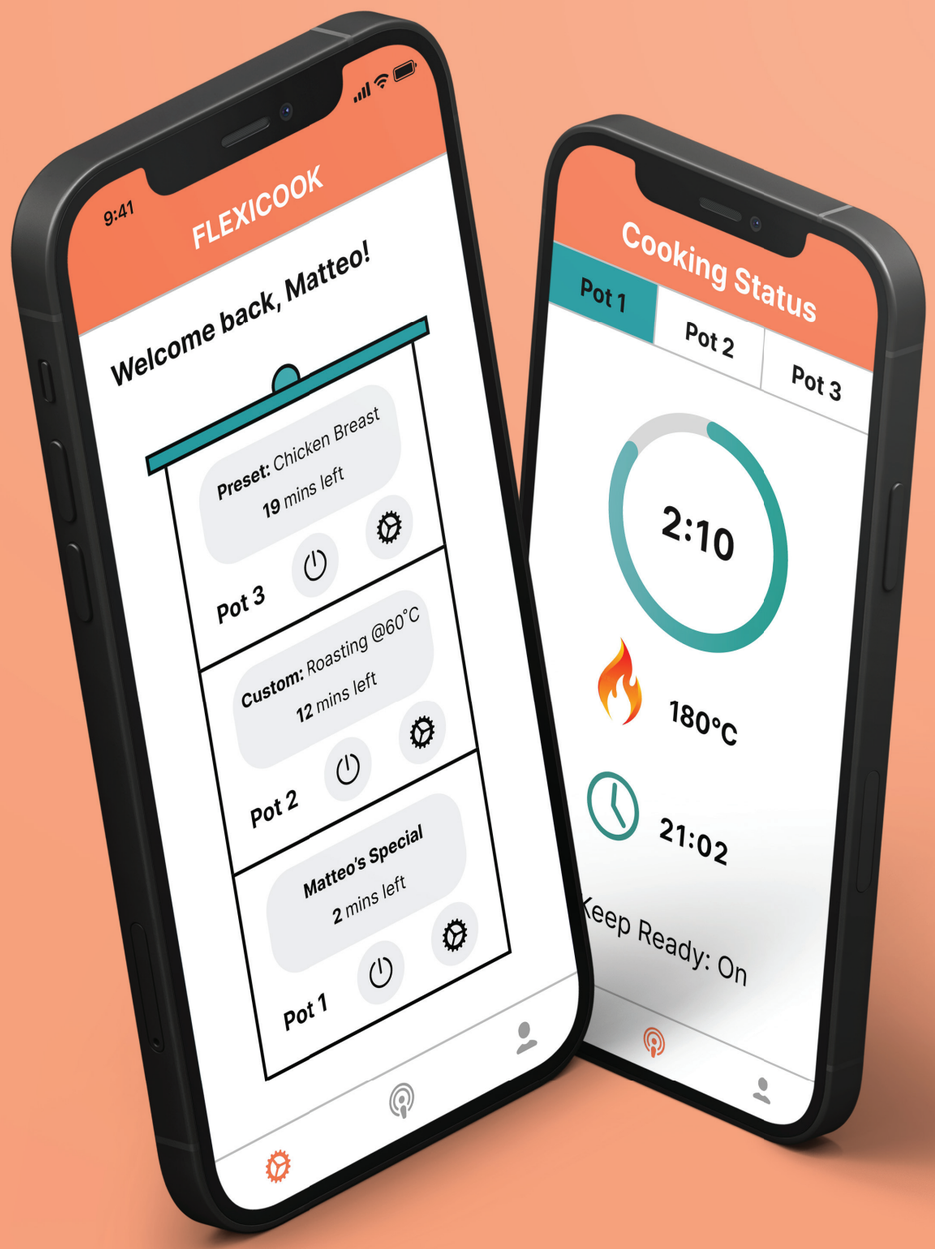


FlexiCook

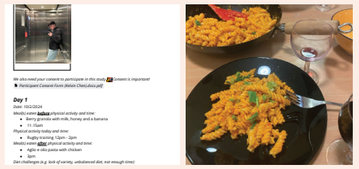
Health is Stealth.

Davin Sheikholeslami Devansh Goel Lara Merican Matteo Guillon

Context & Methodology

Process Outline & Background Information

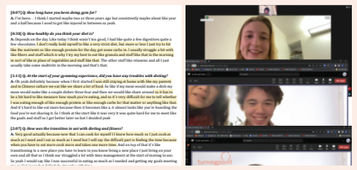
INITIAL CONCEPT DEVELOPMENT OUTLINE



Diary Studies & Observations

Users filled diary studies about their sporting and eating habits, with pictures to reinforce it. **Primary insight**: Students struggled with time and variety of food.

23 diary studies **8** observations



Interviews

Selected users were followed up by interview to gain a deeper insight as to why they have these specific habits. All interviews were voice recorded and transcribed in order to be further analysed.

14 interviews

Personas

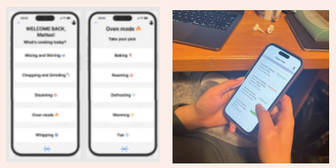
Personas were formed from collated user data which inspired UX journey maps. The journey maps were analysed to highlight pain points & key opportunities to form various insights.

Divergent Sketching

To initiate ideation, the “Crazy 8’s” method was used - a rapid sketching activity with one idea each minute. A co-design session enabled development of the initial sketches by imagining user scenarios.

Selection & Evaluation

Techniques such as a “Feasibility-Impact Matrix” and target group voting was used to narrow down a group of concepts to 3 selected concepts. A group of 10 target users were brought together in a co-design session to vote for their favourite concept.



Prototyping & User testing

Each stage of prototypes underwent user testing where user feedback is implemented at each iteration.

