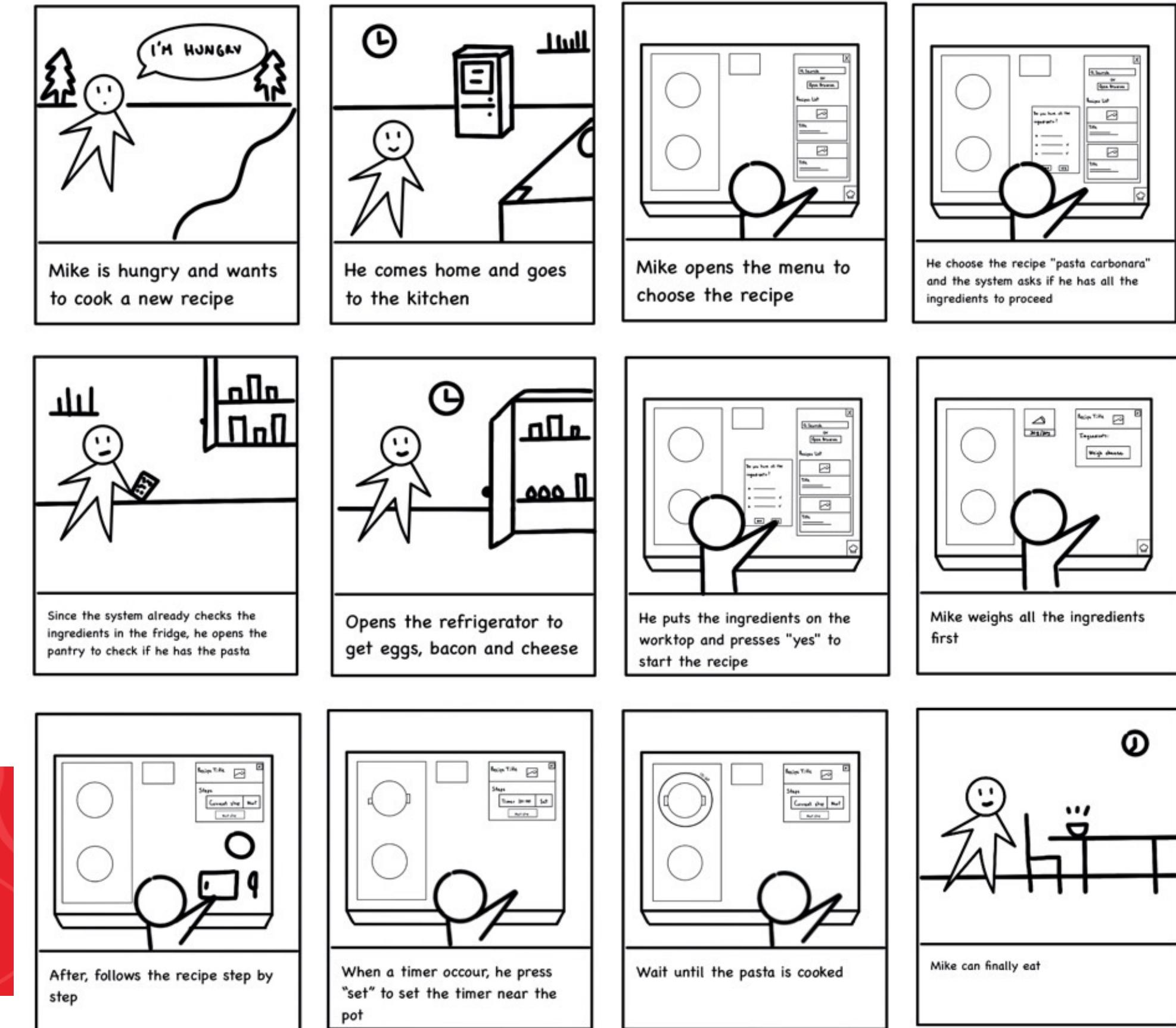


Design

