

Human-Centred Design Engineering Delivery Report Term 3



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Summary of context

1.

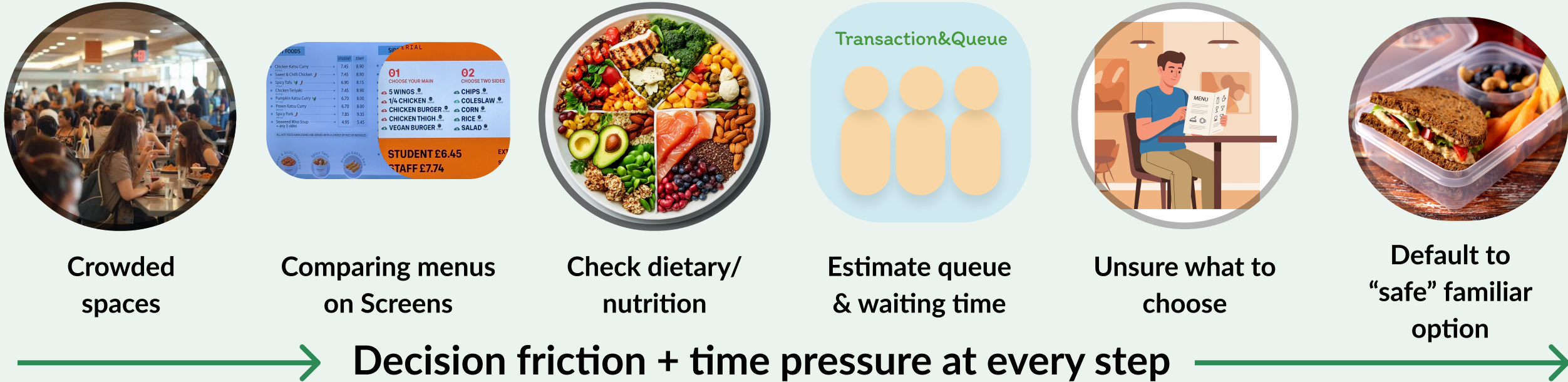
How might we reduce the **cognitive and time burden** of on-campus dining for busy students and staff, enabling a **more predictive, informed, and personalised meal experience**?

1 What problem are we solving?

Students and staff face **unnecessary cognitive load** and **time pressure** when deciding what to eat on campus. Information about menus, nutrition, dietary suitability, queues, and availability is **fragmented** across physical spaces, making it hard to navigate, compare, and choose with confidence - especially during busy periods. (1)

- This results in:**
- ⌚ Rushed and stressed decision-making
 - 💬 Low confidence in meal suitability
 - ⚖️ Repeated choice fatigue
 - 📖 Inefficient movement between food spaces
 - 😞 Reduced satisfaction with the overall meal experience

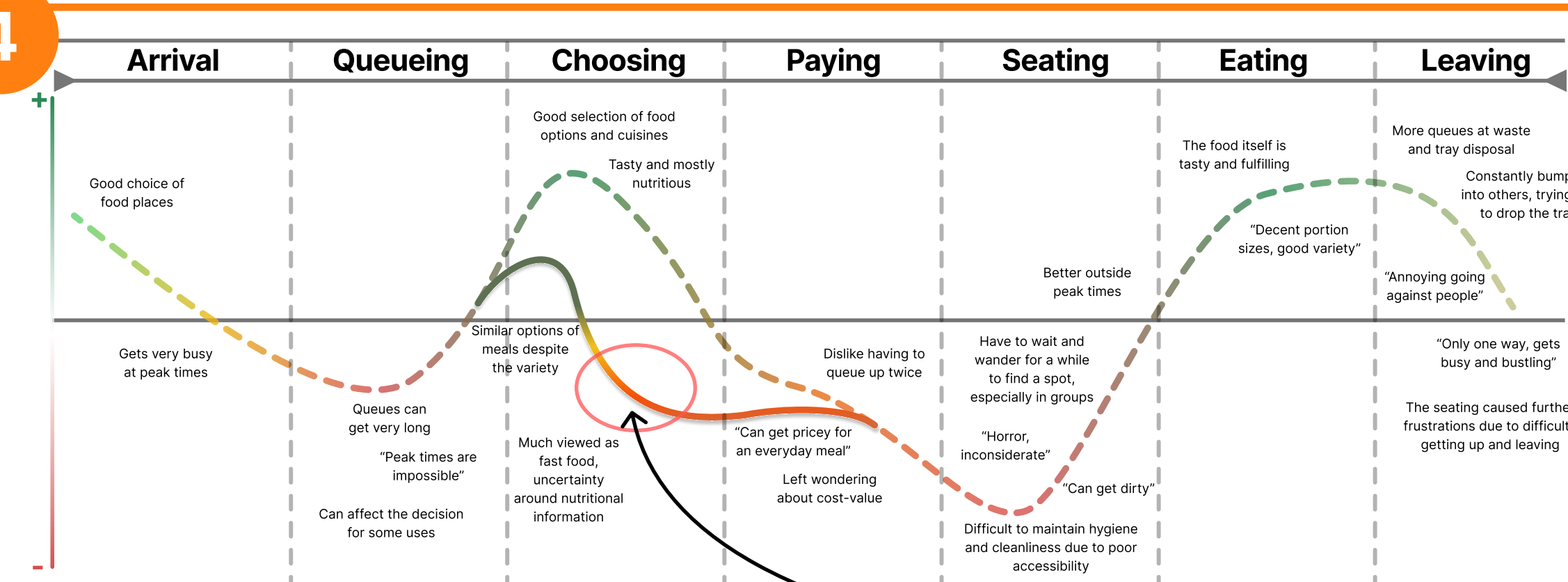
2 The problem in context



KEY INSIGHT: Through user research, it was revealed that the barrier to eating well on campus is not food availability, but rather the **lack of accessible information**. Users struggle with **decision uncertainty** because they cannot quickly access menus and details about nutritional content, ingredients, allergens, or dietary alignment before purchasing. This creates **decision friction**, hidden constraints for those with **specific dietary needs**, and anxiety about whether their choices actually match their **nutritional goals**.

3 Potential User Groups

- Students (busy schedules)** Final user group
- Face unnecessary cognitive load and time pressure while choosing suitable meals at the various food outlets scattered across campus.
 - Need quick and reliable ways to compare options
 - "I'm very indecisive" [p1]
- Professors (nutritional needs)**
- Have specific dietary needs which are often unmet due to lack of accessible nutritional information.
 - Often default to familiar options because checking alternatives takes too much effort.
 - "I tend to have one thing I eat and stick to that" [p2]
- Staff workers (serving exhaustion)**
- Feel stressed during peak hours due to high workload intensity.
 - Need a more efficient system to communicate and complete orders
 - "Our day is entirely decided by the number of students that we have to serve" [p3]



Revising the Journey Map

The **journey map** shows how users **experience and feel** through the **stages of their meal experience** - dashed line represents what we developed last term from our **Co-Ideation Workshops**.

This journey map has been **revised**, as the satisfaction level it reached at **"Choosing"** **did not match the insights and comments** we received from students and professors about their everyday meal experience. We realised that the discrepancy was because in our workshops, the users assessed the variety of food outlets around campus, which was positive due to the broad choice, rather than the information and customer experience issues that followed: there was a **lack of coordination** and **information** for **new customers** to learn about the **food and nutritional information** on campus which caused **decision fatigue and uncertainty**, often even forcing users to **avoid** eating on campus. The **new line** illustrates the consequent issue that we addressed.

5 Final Aim of Design

Our research from Term 2 showed that the main barrier to eating well on campus is the difficulty of accessing clear, relevant information quickly, as explained in box 2.

Thus, our design should:

- make food information easy to access, understand, and compare
- help users filter meals by dietary needs, allergens, nutrition, and price
- reduce uncertainty and time pressure during meal choice
- support faster and more confident decision-making
- fit naturally within canteen spaces and everyday campus routines

Why we narrowed our focus

While the issue was relevant across students, staff, and professors, we chose to focus on busy and newer students as our primary user group. They were most consistently affected by time pressure, unfamiliarity with campus food spaces, and difficulty identifying suitable meals quickly. Designing for this group allowed us to respond directly to the most urgent and recurring needs identified through research.

Insights to Ideas

Developing ideas and prototypes from our concrete HMW...

2.

1 To **better understand users' needs**, we conducted **further interviews** with students and staff members across Imperial College London. The conversations revealed recurring pain points in the on-campus meal journey, such as difficulty navigating food options, limited personalisation, and decision fatigue. From these insights, we identified **clear user needs** and translated them into **design opportunities** that shaped our concepts.

Final HMW:

How might we reduce the **cognitive and time burden** of on-campus dining for **busy and new students**, enabling a more **predictive, informed, and personalised** meal experience?

8 user interviews

38% felt dissatisfied

63% had experienced decision friction

50% wanted higher level of personalisation in canteen spaces

100% felt it was difficult to navigate for food as freshers

25% felt disadvantaged in finding food due to their dietary restrictions

Issue	 Poor customer experience	 Navigation issues	 Decision friction	 Lacking personalisation
Insight	Users found the current food purchasing journey “ unnecessarily long, slow, and fragmented ”, often involving excessive queues, unclear information, and repeated steps, such as having to inconveniently tap multiple cards while holding food and personal belongings. [p4]	Visitors and newer students found it “ difficult ” to locate suitable food outlets and understand what each place offered due to the “ lack of visual illustration ” of meals and “ dispersed outlet locations ”. [p5]	Despite the extensive choice of food places, users often lacked “ explicit information ” to decide confidently, especially when considering allergens, nutrition, or dietary restrictions . This causes confusion and indecisiveness. [p7]	Users found that the current meal experience does not account for their “ individuality ” and “ personal preferences ”. The canteen service felt “ too generic ” and unable to effectively cater to a personal dietary needs, preferences, and health goals . [p8]
Need	Users across all user groups wanted a “ simpler, more intuitive ” process for choosing and purchasing food, with as “ few steps ” as possible. [p4]	Users, especially freshers and visitors, needed clearer “guidance” [p6] to food locations and a quicker way to identify suitable options . More intuitive navigation options such as “ arrows or signs ” would substantially reduce confusion when finding outlets. [p5]	Users wanted an “ easier way ” to access information and “ filter options ”, so they can make confident food decisions without having to manually compare everything. [p7]	Users groups wanted a more “ personalised meal experience ”, which was specific to each individuals requirements and priorities . If the canteen did become further “ goal-oriented ”, it would “ attract more people ” as the canteen meal experience integrates their own needs more effectively. [p9]

Concept Ideation:

TasteWay Lights

How might we develop an **intuitive and easy to follow path system** to help users navigate based on their **dietary preferences**?

Purpose:

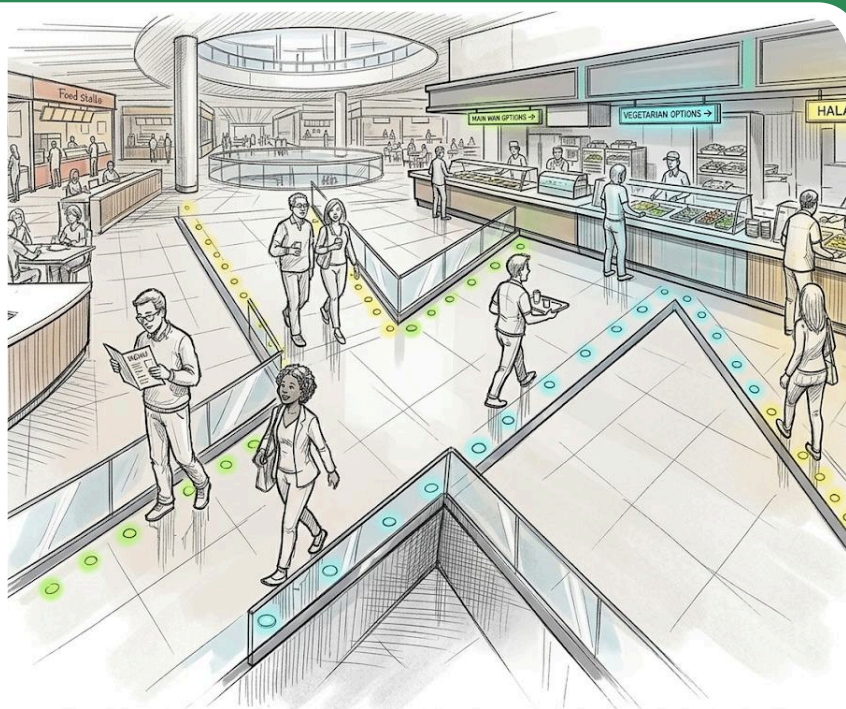
A system of **embedded LEDs** in the ground whose colour corresponds to a **dietary preference** (gluten-free, vegetarian etc.) based on a **key**.

Functionality:

It addresses **navigation issues** faced by users, and **poor customer experience** by allowing for users to follow a path leading to meals suited for their needs and makes it easier to locate where different outlets are located, since users only need to **traverse** along the path to reach the destination, rather than having to **know where the location** is explicitly.

Issues that it solves:

TasteWay Lights solves poor user experience and navigation issues.



User Feedback:

TasteWay Lights provides **greater clarity** on the locations of different outlets in a **simple, user-friendly manner**, therefore if ideated “**improves travel**” for canteen food purchase and reduces “**decision fatigue** from outlet selection” since all foods that follow a certain dietary requirement are located in the same area. This means “**less time [is] wasted**” trying to find out if a certain outlet has gluten-free food options or not before entering a queue. [p10]

Imperial Eats App

How might we provide a **more transparent and personalised meal experience** for those with strict dietary requirements, so they can safely enjoy on-campus dining with peace of mind, addressing the health effect concerns?