Project Aims

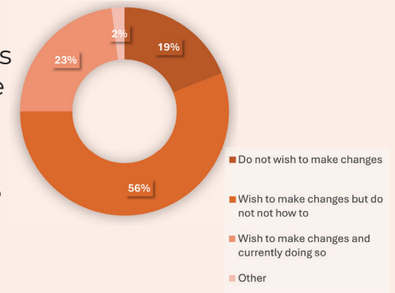
- Use a **human-centred design engineering** process to create a product that **enhances dietary habits of student athletes**
- Encourage students to eat a **wider variety of meals** without causing additional stress
- **Financially accessible** and **easy-to-use** product

Why

360K of adults in the UK Biobank were involved in a study that proved **“physical activity does not counteract poor diet”**

35% of people don’t make changes to their diet or physical activity due to ‘tiredness’

Over 50% of student athletes surveyed said they “wish to make changes but do not know how to”



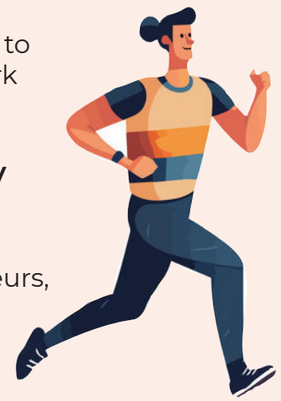
Who

University students aged **18-24** who have to balance their time between university work and other activities

Students who wish to maintain a **healthy diet**

Involved in sports at **all levels** (e.g. amateurs, recreational, enthusiasts, professionals)

Involved in a **variety** of sports



Concept Development Overview

Product Development Methodology & User Research

FINAL PRODUCT DEVELOPMENT OUTLINE

Concept Selection

Group voting based on feasibility, practicality and desirability, followed by a target group voting session led to the final concept to be chosen - the “Remote Cooker”.

Co-design

Co-design sessions took place throughout the development of the concept to figure out what users thought were most important in terms of features, design and general accessibility.

Brand Identity & UX Map

Brand identity which includes identity, essence, origins and values of the concept are outlined to highlight the distinctiveness of the product. The impact of the product is then shown through a persona’s user experience map.

Specifications & Features

From the co-design session, a list of the most important features were formed for both the app and the cooker. Features were ranked by importance when reflecting on user’s opinions.

Cooker Prototype

‘Looks-like’ prototypes were made on Fusion 360 and ‘Works-like’ prototypes were made using Arduino. Each stage of prototypes underwent user testing where user feedback is implemented at each iteration.

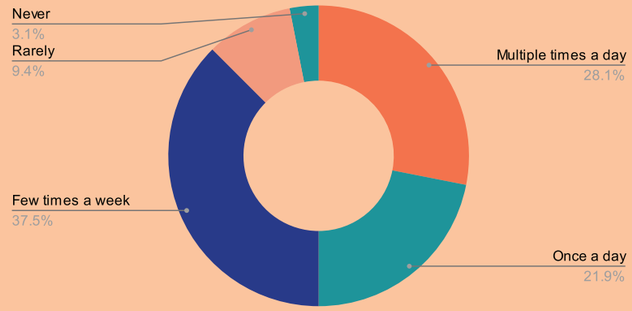
App Prototype

An initial idea of the app was sketched out on paper. After user feedback was given, Figma was used to create a combined ‘looks-like’ and ‘works-like’ prototype where further feedback inspired changes in the app to improve user experience.

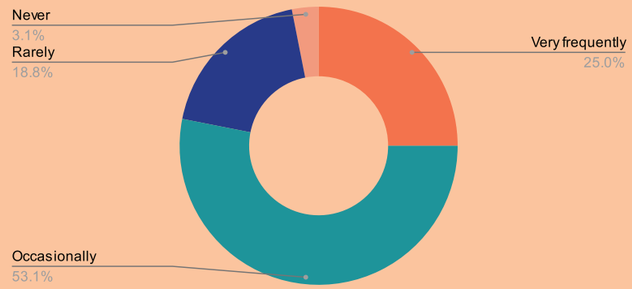
Survey Responses

Subsequent to selecting the final concept, we used a survey to gain further insights from **32 target users** to gain an initial idea of different aspects such as features, concerns and intentions of users.

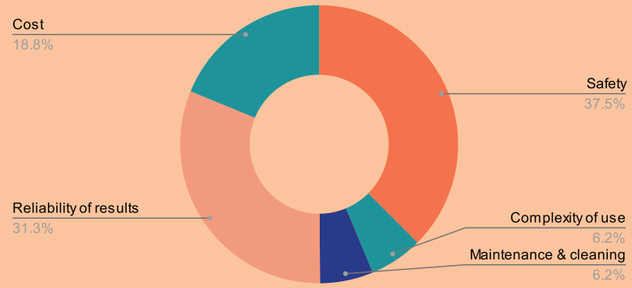
How often do you cook meals at home?



How frequently do you find yourself wishing you could start cooking before you get home?



What is your biggest concern about using a remote-controlled cooker?



Concept Selection

Evaluation & Selection of a Concept

Group Voting

Each member of the group rated each of the 12 ideas based on 3 parameters.
A final table of averages was formed as shown below, with the 5 highest rated concepts highlighted.

	1Pot	CartScan	NutriGuide	Expiry App	Nutrition Pods	Recipe App	Spices Machine	Fit Quests App	Measure Tray	Remote Cooker	Recipe App	Freshness Tabs
Feasibility	9.75	6.50	6.25	8.25	5.75	8.50	7.50	7.75	4.00	7.00	8.25	5.75
Practicality	8.00	6.75	7.00	6.25	8.50	7.75	8.25	6.00	7.00	7.00	7.50	5.75
Desirability	4.75	6.25	6.25	6.25	7.25	5.25	6.75	4.25	5.75	8.25	5.00	4.75
TOTAL	22.50	19.50	19.50	20.75	21.50	21.50	22.50	18.00	16.75	22.25	20.75	16.25

FEASIBILITY
Can the idea be implemented realistically?

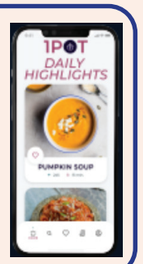
PRACTICALITY
Will the users be able to use the product easily?

DESIRABILITY
Would target users want to buy the product?

5 Highest Rated Concepts

1 Pot

An app filled with one-pot recipes that blends convenience and taste. Eat quick, easy and healthy!



Nutrition Pods

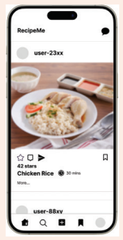
Pods stocked with fresh fruits, vege-tables and healthy snacks that can be placed conveniently around campus.

Spices Machine

Eliminate time spent looking for and measuring spices to be put in food. Spices are dispensed auto-matically!

Recipe App

Filter for ingredients to find and share recipes, forming a fitness-diet related community.