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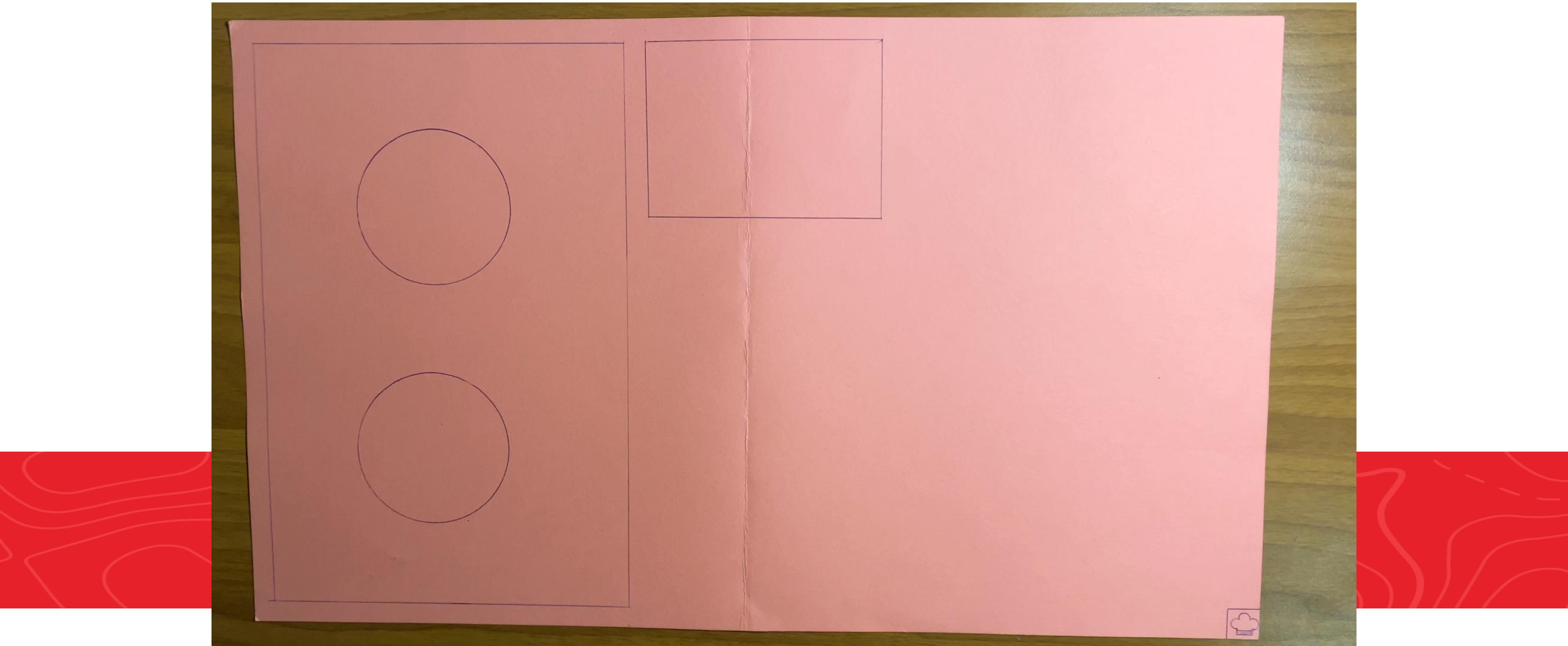