Purpose:

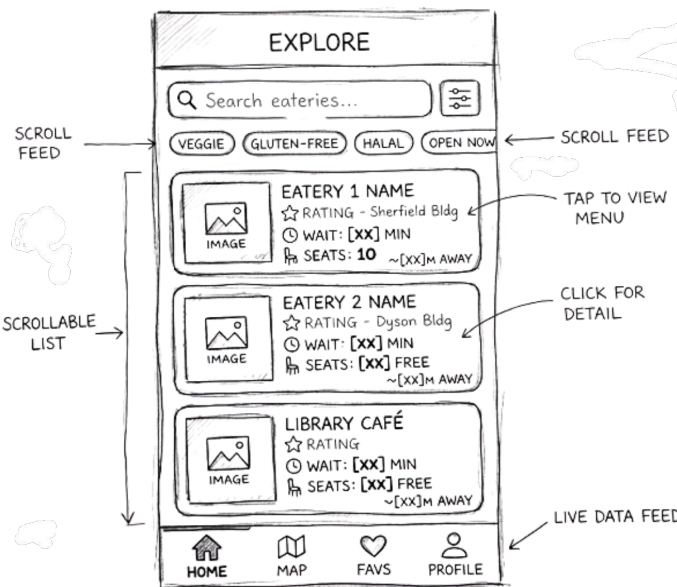
A mobile app that allows users to digitally explore menus, compare outlets, and filter meals by dietary requirements, availability, and other useful information. Without having to physically navigate to outlets.

Functionality:

It addresses **decision fatigue** by making food information **easier to access** and compare before travelling to a food location.

Issues that it solves:

Lack of **transparency, slow decision making**, and difficulty in finding suitable meals.



User Feedback:

The Imperial Eats App has the “**potential to transform**” the canteen purchase system, through its “**compare tool identifying most suitable food options**”. User interviews indicated the popularity of the app over the TasteWay lights, as a result of the **food comparison functionality** but also because the **feasibility** of integrating an app is much easier. The app also could include “**pre-purchase**” options, that **improves efficiency** by allowing for users to order then travel to the food outlet and just needing to **collect** their already made meal. [p11]

Personalisable menu board

How might we **optimise** the daily food-selection workflow for busy students to **minimise search and transit time** across campus?

Purpose:

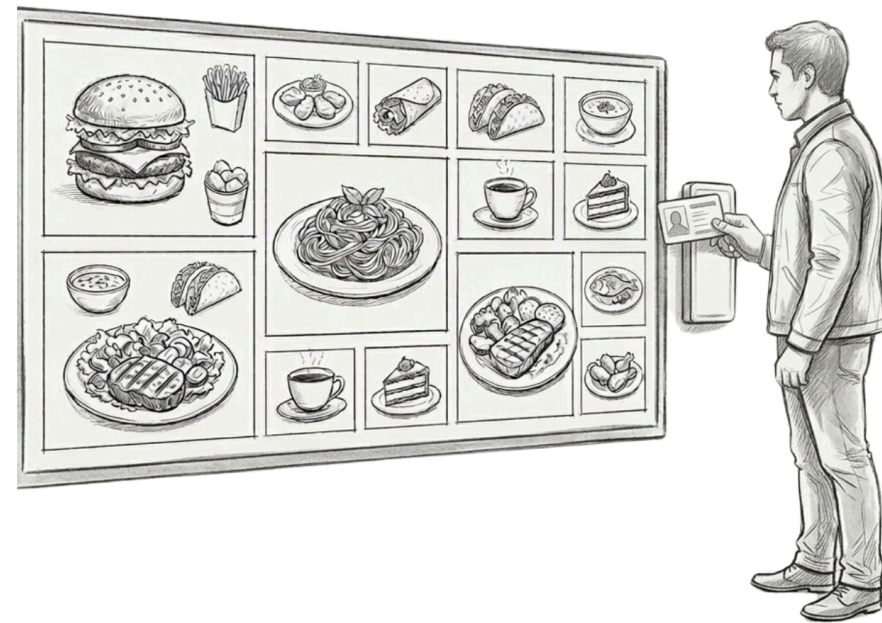
An interactive menu board that adapts visually to the **user's preferences**, making relevant meals more prominent and less suitable meals less visible.

Functionality:

It responds to the need for **personalisation** and **reduces cognitive overload** in busy food environments.

Issue that it solves:

Decision fatigue and **lack of personalisation** at the point of purchase.



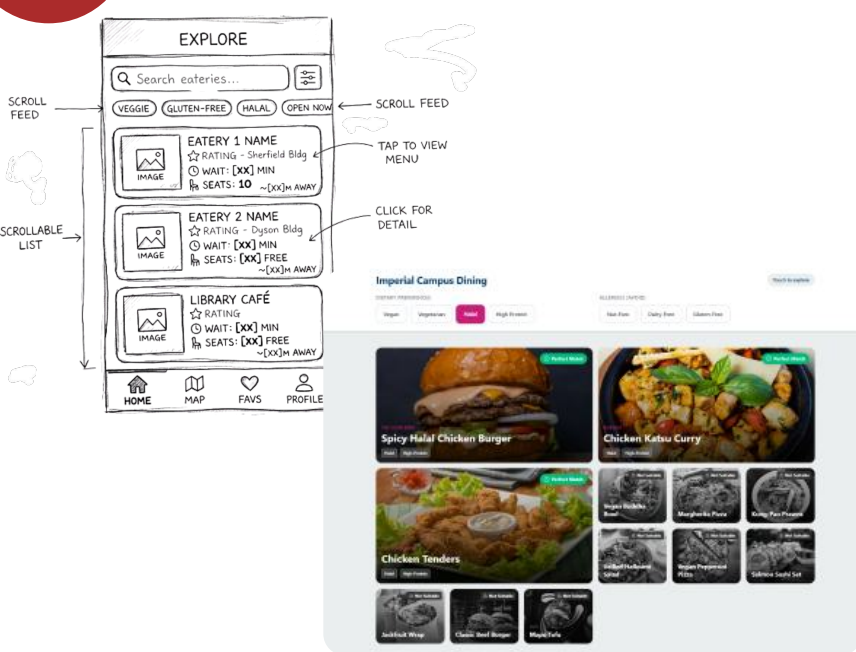
User Feedback:

The Menu board relies on “**visual**” **food options** to help users identify which meals they are best suited for. This can help aid the **lack of personalisation** that the canteen suffers from by having “**unique**” food option displays for each user. In addition, it utilises ID card reading to store user data (as shown in the image above) but can suffer from **privacy issues**, since it is a public display so can potentially reveal user data that they would prefer to “**not be shown**”. [p9]

Concept selection

3.

1 Imperial Eats App



Purpose:
A mobile app designed to help users find suitable food options on campus. It provides key information such as menus, dietary filters, ratings, estimated waiting times, seating availability, and a map of food outlets.

- | Strengths | Limitations |
|--|---|
| <ul style="list-style-type: none">• High level of personalisation• Easy to update and scale digitally• Supports informed decision-making | <ul style="list-style-type: none">• Requires active searching by the user• Relies on accurate live data• Less support for the physical in-person experience• Does not directly improve physical navigation around campus |

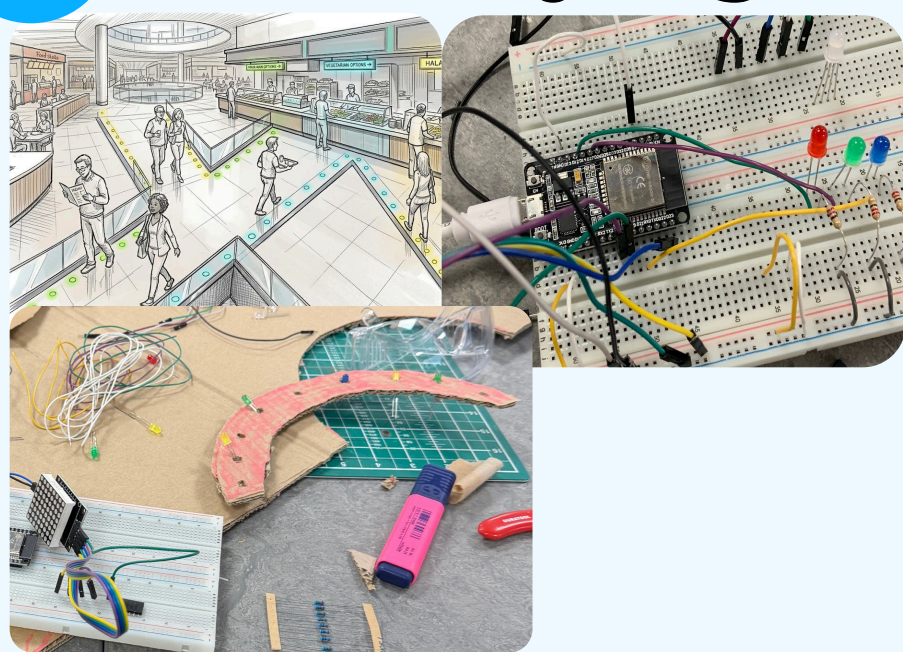
2 Re-organisable Menu Board



Purpose:
An interactive menu board that changes according to the user's preferences. Relevant meals become more prominent, helping users make faster and easier choices at the point of purchase.

- | Strengths | Limitations |
|---|--|
| <ul style="list-style-type: none">• Highly visual and intuitive• Speeds up meal selection• Reduces cognitive overload | <ul style="list-style-type: none">• Limited to physical locations• Requires additional hardware and installation• Less useful before arriving at the outlet• Potentially costly to deploy across multiple sites |

3 TasteWay Lights



Purpose:
A colour-coded guidance system that directs users to food outlets matching broad dietary preferences through illuminated pathways or signals.

- | Strengths | Limitations |
|---|--|
| <ul style="list-style-type: none">• Clear and immediate navigation support• Useful for unfamiliar users• Innovative and engaging physical interaction | <ul style="list-style-type: none">• Limited personalisation• Supports navigation only• Does not help compare meals, prices, or nutrition• Not very feasible realistically• Less effective as a complete solution |

4 Synthesising concepts - MealMap

Decision and justification

After a team review of our initial concepts and sharing ideas with our peers, we understood that concepts 1 and 2 are very similar in practice and work to achieve the same goal. This led us to combine these two concept into the MealMap product. This concept provides a website-application for users to be able to filter the food available on campus to their preferences and dietary requirements. MealMap can be accessed at the kiosks located around Imperial campus, allowing students to choose and pre-purchase their meal online, so they are assigned the dish on their account, in a “token” based system. This could be especially useful for new “freshers” students and visitors.

Purpose

The Mealmap is a **food navigation and ordering system**. It helps users narrows down meal options based on **dietary needs, allergies, nutrition goals, price, and selected food outlets**. It acts as a **multi-purpose personalised platform** with an incorporated **pre-purchasing** system, making the process of finding and buying food more efficient, transparent, and user-centred.

5 Our final concept: MealMap

Each concept was reviewed against key criteria derived from user research: personalisation, usability, feasibility, scalability, and coverage of the full food decision journey.

Combination of Imperial Eats App and Re-organisable Menu Board

The Imperial Eats App and Re-organisable Menu Board were combined into **MealMap** as they complemented each other. Together, they created a more seamless journey from discovery to decision to purchase.

- **Most complete solution:** MealMap supports users across the full journey: finding food, comparing choices, filtering options, and ordering efficiently.
- **Higher personalisation:** It goes beyond broad categories by considering individual dietary needs, allergies, nutrition goals, and budget.
- **Better feasibility:** A mainly digital system is easier to scale and maintain than installing physical hardware across multiple campus sites.
- **Stronger usability:** It reduces decision fatigue by narrowing options early and streamlining the final purchasing process.
- **Greater value than TasteWay Lights:** While TasteWay Lights helps with navigation, MealMap provides a broader and more practical solution by combining navigation, meal filtering, and ordering in one platform.

This combination retained the strongest features of both concepts while creating a more useful and practical final system.

Development: UI/UX of Web Application

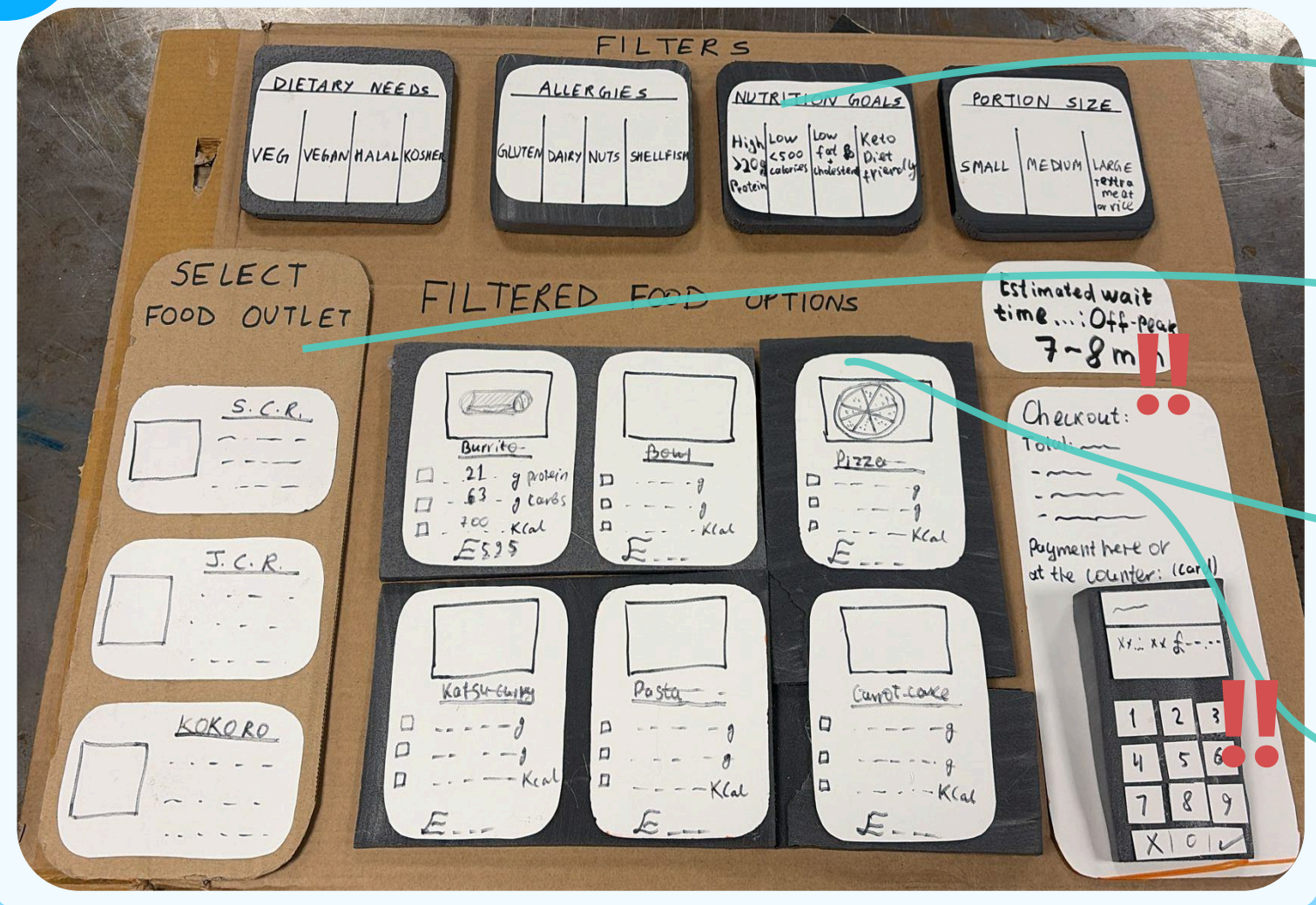
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Prototyping Question

How can a food discovery platform help students make faster and more informed meal decisions?