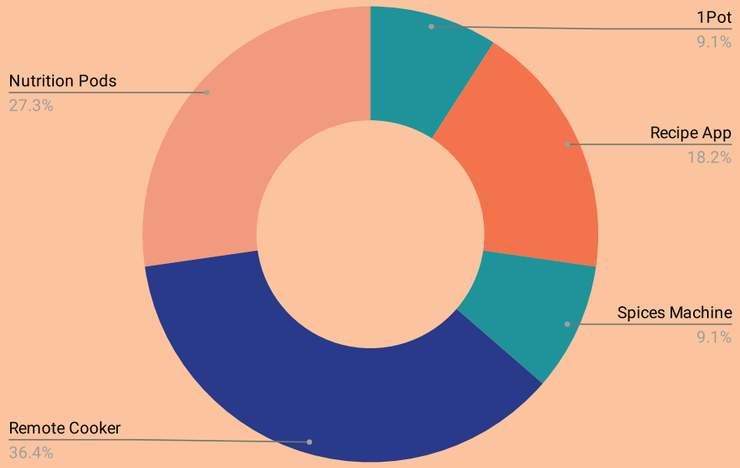


CHOSEN CONCEPT: Remote Cooker

Users can activate this cooker on an app during their journey home from gym, for example. The meal is ready and kept warm when they reach home!

User Centric Selection

A target group voting session narrowed down the 5 highest rated concepts to the final concept, the “Remote Cooker”. Users were told to keep 2 parameters in mind: originality and relevance to themselves as target users.



Comments from target users:

“It’s a cool idea but I don’t really eat meals that use spices”
(Spices Machine)

“So it’s just a vending machine but with healthy stuff?”
(Nutrition Pods)

“As a student on a placement from 9-5 I would love if I could just hit that button and by the time I got home my food would be ready”
(Remote Cooker)

Co-design & Research

Interaction with Users and Secondary Research

A Co-design Session was conducted where 5 people who fit our target user group were invited and asked about their opinion on the concept. First, the idea was presented and key features were discussed. Then, initial sketches of the app and cooker were shown and discussed in detail.

Demographic Information

5 Participants

Aged **17-20**

Students at Imperial College London and Queen Mary University

Athletes and Sportspeople (Athletics, Football, Gym, Rugby, Tennis)

Safety Features:
"Since it is not monitored in person, it must have some emergency features like temperature shut-off if it like starts burning or it shuts if the cooker gets disconnected from Wifi or something"

Notifications & Alerts:
"... might forget that I put food in the cooker, so a reminder would be good if I haven't put any cooking setting"
"I would want to know when my food is cooked and ready"

Preset Cooking Options:
"I often eat the same meal so I don't want to put the same settings everyday... Ideally, I would just click a button and it knows how much to cook it"

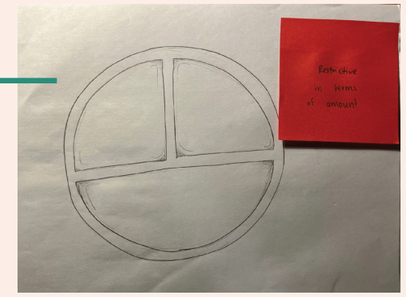
Multiple Cooking Processes:
"If this is for daily meals, it should have multiple cooking methods like some foods need to be steamed, some fried, some baked etc. like that"

Nutritional Information:
"If I think from my sports side, I would want some kind of information about what I'm eating like calories or whatever since the cooker already knows what I'm eating so might as well just have it on the same app"

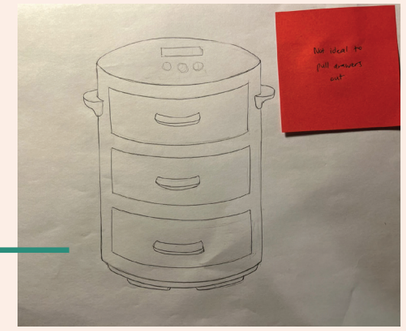
Keep Warm & Cold Setting:
"If I'm running late and not reaching at the time I planned to get home, the cooker could have a keep warm feature or something... Also if my plans change then the food inside the cooker should not get spoilt so like keep cold also"

Cooker Design Feedback:

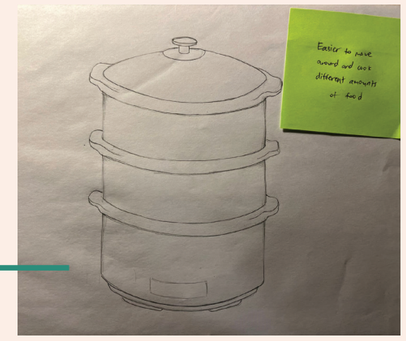
The different sections in the same bowl seemed a little restrictive in terms of size and space to the users.



The drawers were interesting but didn't seem practical as inserting and pulling hot bowls is inconvenient.

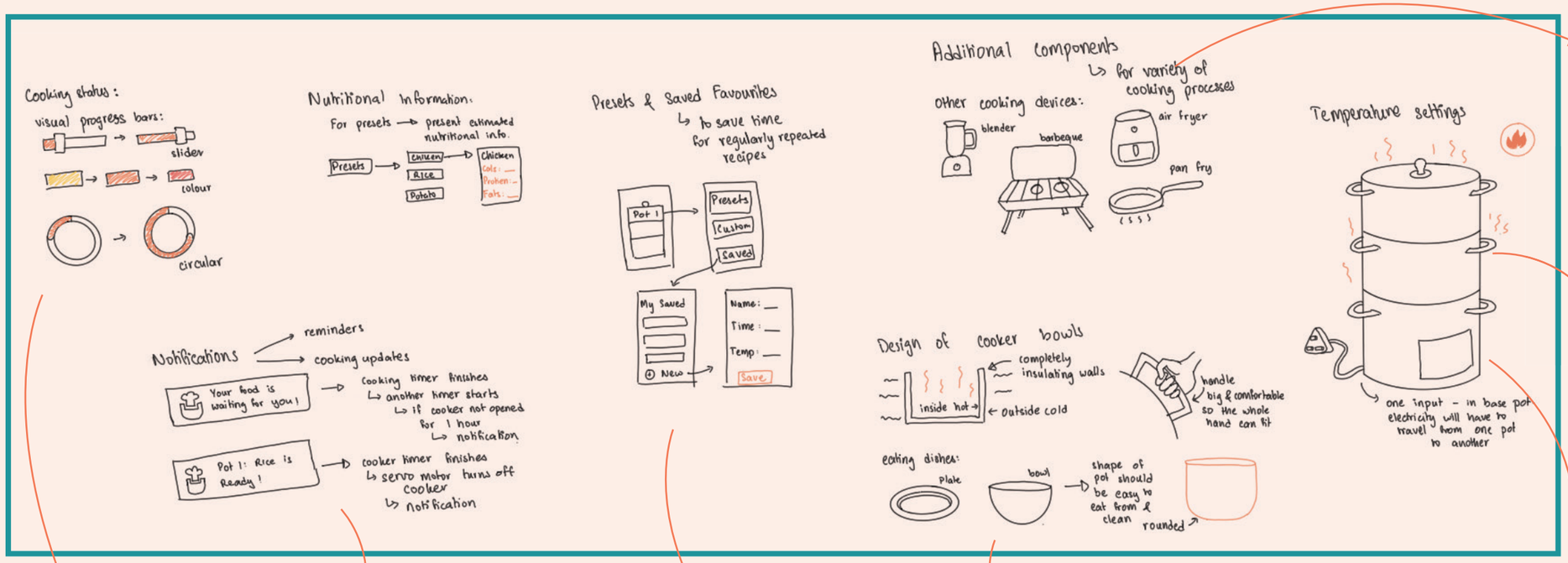


This design was unanimously decided to be the best option as it provided enough space for all dishes, feels comfortable to use and looks clean and simple.