Storyboard



Design

Prototype

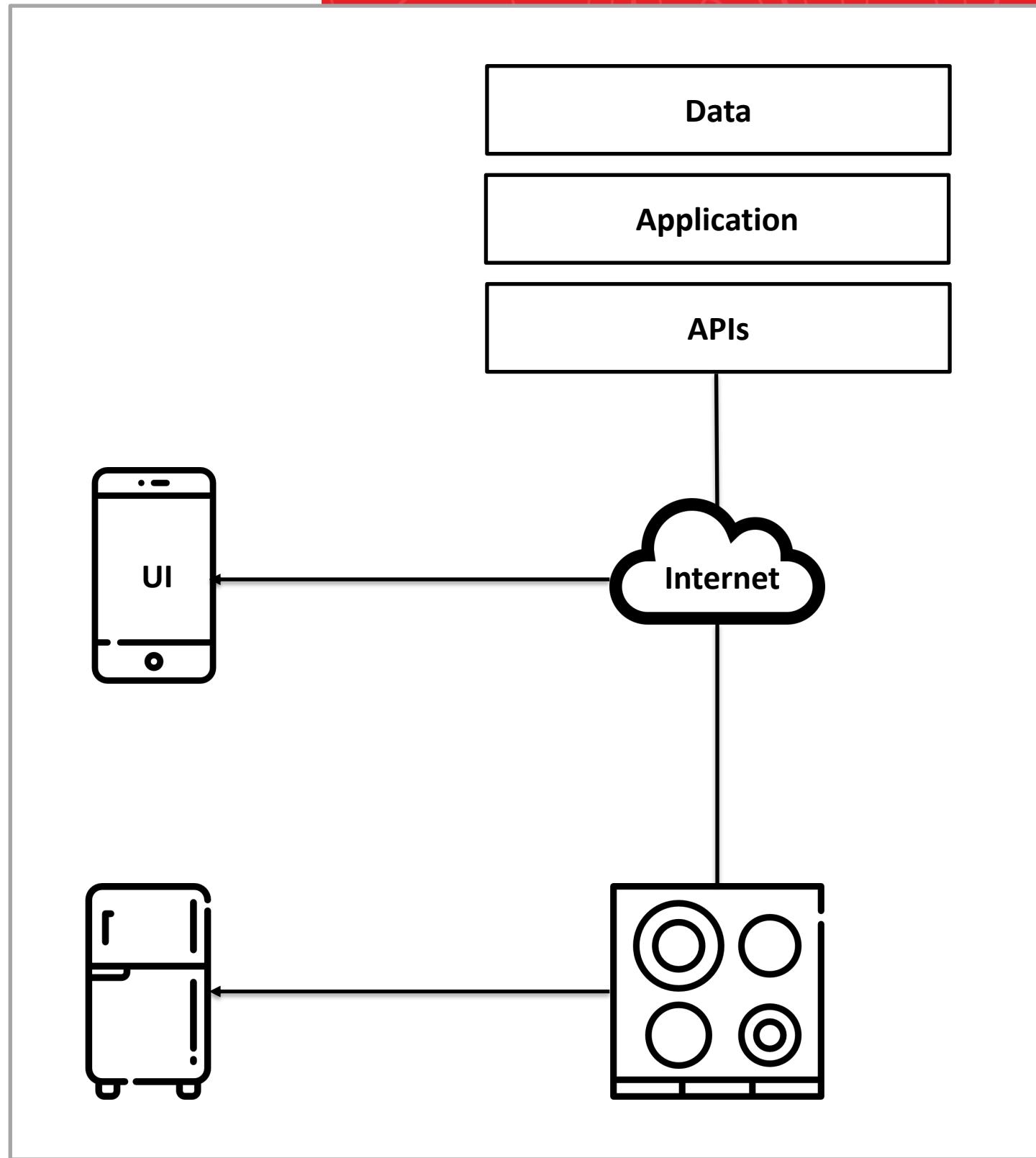


IoT Architecture

Direct internet connection + Device-to-device connections.

The UI provided by the smartphone will be used to search for recipes and save them to the database of the system.

The device-to-device connection between the fridge and the cooktop will be used to retrieve the available ingredients.



Evaluation

Continuity

Does content and data allow smoothly transition across the seams between tools/parts of the system?

Yes, user-uploaded content and user data follows the user whenever they go in the system.

The user, using the cooktop, can search for recipes on the Internet and save them for future execution.

Because the **cooktop can be accessed using any smartphone, tablet and computer for recipe management, the data between devices are shared.**



Evaluation

Composition

How easy is it for the user to figure out how to achieve their goal in the system?

Straightforward. Users usually know which tool to use to achieve their goals and how to access them.

This is because the workflow was designed using the following **mental model**:

- **recipe search**;
- **recipe saving**;
- **checking ingredients** before executing the recipe;



Evaluation

Consistency

Do different tools seem like they belong together and work in concert, or does the interface vary widely across products?

Every tool in the system looks and behaves like it belongs in the same product suite.

Users can easily switch between different tools without a lot of cognitive loads.

Because we have **consistent terminology, same visual elements, and same patterns.**



**Thank
You**