Methodology of User Testing: We conducted several design feedback and scenario testing for each version throughout development of the platform consisting of the same **8 participants** each time. They were tasked with observing each feature of the platform while **thinking out loud**, **sharing their thoughts** and **what could be improved**. The users tested the prototypes at 3 different roleplaying scenarios (more on Final Design slide)

1 Prototype Sketch



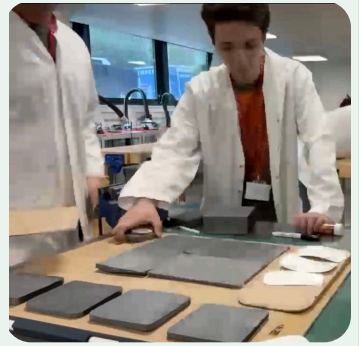
Intended Prototype Features

Filter Selection: Users apply filters such as dietary needs, allergens, etc. in order to suit their preferences.

Outlet Selection: Users can narrow their search by selecting **one or more food outlets** in order to get results catered to their exact needs.

Filtered Food Options: The results of the search after selecting the filters and outlets are shown instead of the entire menu in order to **minimize choice fatigue**.

Checkout: Users can view and pay for their selected food items with **multiple payment methods** (apple pay, card or college ID to pay later) in order to suit the user's convenience.



!! Rejected Features

Queue Times: There is no straightforward method of accurately determining the queue times for each outlet and would become another project in its entirety.

Built in Card Reader: It was decided that the card reader would not be taking up screen space, but would be an extension of the menuboard.

2 Core Design Decisions for Creating the First Prototype

Color System

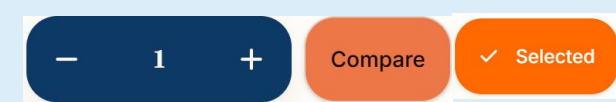
- Warm cream background – neutral, modern color, easy on the eye.
- Navy blue used for navigation and orange for primary actions – sharp contrast guiding user attention.
- Unique outlet colours (amber, green, red, etc.) – help distinguish food outlets at a glance.
- Red and green for status messages - red indicating an alert, green indicating success.

Component Design and Font

- Rounded shapes making the interface feel less intimidating and easier to navigate.
- Large headings and clear font-weightings to help users quickly distinguish between outlets, meals, prices, and nutritional information.
- Consistent UI patterns to make the experience intuitive.
- Generous spacing between elements to prevent visual overcrowding and improve readability.

Subtle Animations and Visual Feedback

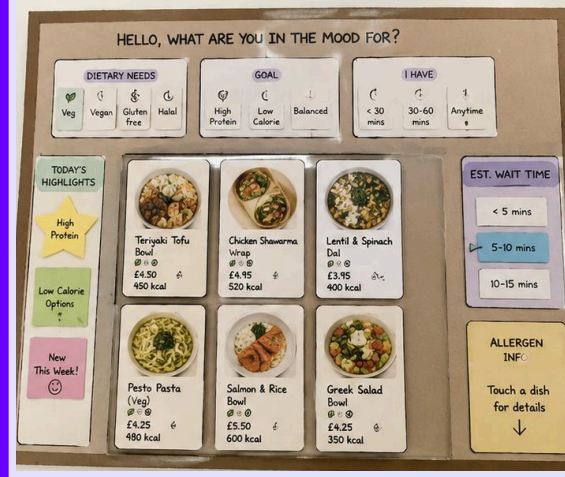
- Side-bar style checkout panel which smoothly opens and closes to retain the one-screen layout.
- Smooth transitions and responsive button states to provide immediate confirmation of user actions.
- Animations when hovering over buttons to create a reassuring interaction flow.



V1 Goals of prototype + methodology

The goal of the prototype is to plan out and come up with an **initial prototype** and to check whether AI can be used to make viable and editable platform.

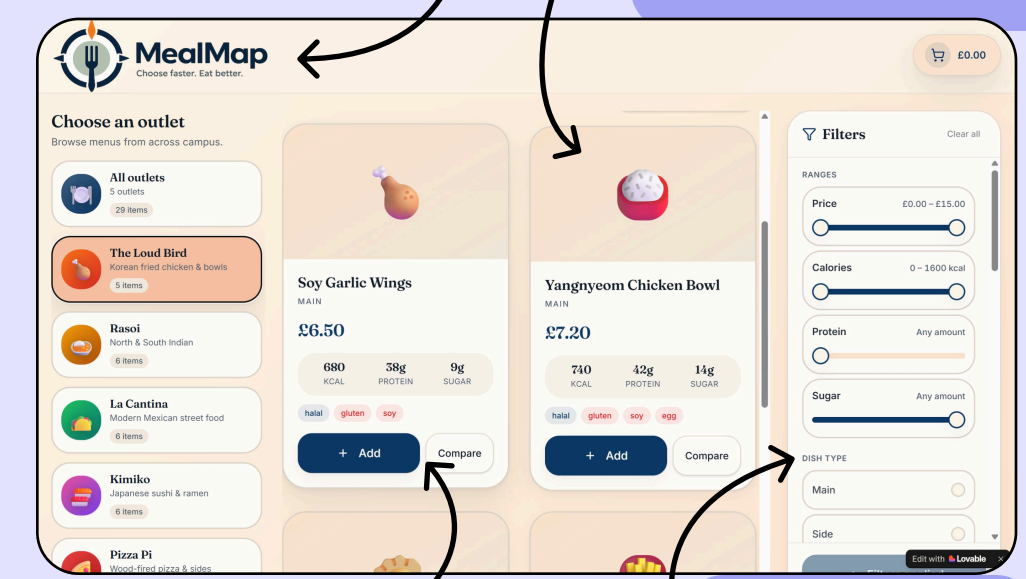
Our workflow remained prompting and discussion in **ChatGPT** to create implementable prompts for **Lovable AI**. We provided ChatGPT the **wireframe** to create the first prototype.



This is an **improved version** of the LO-FI prototype generated with AI in order to visualise the platform before moving to the next stage in prototyping. The images and text allow us to get an **idea of the size** of the elements, potential colour scheme. We liked the **colour contrast** between the background and the elements.

Opens directly into the full **menu dashboard** with **All outlets** selected by default. Can only view one outlet at a time.

Food cards visible immediately with their info. Shows **average calories, protein, carbs, fat, sugar, and price**



Add and Compare buttons visible on each food card.

Food browsing, filtering, comparing, cart, checkout.

User Feedback

Users thought a **Search feature** could be useful and wanted to **filter by more than one food outlet** instead of one outlet at a time. They found the one-screen layout **too cluttered** and instead wanted **multiple screens**. They wanted **collapsible filter sections**, and that they should apply filters before seeing the main food items page.[v1]

V2 Goals of prototype + methodology

This version implements the feedback gathered in the previous user testing session and tests a **restructured user flow** with a new entry point. The new flow follows outlet selection, filtering, and then a transition to the filtered food results, thus applying **progressive disclosure to minimise cognitive load**.

The goal was to validate whether acting on previous feedback produces improved usability outcomes in the next round of testing.

The **outlet cards** are the shown **first** along with their **locations**, in line with user feedback.

The outlet cards slide to the left to create a smooth transition to the filter selection stage.

Filters are now **collapsible** and can be opened with an arrow.

Search bar was added, showing food and dietary needs

Users can also b between 2 food items based on macros and tags.



User Feedback

Users wanted to keep the **search bar** as a **fixed element** instead of moving as it **wasn't very visible**. They wanted the **overall page to be still** and **individual sections scrollable**. They prefer **filters updating live** instead of using the Apply filters button. They found the multiple screens much **more comfortable to look at**. [v2]

Development: UI/UX of Web Application

5.

V3

Goals of prototype + methodology

The goal of the prototype is to introduce **NFC-based authentication** storing user data on a cloud database. User **accounts**, **dietary preferences** and **food orders** are associated with unique **NFC cards** and are stored in this **database (Supabase)**. The aim is to prove that tapping NFCs to login leads to a **smoother, frictionless interaction** with the platform.



The home page prompts users to tap their MealMap card to login or to create a new account.

A new user puts in their details and selects their dietary preferences in order to save them to the database.

The user is prompted to tap their card again to save their preferences for a quick login in the future.

The user can view and edit their saved preferences by tapping their card for greater personalisation.

The user selects the outlet(s) and views the filtered food options to choose from only dishes relevant to the user.

After selecting and paying for the dishes, the user then taps their card to store the dishes to their account.

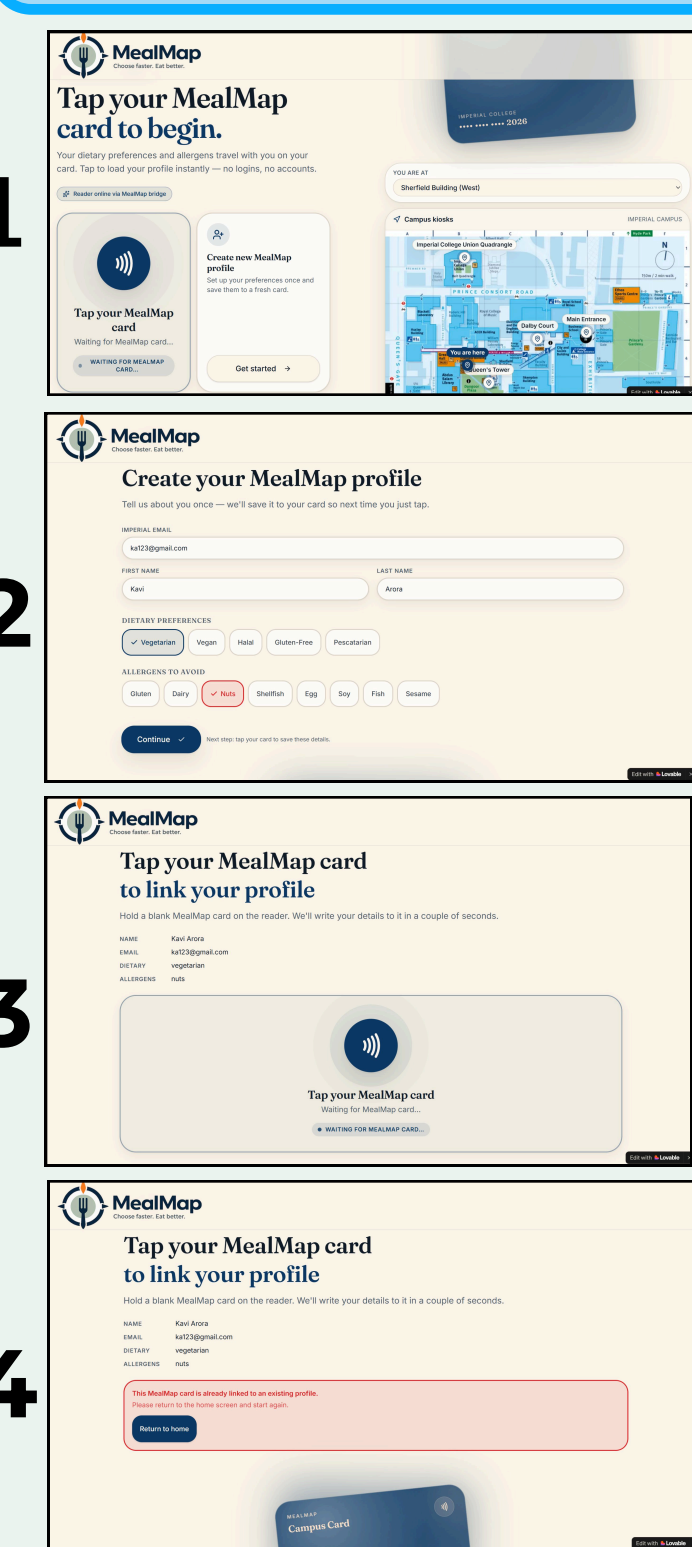
User Feedback

Users found the overall flow to be quite **smooth** and **intuitive**, and found tap to login quite **convenient** to use. However, they were **confused by the tap now icon** and often clicked on it instead of tapping their card. There was also a **bug** where existing **NFC cards** could incorrectly be linked to **more than one account**. Users asked for a **map** which could **direct them to the food outlets** they purchased from.[v3]

V4

Goals of prototype + methodology

The goal of the prototype is to refine the **NFC ecosystem**, fix all of the **bugs** and **confusion points** highlighted by the users, and incorporate a **map feature** to direct users. The aim is to create a **polished, finished prototype** of the platform to be merged with the electronics and the overall kiosk design.