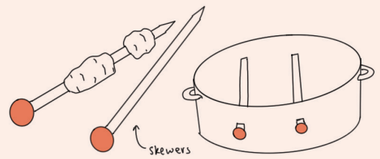


Features & Specifications

Development of Ideas from Co-design Session



Detachable Components:
In order to increase range of cooking processes, components such as skewers and stirrers can be added on to the cooker.



Temperature Cut-Out:
Maximum safe temperature for ovens is 550° C. Average temperature of food on fire is around 600° C.
If temperature goes beyond 550° C, the cooker should switch off and air-seal so that the fire dies.

Cooking Status:
The app should reflect real time updates of - time remaining, temperature, and chosen settings.
Since different items will take different amounts of time to cook, the app must show different progress bars for each pot.

Notifications:
1. When the user has kept food in the cooker but has not given cooking instructions for a long time
2. When the food is ready but not opened for a long time
3. When the cooking activity in any of the pots is complete

Presets and Favourites:
Users can save frequently cooked recipes so they don't need to enter the settings each time.
Information saved:

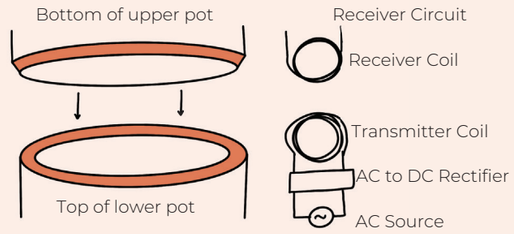
Name of Recipe: Matteo's Special

Time: 31 mins

Temperature: 180°C

Cooking Bowl acts as Plate:
In order to reduce number of dishes to wash, users often eat from the cooking utensils.
The bowls should be thermally insulated from outside so it can be used to eat out of.
Material - Stainless Steel internally insulated with Silicon
Inner edges should be rounded.
No electrical or thermal components should be on the inner side.

Electrical Conduction:
Slow cooker uses 120V.
Inductive coupling can be used to transmit the electricity from one layer to another (similar to wireless charging of a mobile phone).



App

Cooker

Final Concept

Brand Identity and User Experience

BRAND IDENTITY

Identity

Name: FlexiCook embodies flexibility and culinary excellence, catering to any lifestyle and providing healthy, ideal meals.
Logo: Represents modern, cutting-edge features with vibrant colours, illustrating a seamless, enjoyable user experience.

Essence

Product: A smart cooker controlled via an app with different cooking functions. Users place ingredients in the cooker before leaving, and then control it remotely, accessing real-time feedback, recipe saving, and more.
Vision & Goals: Designed for busy individuals, especially university students, to make healthy cooking effortless, enhancing fitness and nutrition.

Values

Brand Words: Convenient, time-efficient, fast, adaptable, health, fitness, smart.
Values & Beliefs: Health is wealth and time is money.
Differentiators: Simple and intuitive remotely controlled cooker via user-centric app. The modularity of FlexiCook removes the need to cook everything in one pot. App's ability to store recipes for improved user experience.

Origin

Motivation: Research revealed students struggle with healthy meal prep due to time constraints, hindering fitness goals.
FlexiCook is the solution for effortless, healthy cooking, tailored to fit busy lifestyles.

USER EXPERIENCE

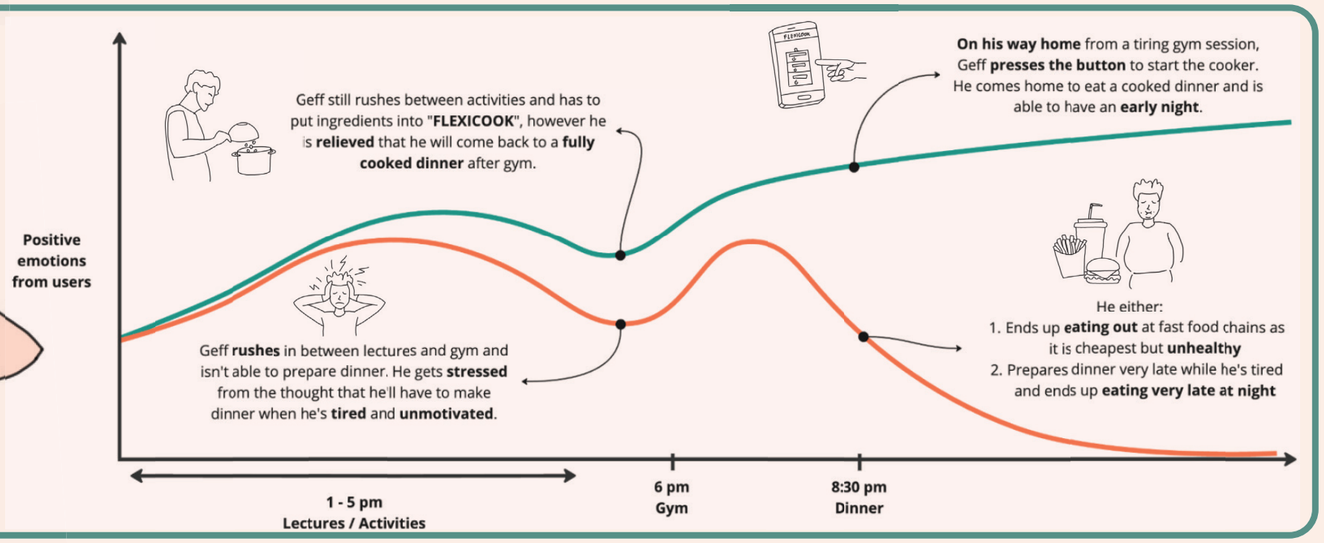
GYM BRO GEFF

Age: 21 years old

Geff is a university student involved in a variety of sports including going to the gym, football, basketball and rugby. In addition to his sporting activities, his busy university schedule leads to him struggling to meet his dietary goals.