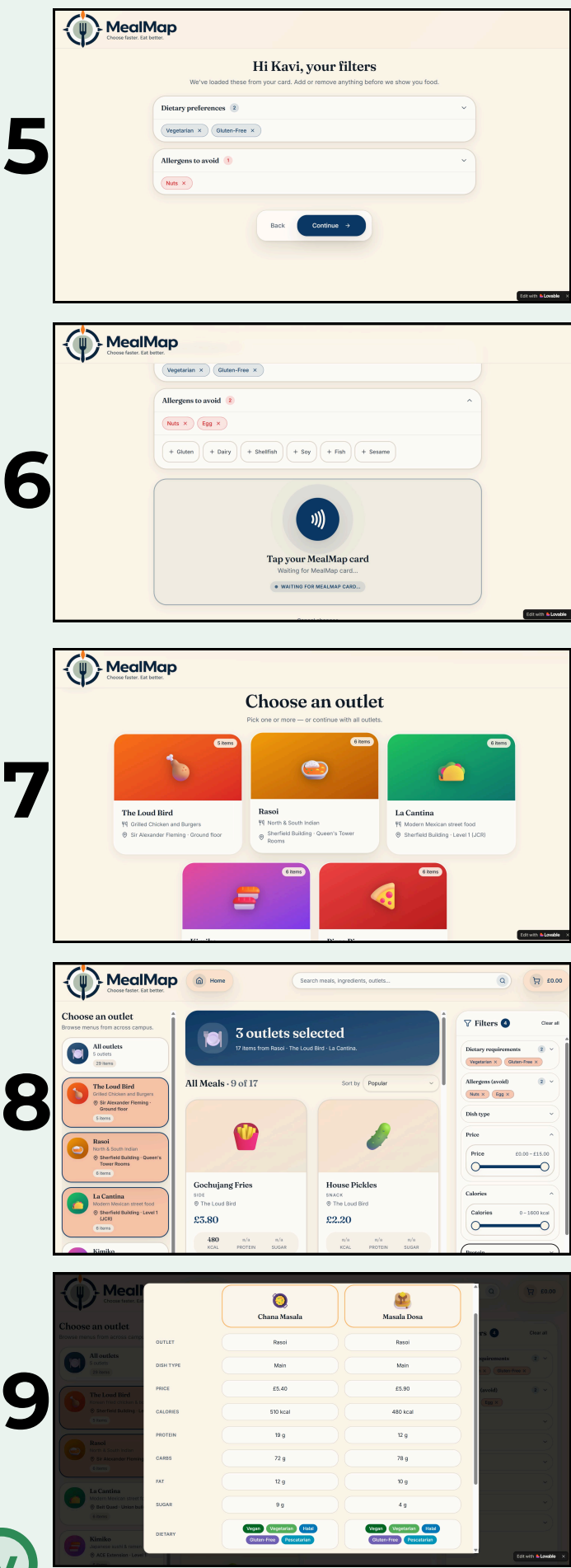
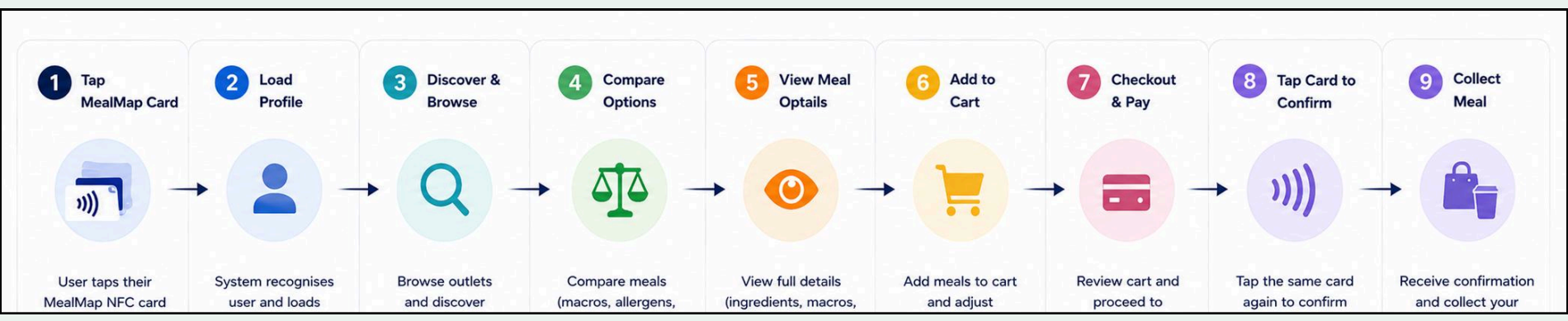
The homepage has a map which indicates the current location of this kiosk on campus. It prompts the users to tap their MealMap card to login or create a new account.

A new user puts in their personal details, along with dietary preferences and allergens in order to save them to the database.

A refined tapping icon prompts the user to tap their card to save their changes. The floating animation around the NFC icon informs the user to tap their card against the reader.

The bug of an existing NFC card being linked with multiple accounts is fixed. It shows an error if the user tries to use an existing card to create a new account.

Journey Map - End to End User Flow



The logged in user can view and edit their saved dietary preferences to provide a greater level of personalisation.

Any changes can be saved by tapping the card in order to provide a familiar method of saving their account.

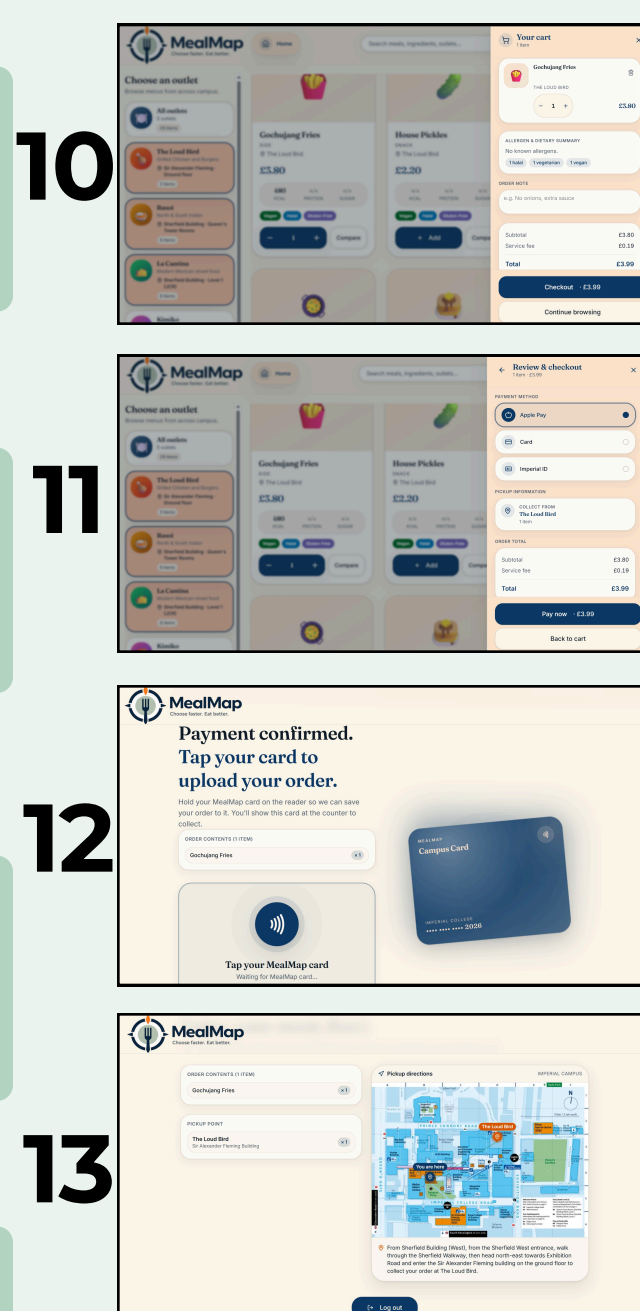
The user then selects one or more outlets to dine from to narrow down the search even more.

The filtered food options are shown instead of the entire menus in order to minimise choice fatigue.

Users can inspect and compare food items on the basis of their macros and nutritional content in order to make an informed decision about their meal.

User Feedback

Users appreciated the reduced number of choices they have to make, and not having to repeatedly input information and preferences. NFC ordering felt intuitive and users did not accidentally click the Tap icon. Users found the UI elements appealing and enjoyed the flow of the entire process. [v4]



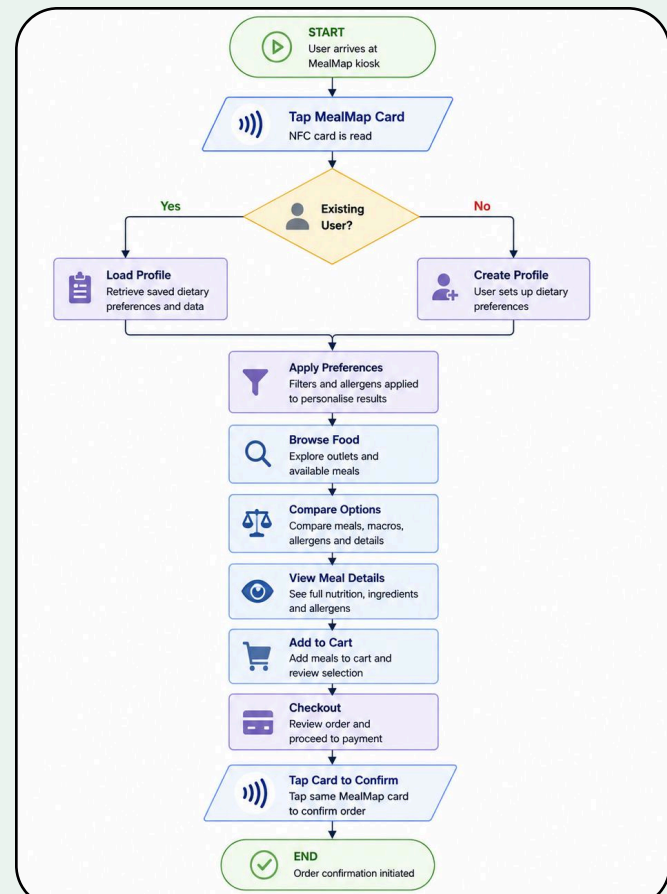
Users can inspect their cart and add any notes for an even more personalised eating experience.

Users can choose between 3 payment methods for greater flexibility and convenience.

After payment is confirmed, the screens prompts to tap the NFC to save the order to the user's account.

The final screen shows a map with directions to the food outlets from the kiosk, along with the ordered items.

Platform Flowchart



Development: Kiosk Design

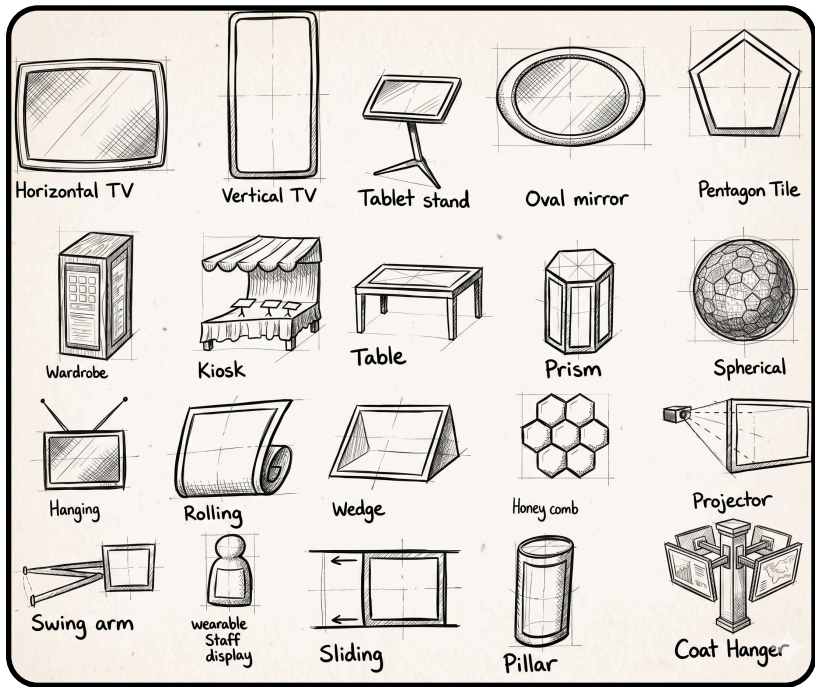
Initial designing

HMW find the best form factor of the MealMap kiosk?

From initial interviews with 14 students at Dyson School, users suggested that having a purely software product, only accessible on one's personal device (phone) is not a very approachable, little meaning in everyday life as it does not stand out or appear to eyes, meaning it is not memorable or impactful in that way.

Why a touchscreen display?

Users said they would prefer a **physical touchscreen display** that can be accessed at different **locations**. A touch screen would also allow for more interactivity with the users as they would be able to physically interact with the product leading to a more human centred design and approach.



Design development

We started ideating various, eye-catching and attractive designs to attract users and “remind” them of the product’s existence. On the side is a collection of 20 sketches conceptualised for the display. They range from standard TV orientation to integrated digital screens in kiosks or tables. With this varied sketches we isolated each idea on a set of factors from ease of usage, feasibility, whether it has a futuristic aesthetic and how welcoming.

User testing

According to user research and asking potential users about form factors which they believe will benefit them. It was noted that they would rather have many medium sized displays dotted around campus which they could interact with. Users also said that they preferred the tablet stand or coat-hanger design. They also would not be opposed to having some horizontal TV’s dotted around campus. They were highly against ideas too extraordinary, which are very unintuitive or even problematic such as the wearable staff display or the spherical display. [v1]

Build design and size: Kiosks

Goal: Come up with an approachable and user-friendly design to draw users and allows them to intuitively interact with the MealMap.

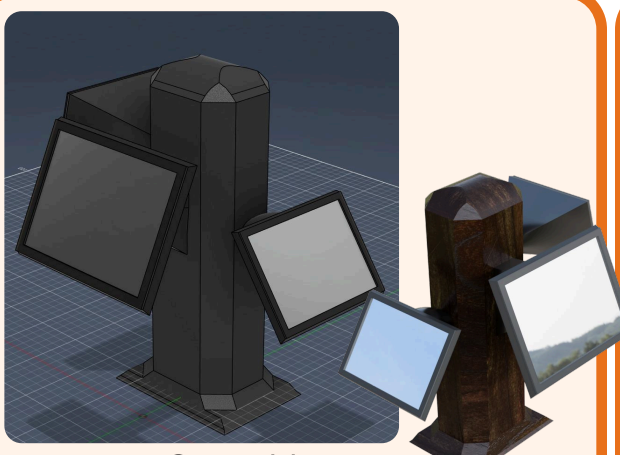


The Helix

Users found the design to be aesthetically pleasing, with an appealing handle. However, there was a consistent concern for the rigidity and stability of the screen. After 3D printing and testing how it reacts to load, it was clearly unsuitable and dangerous. User comments included:

“eye-catching”
“interesting”
“stands out”

“looks flimsy”
“afraid of breaking”
“sways too much”



Coat-Hanger

Users considered this design to be more functional and allow better supply for demand at peak times. However, most suggested it looks intimidating and too bulky, as well as poorly optimised for larger groups looking at one screen, causing disruption. Overall, this one was slightly more successful than the others.

“serves more”
“stands out”
“accessible”

“bulky”
“looks intimidating”
“uncomfortable for large groups at once”



Tabletop

Users thought this design is quite accessible, using it while sitting at benches. However, it scored very low in convenience of use due to its horizontal position and large size. There were also concerns for the maintenance of this design as it can “get messy very quickly” both indoors and outdoors.

“Easy to find”
“accessible”

“gets messy/ dirty”
“not angled”
“not ergonomic”



User testing with smaller tablet designs

For testing and timing user interaction with our website UI, we used smaller, 11 inch iPads, inside of our designed and 3D printed cases with the electronics assembly. We tested whether users preferred larger screens or smaller tablets at the kiosks around campus, and looked at the preferences for build dimensions (thicker vs thinner, more “slick” handle).

Methodology: At the ACEX workshop, we had 7 users physically test the newly printed case and handles for their preferences. The majority of votes favoured a handle with a thicker base for better stability and a rigid structure. The users were much more keen on the second tablet case design as it looked more modern and minimalistic.

Testing and Hi-Fi

Methodology and feedback:

We had 15 students interact with and comment on our designs after lectures. Our key takeaways were that users wanted a screen “smaller than a TV”, but larger than a tablet, and needed enough space to be able to use the product in groups of multiple people (“I would like to be able to view kiosk with my friends while we are walking”). This helped us deduce that placing two or three 24-27” inch (diagonal) touchscreen display per kiosk at accessible locations around campus would be optimal for the cause.

Feedback processing

Based on our initial Mid-Fi prototypes and the consistent feedback we received through our three trials, we outlined these requirements for kiosk:

- Modern, minimalistic, “slick” design that matches the Imperial campus theme/vibe.
- Manages the crowds at morning to afternoon peak usage times.
- Allows enough space for both single users and friend-groups viewing the screen.
- Three medium sized (24-27”) touchscreen displays per kiosk location.
- Holds the NFC and payment tap point

Hi-Fi Prototype

From these insights on the desired kiosk features, we designed the MealMap Kiosk, inspired by the original “Coat-Hanger” prototype, in a symmetrical arrangement.

Our Hi-Fi prototype features a (isosceles) triangular pole in the middle, with three touchscreen displays branching outwards and the “PlatePay” NFC touch point. Thus, each user is given 120° angle space for usage.

Methodology: We displayed this rendered model to 7 users (same students from previous tests) and found that the final design fit very well with their requirements.

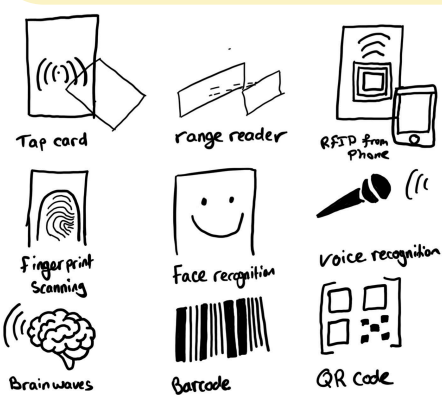


Development: Electronics and Assembly 7.

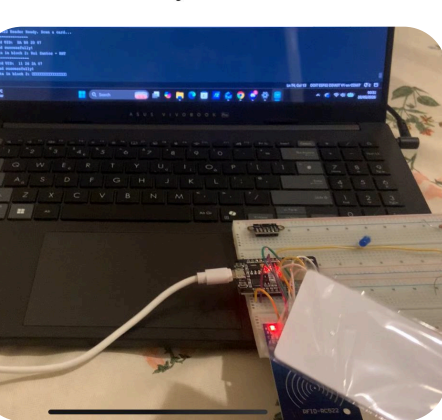
User input/output

How can we develop a responsive system for interactively reading and saving user data?

Methodology of User Testing: We ran the same trial sessions for our 9 methods of accessing the online platform with 5 users initially, who shared which of the options is more suitable. They suggested that an NFC, RFID and QR-Code options work best in everyday life

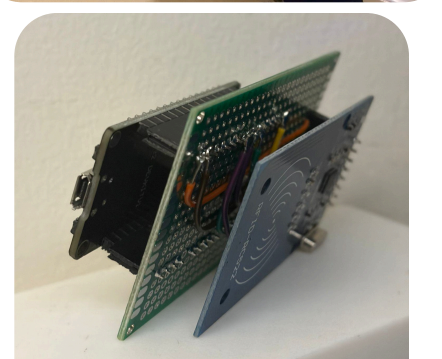


We first developed some **initial sketches** for ways of facilitating **user engagement** with the display interface for the users, in order to identify the design that caters to improving the **users' experience**. After assessing the **ethics** of storing **personal data** from users and collaborating with potential users to **jointly** find a **design solution** mitigating this, we decided to proceed with prototyping the "**tap card**" idea since it can be linked to College IDs, which adds another level of ease of use. We then built "**works like**" prototypes for testing functionality then developed the idea further for a "**looks like**" prototype to **optimise** its design so that its **form** best suits its **purpose**. This was **embedded** into the **Electronics case**.



Breadboard testing

A **breadboard** was used in order to make an **initial prototype** of the electronics. We used an **ESP-32** based on its **small form factor** and **high processing rate** with a **RC-522 RFID card** reader module, to **read information** on the card. The ESP-32 then processes and passes the stored ID of the card to the **database which is accessed by the platform**, allowing for seamlessly reading and storing **user data**.



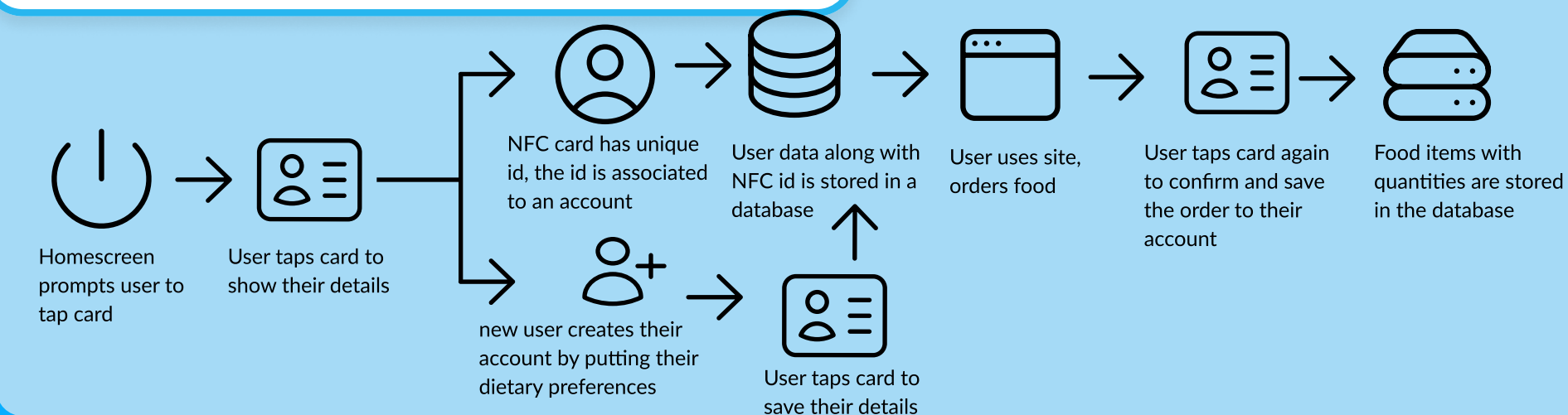
Perf-board testing

Once the breadboard setup was tested and functional, a more **compact build** was needed. Hence a **perfboard** was used to hold the **RFID scanner** and the **ESP-32**. This was to make the electronics **more concise** to fit into a compact electronics case.

Integration with Platform

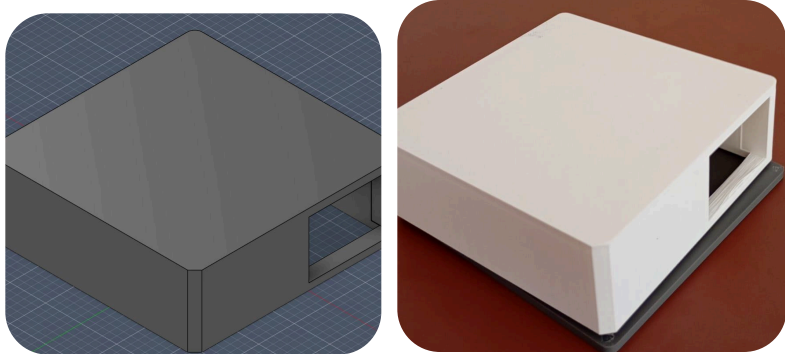
We converted the design of the electronics from wired communication to **wireless** communication as we found that the Ipad we were using does not support it. Furthermore we integrated the ESP-32 with the platform allowing it to **communicate** with the platform and its corresponding databases to **update and save user data** to reorganise the site based on their preferences

Flow of Information



Electronics case

How can we construct a case that allows for RFID scanning and shows its purpose?



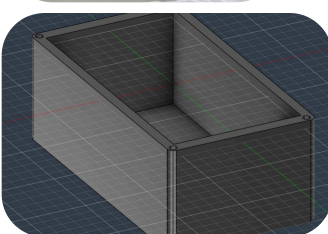
Iteration 1

Initially, the size was **larger** to allow for a breadboard to fit inside and an **open slot** on the side was used for **RFID scanner** to be placed. Issues reported from **user-testing** include the design being too bulky for a small electronics setup, and the pegs, needed to attach the bottom plate to the box, being **too brittle**.



Iteration 2

Downscaling the box was the next step, with a new CAD model involving a **rectangular base** and **chamfered edges** to reduce sharp edges and a **thin base plate** to allow for RFID scanning. To reduce the chance of the pegs from snapping, the **clearance was increased** and the **pegs were filleted** to allow for the base plate to be removed at other angles. A hole has to be drilled into it **manually** for a cable connection, and the enclosure features a **printed contactless payment symbol** to clearly identify its purpose to users.



Iteration 3

The third iteration involved **further downscaling**, to allow for a **flush fit** when the **electronics** are placed inside. Further, a hole was added in CAD to account for the cable rather than manual drilling, to **minimise wasted plastic**. An engraving was also added to indicate its purpose as a **contactless tapping box**.



Iteration 4

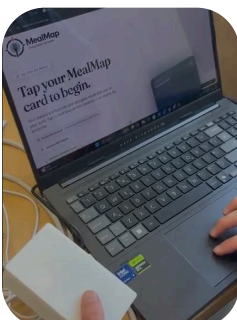
User Feedback indicated that users would rather the contactless tapping box be **located below the screen** rather than on the side. With this idea in mind, the terminal was redesigned to a **semicircular container** with a contactless decal.



Assembly

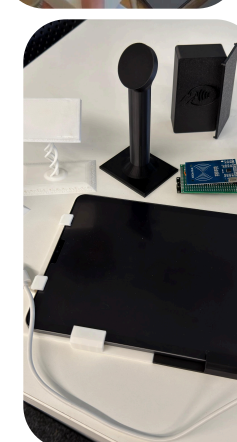
How can we unify all components into a single, functional system?

After constructing the different parts of the Mealmap device individually, they were **integrated together**. The platform being displayed on a device, a USB-C cable connecting the device to the electronics components, which were concisely placed in the **electronics case**. This then allowed for **further user-testing** to check if there were any issues when all the components were unified or any **potential improvements** that could be established.



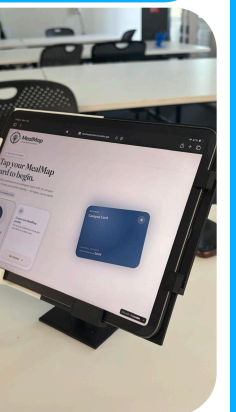
Functionality testing

This involved verifying that there was **no interference** from the electronics case or the device, preventing the RFID card's signature from being read by the scanner when the card is placed on the box. Additionally, the scanner's ability to **correctly interpret** the RFID then relay the information to the ESP-32 for it to be passed onto the device, specifically to the platform was also checked. After conducting these tests repeatedly for different users, the conclusive insight was that **no interference or problems** were faced after the integration of the electronics all together.



Compression testing

As the iPad was the **heaviest** component, it placed the **most pressure** on the case. **compression testing** was therefore conducted, gradually **increasing pressure** on the case's weak points to verify that it could withstand the **load without fracturing**.



User Testing

We communicated with users in order to gain an overall opinion of the final electronics setup. Users told us that it was **clear** as to how to use the device. Furthermore, they liked how **responsive** the communication was when they tapped their card then the platform **updated instantaneously**. [v4]



Final Design and Storyboard

8.



A summary of MEALMAP

- An accessible web platform which improves new users' everyday meal experience on Imperial College campus through personalisation and filtering.
- The PlatePay tap point allows to activate and link to the user's account.
- MealMap can be accessed initially from the kiosks at regular spots on campus



Locations of MealMap



We pinned the regular, accessible places all students pass through, to place the kiosks so that they are visible and can be found easily.

(Queen's Tower, Sherfield Buidling (West), Main Entrance, Dalby Court, IC Union)



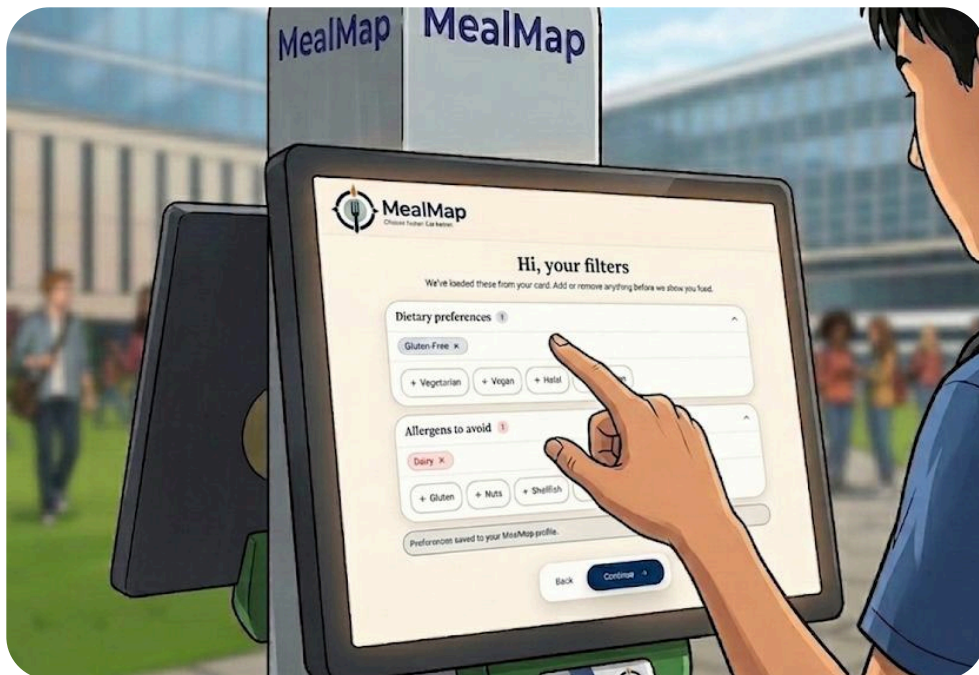
The story board of...