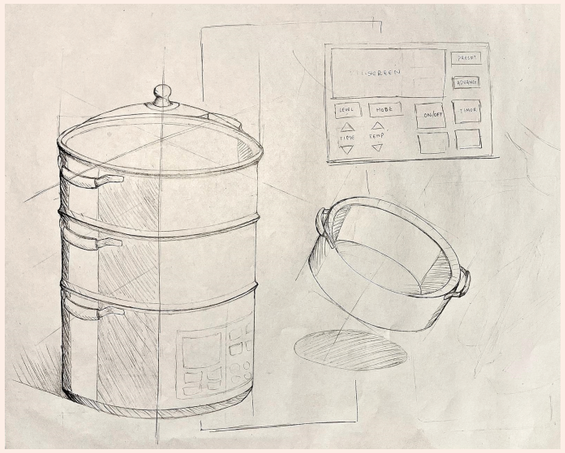
To the right is his UX map:

with FlexiCook without FlexiCook



Cooker Prototype

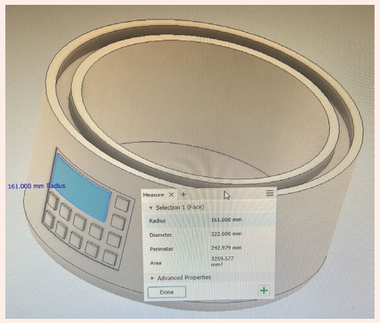
Design & Development of a Looks-like Prototype

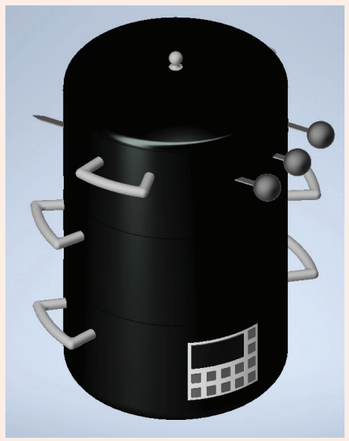


Initial Sketch

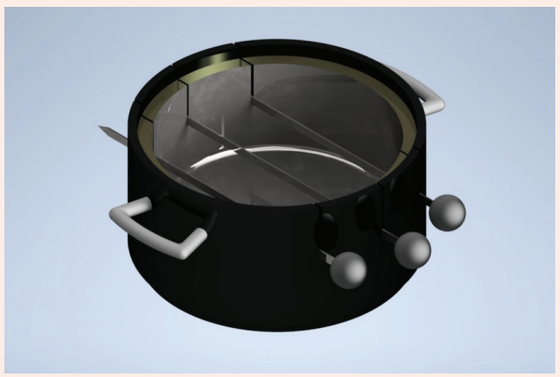
Further developing sketches from the Co-Design session and incorporating all the physical features of the cooker, a detailed product sketch was created. This sketch was then used to create a 3D model of the cooker. The pots can hold a volume of **7L (base pot)** and **6L (basic pot)**. The 3D model was then given material and appearance properties.

Initial CAD Designs



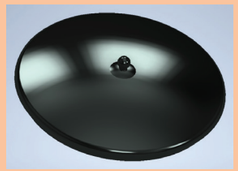


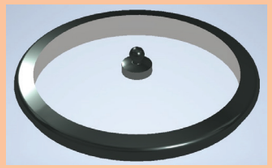
Iterated CAD Designs



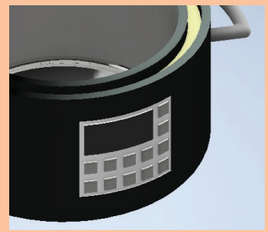
User Feedback

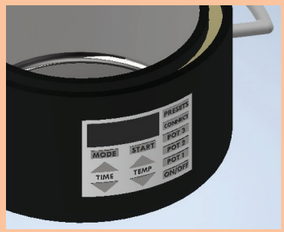
Lid:
Users wanted a transparent glass lid as they would be more comfortable if they could see through in the top pot.



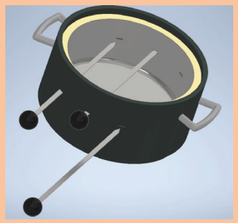


Buttons UI:
Users felt the buttons were too complicated as there were too many. A new format was created to have a more sensible flow of buttons which allowed usage of the cooker without the use of the app.

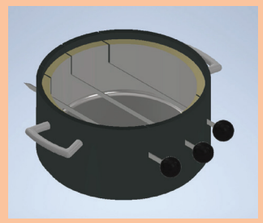




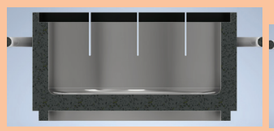
Skewer Slots:
The skewer slots were changed such that the skewers would be placed from the top instead of sliding through, so it's easier to use the skewers. Two designs were created for slot shapes.

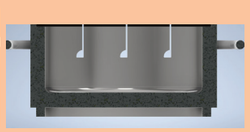


Initial Design



Iterated Design





Two options for shape of slot holes

From Co-Design Session:
The chosen design for the cooker was the one with bowls stacked on top of each other.
This design seemed the most comfortable and user-friendly to the participants of the session.

User's Comments:

"Maybe there could be more detachable components like the skewers..."

" Yeah.. I think it's great but how do we control all three pots if there's only one screen?"

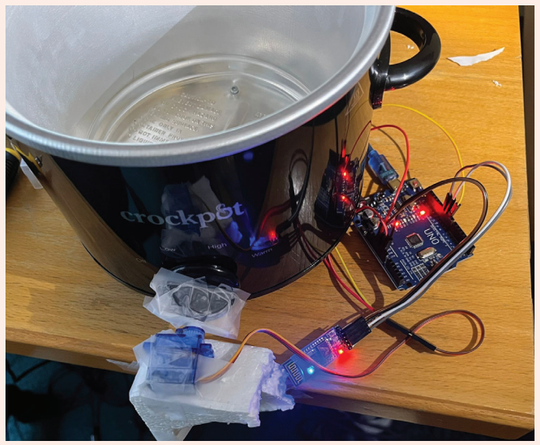
Cooker Prototype

Design & Development of a Works-like Prototype

To Switch On and Off

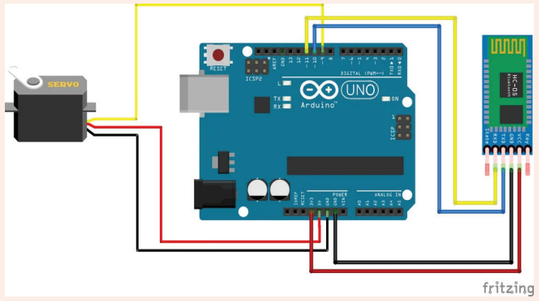
Arduino UNO has a built-in time feature using which we can control the switching on and off of a circuit. An LED bulb was used for this demonstration.


```ino
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

void loop() {
  digitalWrite(LED_BUILTIN, HIGH);  // turn the LED on (HIGH is the voltage level)
  delay(120000);                    // wait for 2 minutes
  digitalWrite(LED_BUILTIN, LOW);   // turn the LED off by making the voltage LOW
  delay(1000);                      // wait for a second
}
```