Mike

- Year 1 CS student
- Gluten-free diet
- Lactose intolerant
- Rushed break in between classes
- Prefers a high protein diet but is on budget
 - Not sure what's suitable and available for him in the menus, but don't have time to visit all food outlets.



Mike has a **short break** between lectures and needs to **find food quickly**. He often **struggles** to work out which campus outlets have **suitable meals** and does not want to spend time **checking the menu of each outlet manually**. That takes way too much time and is very **inconvenient**.



He taps his **College ID** card to begin. His saved **dietary preferences and allergy information** are loaded **automatically**, so he does not need to re-enter them each time.



MealMap shows nearby food outlets and their available meals, which are **filtered** by by gluten-free, dairy-free, and price. He also wants a high-protein meal. MealMap **narrows the list**, helping him **focus on suitable meals**. The option that best fits his budget and schedule was easily chosen. This reduces decision friction and gives him **confidence in his choice**.



He **adds the meal** to his **basket** and completes the order in advance. This **saves time** and **reduces waiting** at the **food outlet**. The **purchased order** is **uploaded** to his College ID card for collection. Mike can now **come up, request and collect his meal anytime** and return to class without **unnecessary delay**.

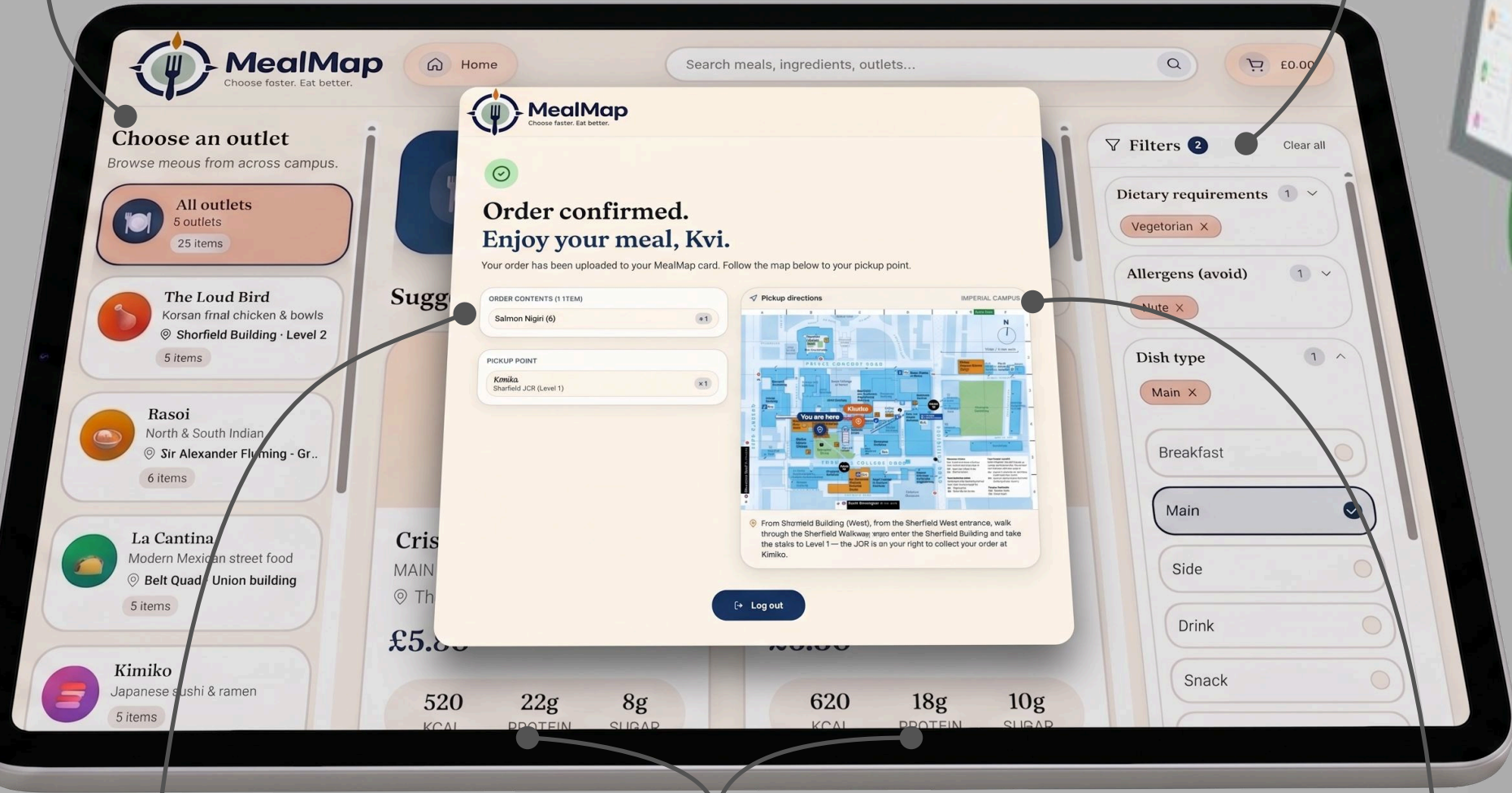
Design Breakdown

User Interface:

The MealMap Kiosk is initially used for registration and account creation. The MealMap web-app can then be accessed from kiosks, as well as from the users' personal devices.

Outlet choice: shows menus of chosen food outlets based on the desired or favourite cuisine

Filters: allow sorting food based on preferences and requirements, such as allergens, portions, prices and other needs.



Basket review: Shows the user their purchased meal and food outlet

Nutritional information: allows to compare food information and macronutrients

Navigation: directs the user to the food outlet they purchased the meal from

MealMap:

Triangular design allows three groups of users to access the screens simultaneously, each given 120° space.

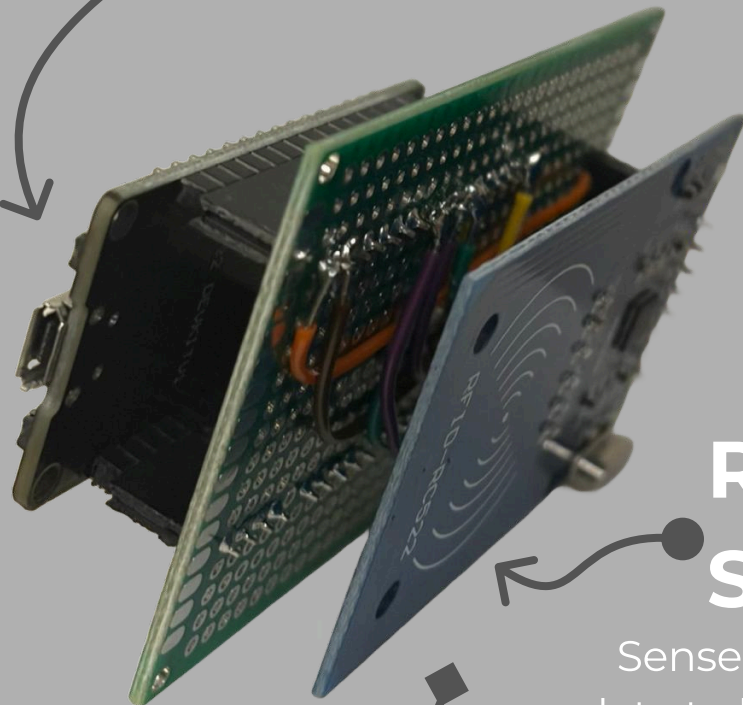


Electronics:

The electronics consisted of 3 parts: a microcontroller, a circuit board and an NFC tap point. These are connected and soldered in a “sandwich” shape.

ESP-32 microcontroller:

processes data and communicates with our webserver for activation and registration



RC-522 RFID Sensor (NFC):

Senses RFID card and sends data to be processed by ESP-32. This activates the account on the website and links to the registered Imperial ID account



The electronics are stored in a “dining plate” inspired casing, allowing the users to intuitively tap their card for registration

Value proposition: MealMap allows users to quickly and confidently find food on Imperial campus, reducing stress from uncertainty and confusion, allowing them to taste food tailored to their requirements. It improves the transaction time by allowing the users to pre-purchase the meals to their account.

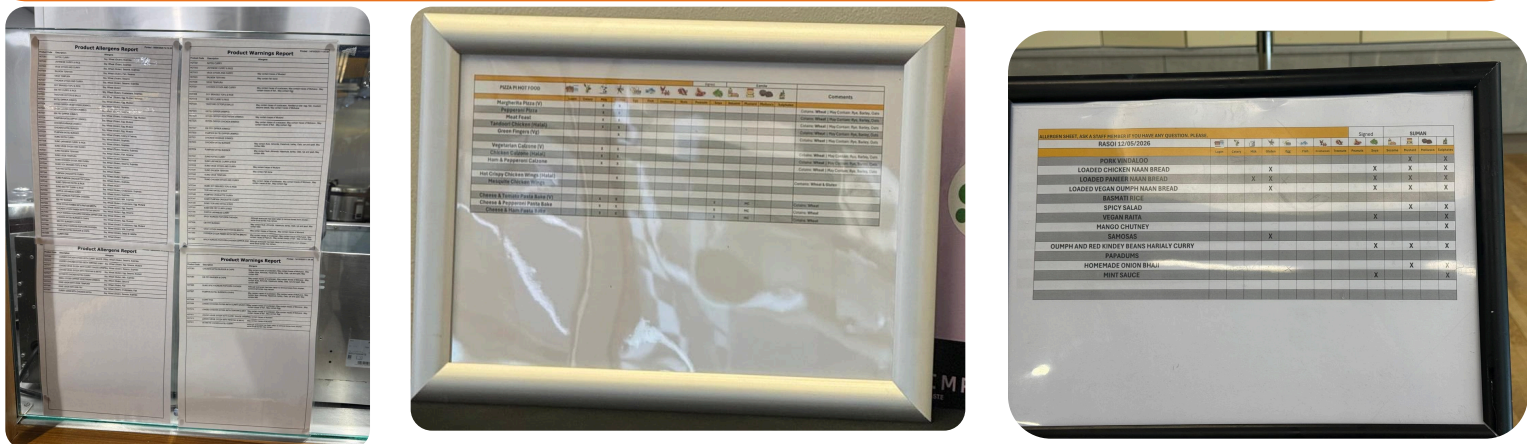
Product Evaluation and Validation10.

How might we reduce the **cognitive and time burden** of on-campus dining for new students, enabling a **more predictive, informed, and personalised meal experience**?

Before vs. After using MealMap

We assessed our prototype to understand whether MealMap helps students and new visitors find suitable meals faster and with less effort than the current campus experience. We saw that the only guidance given in campus cafeterias are allergen charts next to food outlets.

Before: Current campus experience - Allegen tables



The current campus food experience provides tables as seen above, demonstrating allergens information in front of each outlet individually. and where they are. This means users with allergies have to manually find and read the tables for each menu before confidently deciding Furthermore, there is no easy, centralised way to **compare** and **contrast** different food items across all the imperial food outlets. The tables used across different outlets are not very **user-friendly or human centred**. Users would also benefit if they could only see the allergens specific for them rather than all, so **abstraction** of **irrelevant dietary restrictions** is necessary.

Benchmarks:

Customer experience: According to a conversations with students during opportunity sampling, the median score out of 5 for the customer experience at the canteen was a 2. Reasons for this rating included Using dull information tables as methods of communication restricts the ability for the data to be effectively provided to the user in a succinct and user-friendly manner.

Ease of Navigation: We timed how long it took to get from the beginning of the queue to the end of the outlet during peak times. At the SCR it took between 200-400 seconds to get from the start of the queue to the payment section. Highly inconvenient and reduces time available during lunch periods to select the best food option for the user.

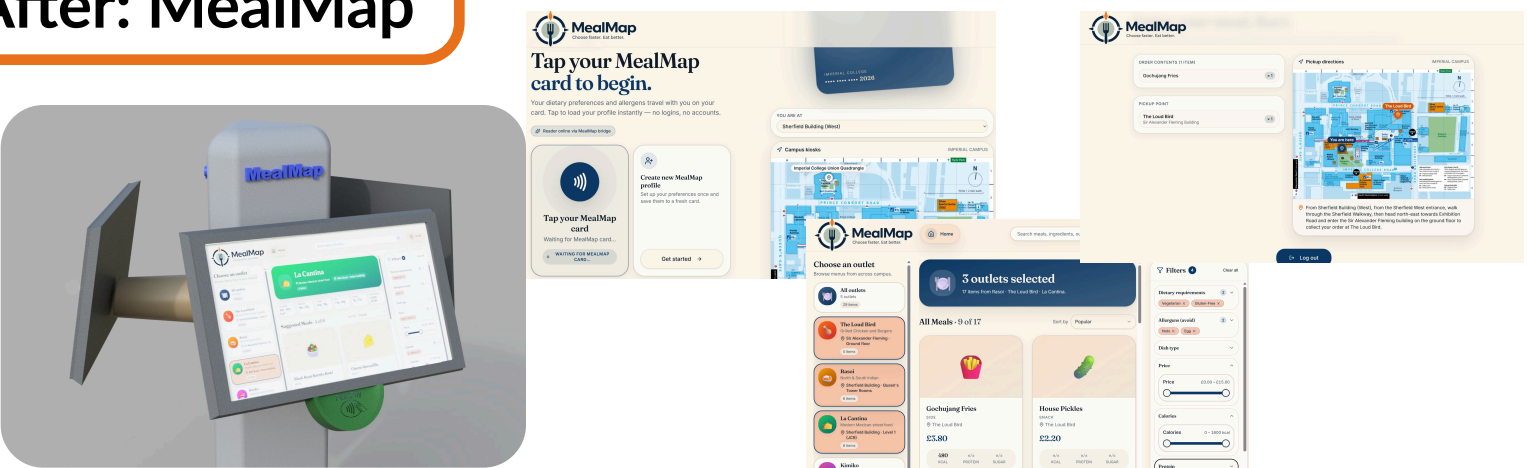
Decision fatigue: 3 users felt burdened with comparing different meals based on nutritional value and dietary restrictions.