To Change Power Mode

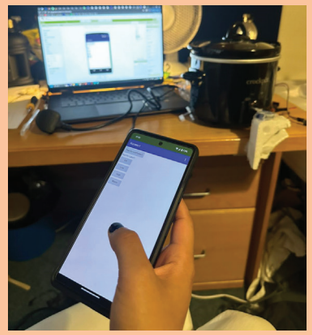
A **Bluetooth Module (HC-05)** and a **Servo Motor** were used to create a circuit which would turn the knob on the cooker to the required setting based on bluetooth signals received from the connected phone. Using **MIT App Inventor,** we created a simple app which sends messages to the HC-05 from a mobile phone.

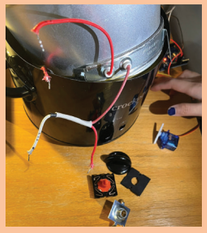



```ino
void setup() {
  // put your setup code here, to run once:
  myservo.attach(9);
  Serial.begin(9600);

  bluetooth.begin(9600);
}

void loop() {
  // put your main code here, to run repeatedly:

  if(bluetooth.available()>0) // When signal detected from bluetooth
  {
    int servopos = bluetooth.read();
    Serial.println(servopos);
    myservo.write(servopos); //Servomotor moves the angle described by bluetooth message
  }
}
```

User Feedback

Question from User: Why is the circuitry on the outside?
Ans: The circuitry is on the outside for the purpose of this prototype. We opened the cooker in an attempt to fit the motor on the inside, but due to space constraints we were forced to put it on the outside.
Question from User: Will it work in long distance range?
Ans: The prototype uses Bluetooth however, the final product will use WiFi allowing it to be controlled from anywhere whilst connected to the internet.

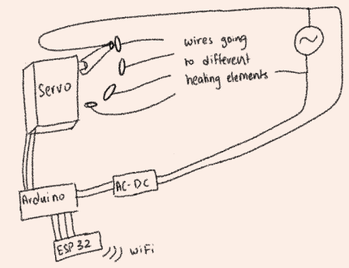




"I don't know what I was expecting, but I was so fascinated it works so well. It's definitely something I would want to use"
"It's very quick and very easy to use"

Final Mechanism Flow

From these prototypes, it can be seen that Arduino can be used to create a remote controller chip for the cooker. The Bluetooth Module will be replaced by a **WiFi Module** so the user can control the cooker, even from a distance.



Basic diagram showing how the circuit will work when motor is connected internally.

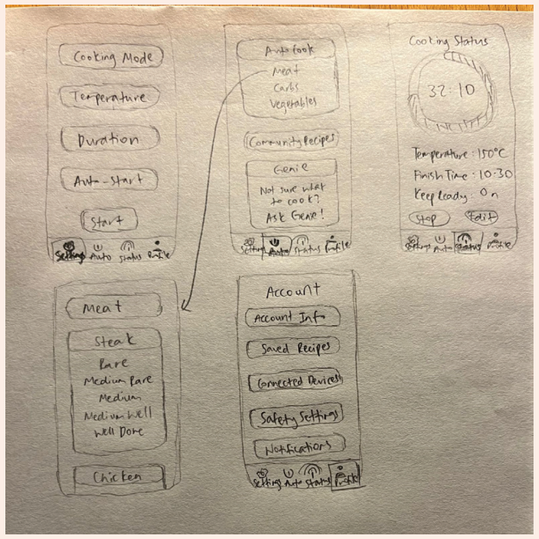
App
Input: Time, Temperature, & Cooking Mode.

→ Sent over WiFi using the WiFi Module (ESP32) →

Cooker
Output: Servo Motor rotates knob to cooking mode and temperature. Rotates back after given time.

App Prototype

Design & Development of a Figma Prototype

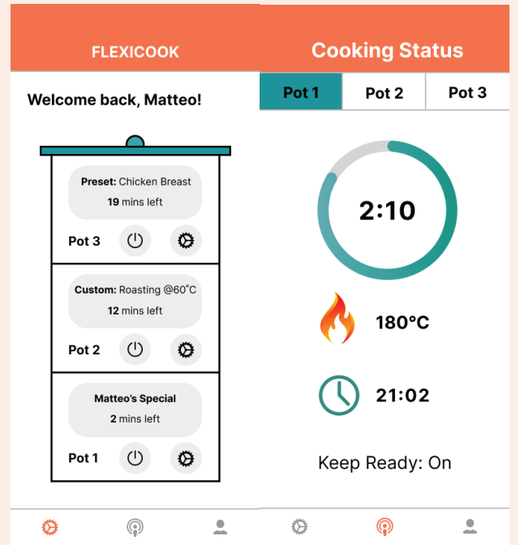


Key Developments:

- Added more options for cooking features
- Improved UX by putting back buttons on every page and help options
- Colours

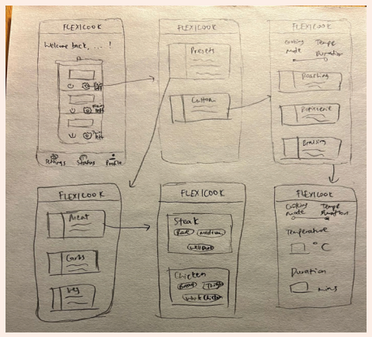
Key Developments:

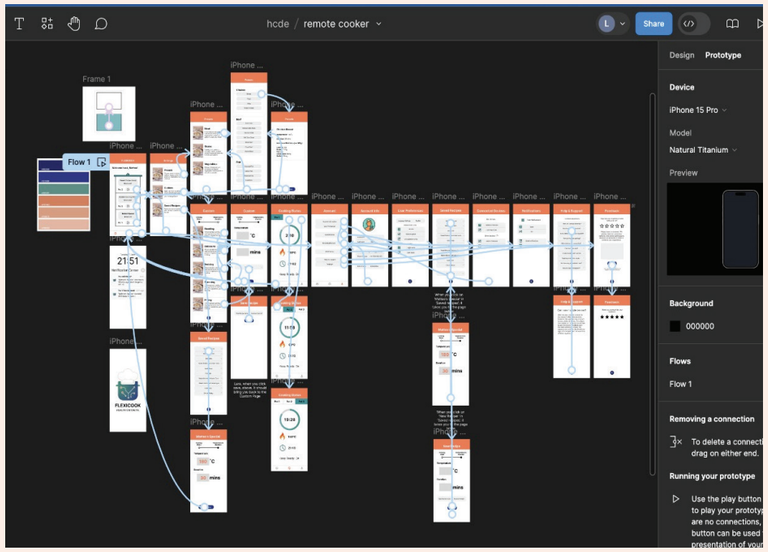
- Cooker image on main page for better visual clarity
- Better UI by reducing number of buttons on each page
- Different timers for different pots



Prototyping of App

Created the App prototype using Figma. Developed the features into flow charts and then into app pages following user feedback shown on the right.



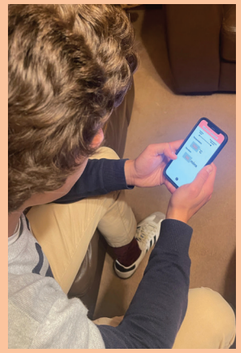


User Feedback

Abrupt Screen Flows:
Some buttons lead back to the home page without any indication of what happened.
This was improved by adding confirmation pages after clicking the button and then returning to the home page. Users were much more satisfied with the updated version.

Cooking Status Page Tabs:
Instead of having different pages with arrows to navigate, users preferred a page with different tabs for the different pots.

Floating buttons:
In some places it was unclear what images were buttons and which were not. This was improved on by using UI principles and adding a 'house' and shadow to the buttons.



Validation

Validating product features

User Concern	Product Aim	Validation	Sources
“I really hate having to cook after a tiring gym session”	The product must **encourage students to cook** a meal despite busy and tiring schedules.	“If this was on the market I would definitely buy it - I won’t be so lazy to cook anymore”	*19 year old Student from Queen Mary University*
“I don’t want to keep inputting custom settings every time I make my regular dish without	The app should be able to **save recipes** that users input.	“The saved recipes function would really save a lot of time and personally would be very useful for me”	*21 year old Student from Imperial College*
“Wouldn’t a multiple pot cooker take up a lot of table space though”	The product **should not** take up a significantly larger amount of space compared to a normal cooker.	“I love that we’re able to stack the pots up vertically!”	*20 year old Student from Imperial College*
“What if I forget that my food is in the cooker?”	The app should **remind users** about their food in case they forget.	“I think the notifications are great, they’re also kind of funny which I like”	*18 year old tennis player from UCL*
“I find it really hard to have the motivation and energy to cook after a long day of work, I can’t be asked”	The product should make cooking **convenient** and **easy** for the user.	“As a student on a placement from 9-5 I would loveeee if I could just hit that button and by the time I got home my food would be ready”	*19 year old football player from Imperial College*

Final Design

Key features of the final product

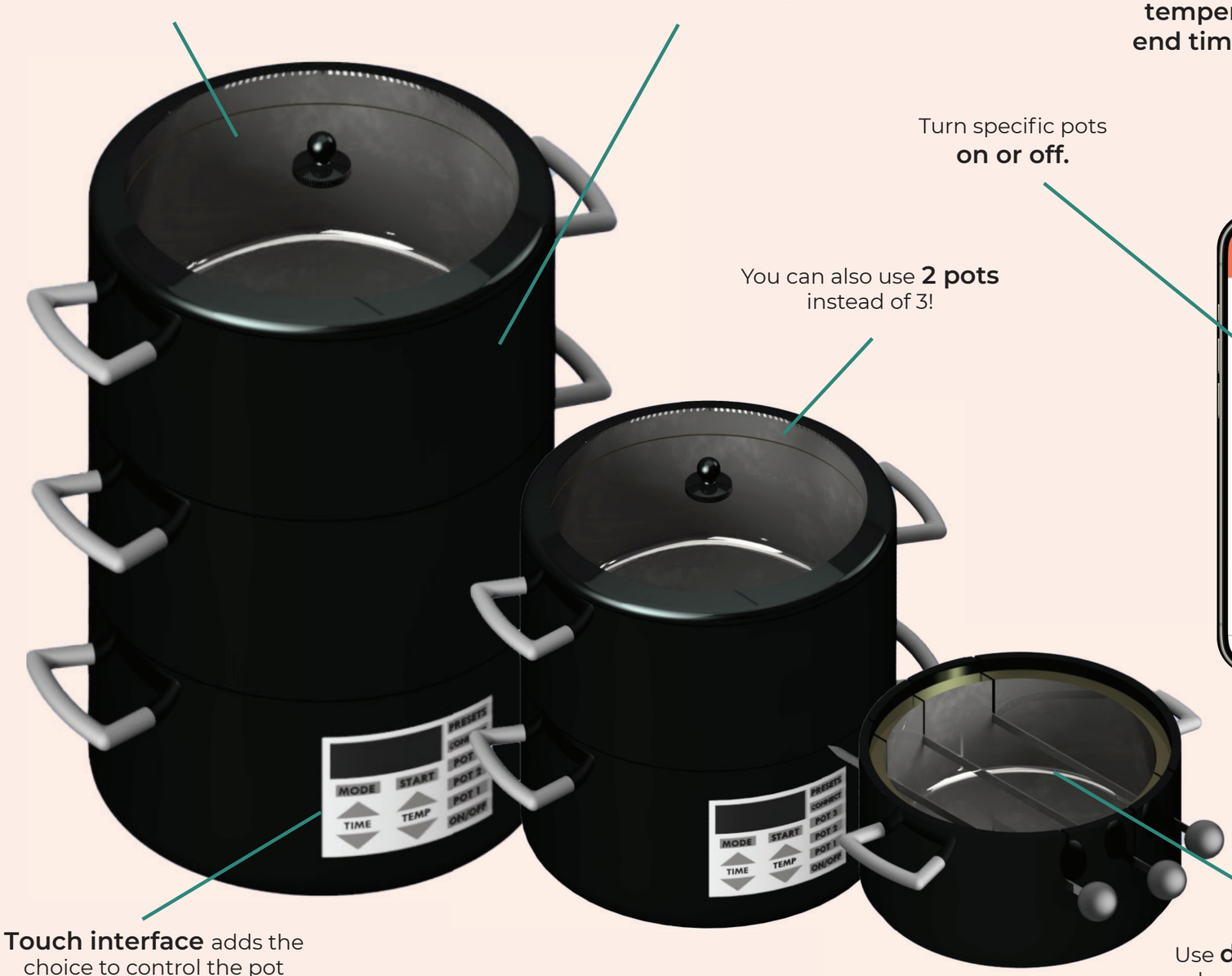
Transparent lid to check on the food in your top pot.