Personalisation: 4 people with dietary restrictions complained that it heavily lacks in personalisation, since table is generic rather than displaying information that is specific for individual user interests and concerns

Quotes:

"It's such a pain to check those everytime if you have allergies"
"The table was hard to follow, in the first few weeks of joining university"
"By the time I've walked round to find something I can actually eat, half of my lunch break gone."
"There's no easy way to compare what each place has."
"It feels like the same generic menu for everyone, nothing that fits what I actually need."

After: MealMap



MealMap is a **personalised campus dining platform** that helps students quickly find meals that match their **dietary requirements, nutritional goals, budget, and food preferences**. Instead of searching through multiple outlets individually, users can browse and compare food across campus, filtering by factors such as allergens, calories, protein, price, dietary requirements, and cuisine type. Once a meal has been selected, users can **pre-purchase** food through MealMap and have it linked to their university account. They can then collect their food directly from the outlet when convenient, **reducing queue times** and making **meal planning easier** throughout the day.

Benchmarks:

Customer experience: According to a survey with students at Dyson school, the average score out of 5 for the customer experience with **MealMap was 4**. Reasons for this rating included:

Ease of Navigation: We timed how long it took to go from the start page of the platform to paying at the end of the web platform. On average it took 30-45 seconds, that is **10x faster** from the current campus experience.

Decision fatigue: **1/5 users** felt there was significant improvement and ease when comparing different meal options using the MealMap relative to the old system.

Personalisation: **all users with dietary restrictions** felt that the new MealMap provided information regarding food selection in a personalised and individual manner, it effectively abstracted meals or outlets that failed to comply with the users' added filters.

Quotes:

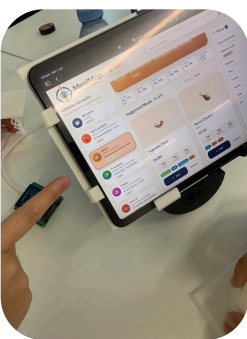
"I would definitely use it, at least twice a week"
"I wish this was around when I was a fresher"
"I would still use it even after months or years of studying"
"This place is such a maze, I think this is good to direct me around to find food"
"Finally I would know if I can eat the food at other spots on campus, rather than same thing every day"
"I'm still wondering if the chicken in burritos is Halal, so this would surely make things more clear"

Testing Methods

Three scenario roleplaying sessions with 14 Imperial students, where we took them through our system and asked for their feedback in order to test the efficiency and time the interaction. We were especially looking for whether they were able to navigate the site without being prompted to look at intuitiveness and whether they say if it is going to be useful:

1. You have a dietary requirement and want to find a suitable meal quickly, choose an outlet, and complete your order.
2. You already know you want food soon. Find an outlet, choose a meal, add it to your cart, and complete checkout as quickly as possible.
3. You're not sure what to eat. Browse available options, compare meals or outlets, and choose something you would order.

Roleplaying method involving users



Method: Created specific scenarios for users e.g find a specific dish. Users then answered questions related to the rankings below in order for us to gain an understanding on what users thought of the system.



Users were provided with the MealMap and generally found that the user interface was simple and well-thought out.

User ratings from our survey

Poor								Excellent	
1	2	3	4	5	6	7	8	9	10
Ease of setting up and using:								8.21	
Intuitive/understandable to use:								7.71	
Approachable and appealing design:								7.57	
Useful in everyday life:								7.54	
Impactful, making a change:								6.86	
Personalised for individuals:								7.93	

On Average, users found the ease of set up and usability of the MealMap the best, however the impact of the MealMap was scored the lowest suggesting that the MealMap's function would not substantially change the user's canteen experience. Despite this more positive feedback was received with the user-friendly design, greater personalisation and intuitiveness.

Interview with "Taste Imperial" staff

We organised a **meeting** and conducted an **interview** with one of **Taste Imperial's Project Managers at the Junior Common Room** (requested to remain anonymous). The meeting involved a **demonstration** of the our web-app UI, after which we discussed how MealMap could **affect the everyday life from the perspective of the staff members**. They confirmed that **"a lot of people come in and don't know what to do, then struggle to ask questions"** and the feedback we received was **mostly positive** (5/10 on Impact, 7/10 for product). They suggested to improve the transaction system and see how it works with the current financial team, to avoid any technical issues.

Key Takeaway

In conclusion, MealMap helps you find the right food for you, then lets you purchase it in advance and collect it at your own will, allowing for an easier, more personalised meal experience. This enables users to plan out their meals while also helping them make a more informed decision on what food caters to their dietary needs.

Bibliography and References

Information for our Context slide 2 was taken from our Team RevAMP Term 2 Discovery report, along with the visuals, illustration, insights and concepts

Notion: <https://app.notion.com/p/Human-Centred-Design-Engineering-268cf0ec357c806187cdde11a3638ed5>

Miro: https://miro.com/app/board/uXjVGOGI9OU=/?share_link_id=373504639373

Slide 2:

A crowded college cafeteria with students eating drinking and chatting during lunchtime crowded cafeteria with students chatting and eating, **Iftikhar Alam (generated with AI) (18 September 2024)**

https://www.magnific.com/premium-ai-image/crowded-college-cafeteria-with-students-eating-drinking-chatting-lunchtime-crowded-cafeteria-with-students-chatting-eating_248975026.htm#fromView=keyword&page=1&position=15&uuid=71df8994-eaf9-4a9c-a522-b8987674f8aa&query=College+campus+cafeteria

Kokoro and LoudBird Menus photos taken by our team.

Healthy balanced diet plate featuring fresh organic vegetables fruits protein grains nuts and see, **shabanashoukat49 (generated with AI) (22 September 2024)**

https://www.magnific.com/premium-vector/healthy-balanced-diet-plate-featuring-fresh-organic-vegetables-fruits-protein-grains-nuts-see_354659365.htm

Man Deciding What To Order From Restaurant Menu Illustration, By NISTUL

[https://stock.adobe.com/uk/search?](https://stock.adobe.com/uk/search?filters%5Bcontent_type%3Aphoto%5D=1&filters%5Bcontent_type%3Aillustration%5D=1&filters%5Bcontent_type%3Azip_vector%5D=1&filters%5Bcontent_type%3Avideo%5D=1&filters%5Bcontent_type%3Atemplate%5D=1&filters%5Bcontent_type%3A3d%5D=1&filters%5Bfetch_excluded_assets%5D=1&filters%5Binclude_stock_enterprise%5D=1&filters%5Bcontent_type%3Aimage%5D=1&k=menu+deciding&order=relevance&limit=100&search_page=1&search_type=usertyped&acp=&aco=menu+deciding&get_facets=0&asset_id=1911115883)

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Close up of school lunch box with vegan sandwich, nuts and berries, By KateCat

https://stock.adobe.com/uk/search?k=packed+lunch&search_type=usertyped&asset_id=366522863

The map of Imperial South Kensington Campus was accessed on <https://www.imperial.ac.uk/study/visit/undergraduate/open-days/campus-map/>

The rest of the images on slides 1-11 have been generated using AI:

ChatGPT 5.5 and Google Gemini 3.1 Pro (Nano Banana)

The website was developed using LovableAI and help with ChatGPT prompting

[p1] to [p11] - check appendix

[v1] to [v4] - check appendix

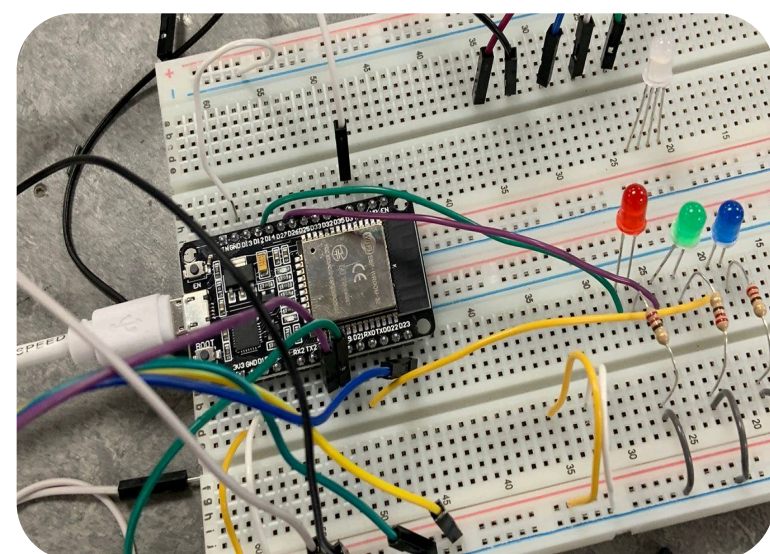
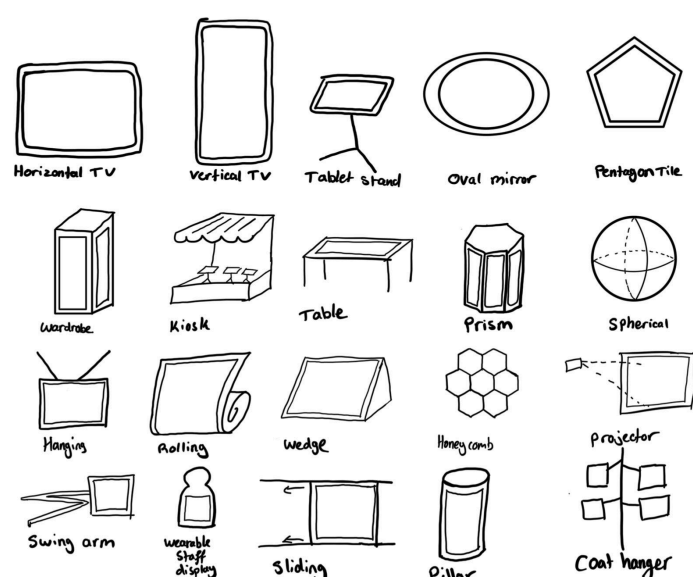
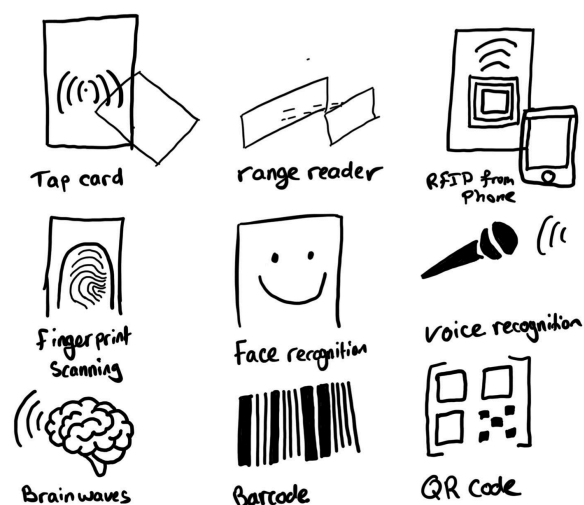
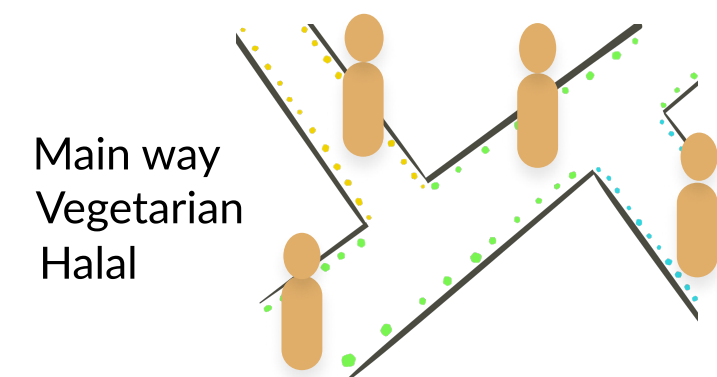
Appendix: Concept Design