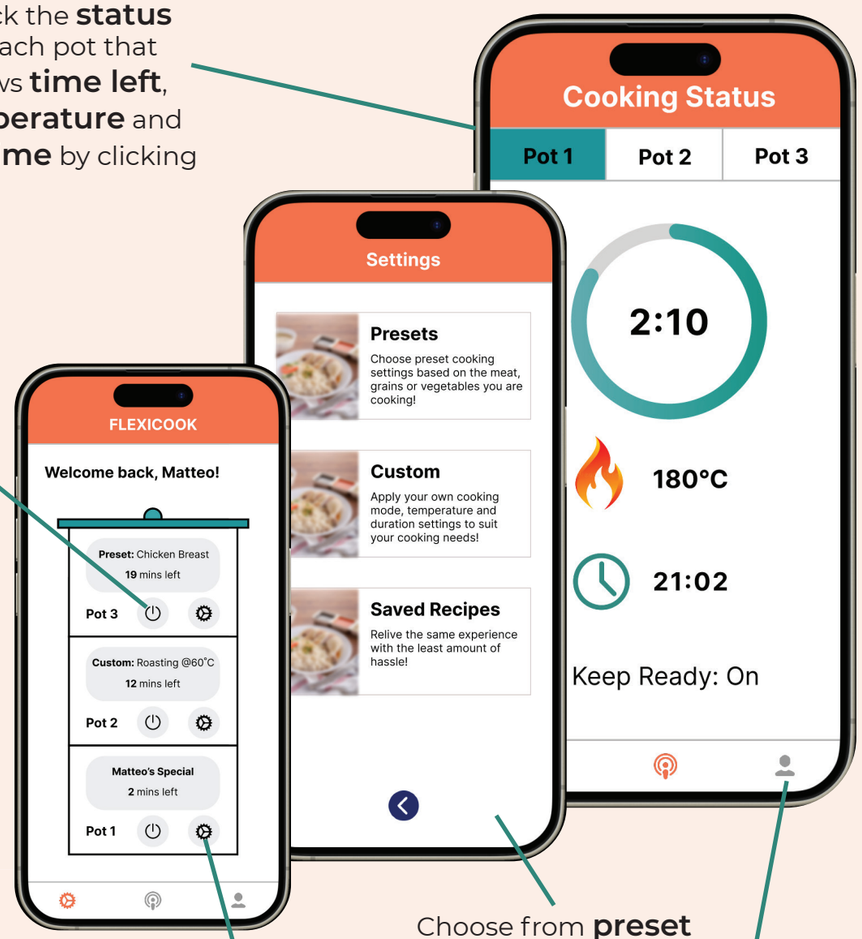
3 pots to cook different foods simultaneously.

Check the **status** of each pot that shows **time left**, **temperature** and **end time** by clicking

Turn specific pots **on or off.**

You can also use **2 pots** instead of 3!





Touch interface adds the choice to control the pot outside of the app.

Use **detachable items** such as skewers to suit your cooking needs.

Change the **settings** of each pot.

Choose from **preset** settings, **custom** or **saved recipes**!

Click on the account button to see **account information**, **notification settings**, help and more!

Appendix

Supplementary Information

References

1. Isometric Psd iPhone 12 Mockup Set | Pixeden Club. https://www.pixeden.com/psd-mock-up-templates/isometric-psd-iphone-12-mockup-set [Accessed 10th June 2024].
2. Free PSD | Smartphone mock-up isolated. https://www.freepik.com/free-psd/smartphone-mock-up-isolated_4075382.htm#query=mockup%20iphone&position=46&from_view=keyword&track=ais_user&uuid=4f37fe05-7bb3-4341-8671-3a7278cb3346 [Accessed 10th June 2024].
3. 240 modern thin line icons. High quality pictograms. Linear icons set of Real Estate, Recruitment, sachet, etc symbol template for graphic and web design collection logo vector illustration Stock Vector. Adobe Stock. https://stock.adobe.com/uk/images/240-modern-thin-line-icons-high-quality-pictograms-linear-icons-set-of-real-estate-recruitment-sachet-etc-symbol-template-for-graphic-and-web-design-collection-logo-vector-illustration/428551919 [Accessed 6th June 2024].
4. Can you outrun a poor diet. The University of Sydney. https://www.sydney.edu. au/news-opinion/news/2022/07/12/can-you-outrun-a-poor-diet.html [Accessed 18th February 2024].
5. Campbell D, editor DCH policy. People too tired to lead healthier lifestyles, UK survey finds. The Guardian. 2023. https://www.theguardian.com/society/2023/ may/17/people-too-tired-to-lead-healthier-lifestyles-uk-survey-finds [Accessed 18th February 2024].
6. Young man running with speed vector image on VectorStock. VectorStock. https://www.vectorstock.com/royalty-free-vector/young-man-running-with-speed-vector-46927376 [Accessed 6th June 2024].
7. Free PSD | New smartphones mockup facing up. https://www.freepik.com/free-psd/new-smartphones-mockup-facing-up_10313329.htm#fromView=search&page=1&position=46&uuid=adf2e09e-e8e1-4faa-af8a-053bc4b5c229 [Accessed 10th June 2024].
8. MertArduinoMaker 101. Arduino : How to Control Servo Motor Via Bluetooth (with Smartphone). Instructables. https://www.instructables.com/Arduino-How-to-Control-Servo-Motor-Via-Bluetooth-w/

Links

Meeting Minutes
(Google Docs) https://docs.google.com/document/d/1Cw7PlqosUQuIckvW6pN5LpA-4JK2zmH4JJAZsnp2cZs/edit?usp=sharing

Gantt Chart & Other Resources
(Google Sheets) https://docs.google.com/spreadsheets/d/1pOSuEq0E-eVDF68XffwhBIYGGfFz6sfSUYVI6zLahsk/edit?usp=sharing

App Initial Prototype
(Figma) https://www.figma.com/design/xnlPAHGLWVDrvqQ8mBJTfO/Remote-Cooker-Initial-Design?node-id=1-3733&t=xyLOapAoC7eraV2h-0

App Final Prototype
(Figma) https://www.figma.com/design/URu7s7h3U8FduxEomXKZdU/FlexiCook-Prototype-(ver-2)?node-id=0-1&t=EggCLbzY7tbwy17J-1

Colour Scheme

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Extra Content