Initial sketches

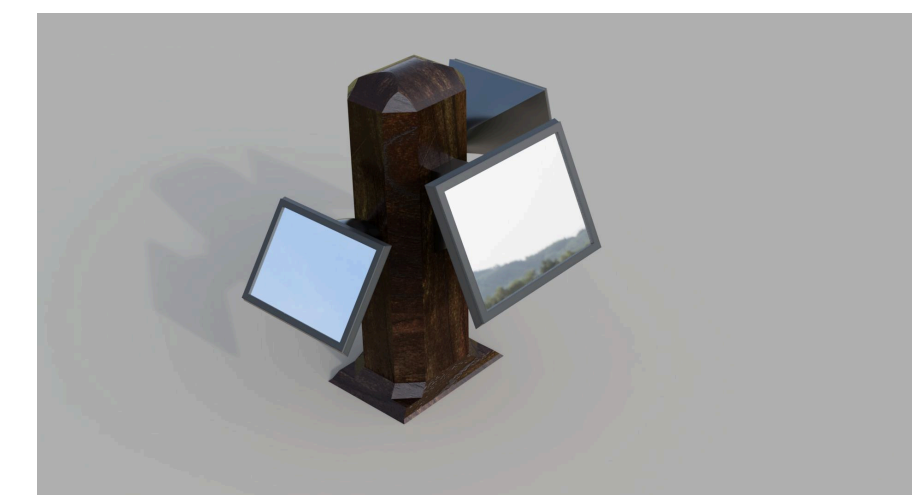
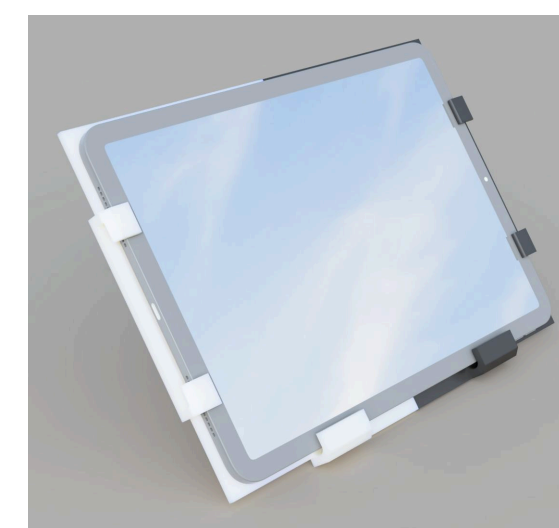
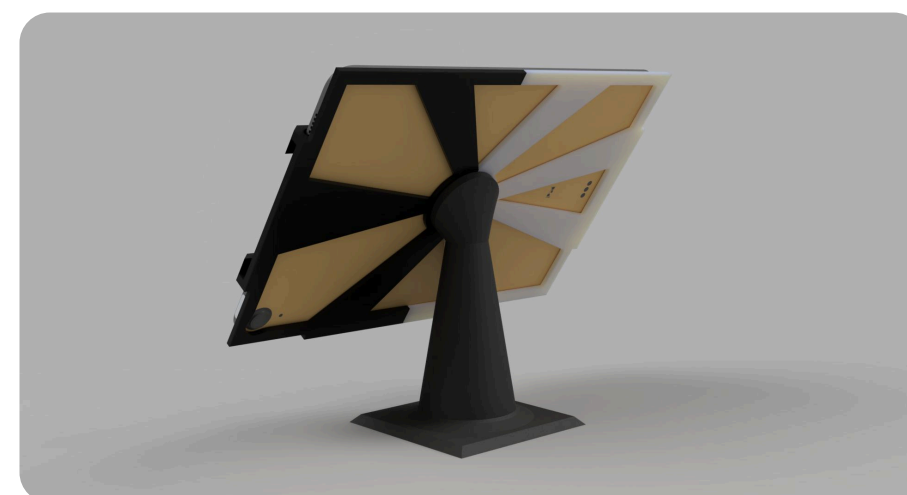
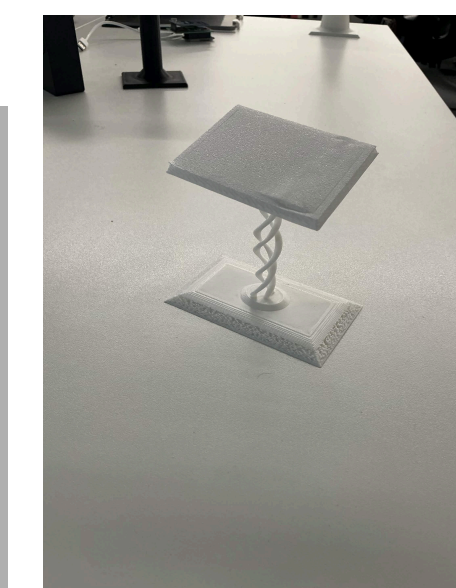
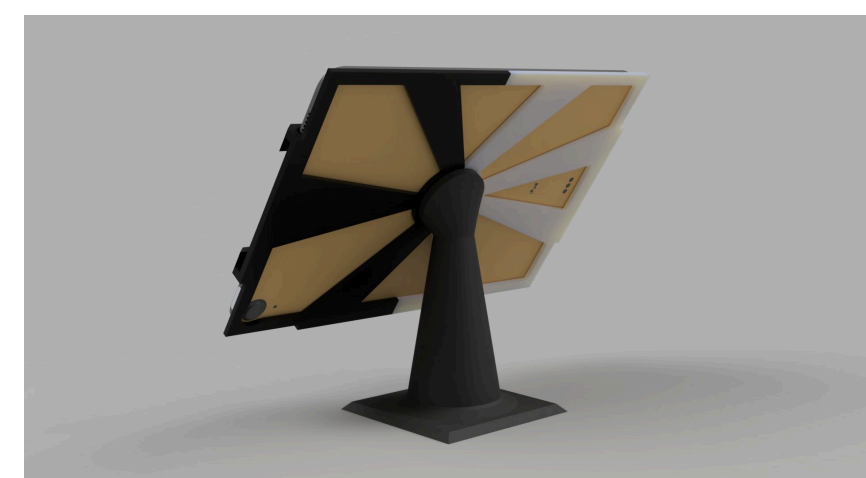
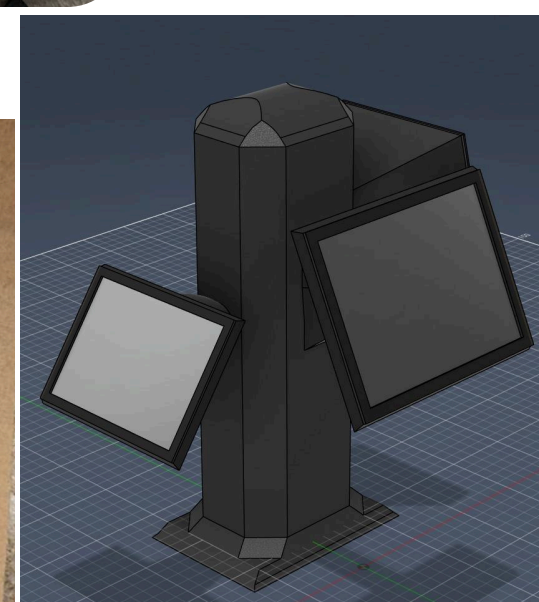
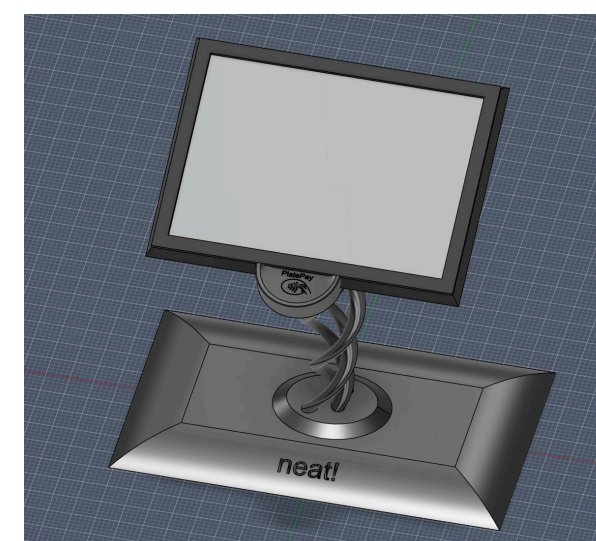
More electronics and Lo-Fi cardboard prototypes:

Fusion 360 designs, CAD and AI renders, 3D printed models:

TasteWay Lights

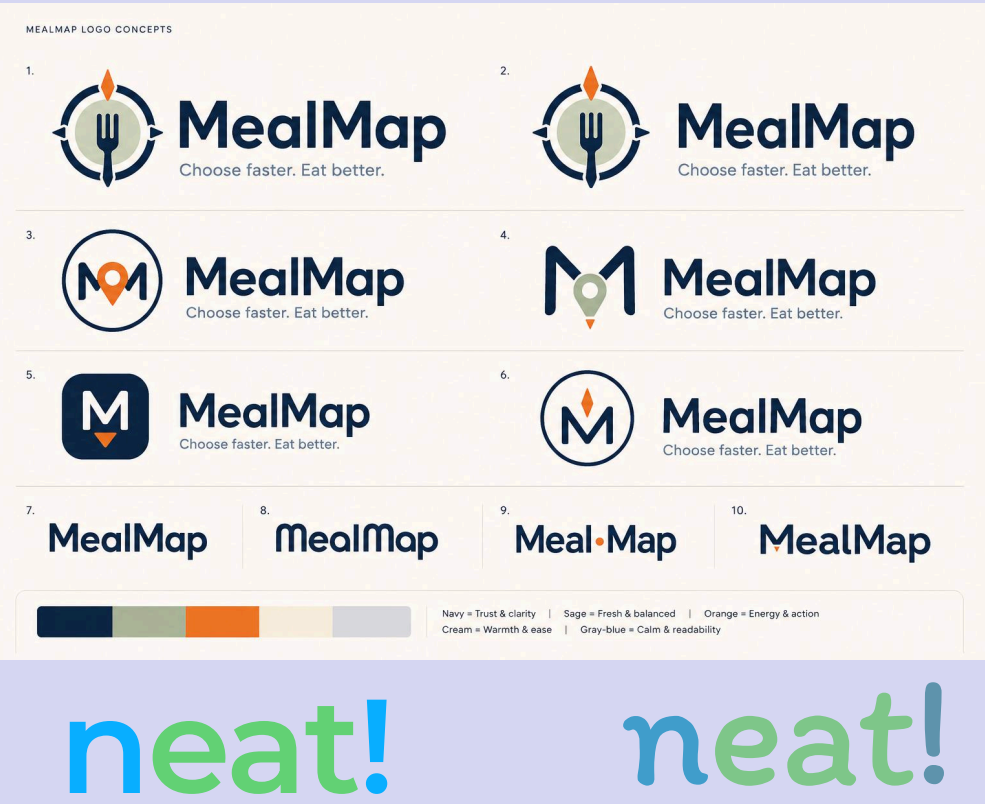


Votes for tablet designs:



Appendix: Themes and quantitative feedback

Logo and Name selection:



Themes we focused on for concept ideation:



Poor										Excellent	
1	2	3	4	5	6	7	8	9	10		
Ease of setting up and using:										8.21	
Intuitive/understandable to use:										7.71	
Approachable and appealing design:										7.57	
Useful in everyday life:										7.54	
Impactful, making a change:										6.86	
Personalised for individuals:										7.93	

User ratings from survey (first batch):

Validation questions: Ranking 0-10	Tomas	Xavier	MUSA:	Joyce:	Sunday	Daisy	Aiden	Victor
Easy to use?	8	8	9	8	9	10	8	7
Intuitive and understandable?	7	7	9	7	9	10	8	8
Approachable and appealing?	9	7	6	8	8 (UI), 6	10 (UI)	6	8
Useful?	7	8	6	7.5	8	8 (freshers)	9	7
Impactful (making a change)?	8	2 "wakes up too late anyway"	8	7.5	9	8.5	9	8
Personal?	6	6	8	7	9	9	8	6
How often would you use it?	everyday	everyday	as fresher - daily	daily or use once a week to collect food daily add stats	"pretty often"	"pretty often"	everyday!	"I would use it pretty consistently throughout, wouldnt use less after freshers" 5 times a week

The rest of students who provided feedback preferred to remain anonymous.

The data was logged on excel and average, mean values were calculated for the ratings table

8	8	9	8	9	10	8	7	7	8	9	9	7	8	Easy to use?	
7	7	9	7	9	10	8	8	6	8	7	7	7	8	Intuitive and understandable?	
9	7	6	8	8	10	6	8	7	8	7	7	7	8	Approachable and appealing?	
7	8	6	7.5	8	8	9	7	7	7	9	7	7	8	Useful?	
8	2	7	7.5	9	8.5	9	8	7	9	6	7	8	7	Impactful (making a change)?	
6	6	8	7	9	9	8	6	8	9	9	9	8	9	Personal?	

We considered naming our concept MealMap or neat!.

After sharing our name ideas with GTAs and rating the names between each other in the group, we concluded that MealMap described our product better and instantly explained to the user what the core purpose is - food and mind navigation.

The colour scheme was designed to match the web-app original and warm colours.

The "itim" font was found suitable for name due to its simple and friendly appearance.

Appendix: Transcripts

(the long conversation logs have been processed and trimmed for the key parts we noted from user testing. Some parts were manually paraphrased or rewritten post-interview, but quotes on slides were kept original)

Student, Professor, Staff worker Interview

P1 (Student)
I: Walk me through what it's like deciding where to eat on campus.
P1: Honestly? It takes way longer than it should. There are so many places and I'll just stand there going back and forth. I'm very indecisive, so when there's no easy way to compare what's where, I kinda freeze up.
I: How does that affect your day?
P1: It becomes a drag right after lectures. It's not that there aren't options there are too many, and nothing helps me narrow it down quickly. If something just told me "here's what's good, here's what's close," I'd save myself the whole spiral.

P2 (Professor)
I: Tell me about your eating habits during the workday.
P2: I tend to have one thing I eat and stick to that. It sounds boring, but it's the only way I can be sure I'm getting something I could eat.
I: Why stick to just the one thing?
P2: Because finding out what actually meets my needs across all these outlets is exhausting. The information just isn't there in any usable way, I'd have to ask at every counter or guess. So for me a safe option is the best.

P3 (Food Service Staff)
I: What shapes your typical shift?
P3: The day is decided by the number of students that we have to serve. Based on that is how hard the day becomes.
I: What happens when it gets busy?
P3: When the rush hits, it's really difficult. It is tough physically and mentally..

many individuals who we interviewed opted for their names and faces to not be included in this report, therefore we have ommited this information

Slide 3-User Interview Transcripts

Interview 1: P4 (2nd year, Mechanical Engineering)

R: Walk me through a typical time you buy food on campus.

P4: Honestly, it's a bit of a trek. The whole thing feels unnecessarily long, slow, and fragmented. I'll queue at one place, realise they don't have what I want, then go somewhere else and queue all over again. By the time I've actually eaten, half my break is gone.

R: What would make it better for you?

P4: I just want it to be simpler, more intuitive. Right now there are too many steps. If I could sort food out in as few steps as possible see what's nearby, decide, pay that alone would change my whole day.

Interview 2: P5 (1st year, Physics)

R: As a first-year, how easy was it to find your way to the food outlets?

P5: At the start it was really difficult. I genuinely had no idea where half the places were.

R: What made it hard?

P5: There's a lack of visual illustration, nothing really shows you what's on offer or which way to go. You kind of stumble into places by accident. Honestly, even some arrows or signs pointing toward the different outlets would have saved me weeks of wandering around.

Interview 3: P6 (3rd year, Biochemistry)

R: When you're hungry between lectures, how do you decide where to go?

P6:That's the problem, there's barely any guidance. You're left to figure out the suitable options completely on your own.

R: Suitable in what sense?

P6: Like which places actually have something I can grab quickly and that's close by. I shouldn't have to just know where the location is from memory for every single outlet. I'd much rather something pointed me to the right place for what I actually want.

Interview 4: P7 (MSc, Computing)

R: You mentioned earlier that you find it hard to decide what to eat. Why is that?

P7: There's loads of choice, but not much explicit information. I can't easily see allergens or nutrition anywhere, so I end up second-guessing every option.

R: What would help?

P7: Just an easier way to access that information. And filter options, let me filter by what I can and can't eat, instead of having to inspect every counter myself. At the moment it's all on me to work it out.

Interview 5: P8 (2nd year, Computing)

R: Does the current setup feel tailored to you at all?

P8: Not really. There's no sense of individuality to it, it doesn't account for personal preferences whatsoever. The menus feel too generic, exactly the same for everyone regardless of what you actually need.

R: You mentioned dietary needs earlier.

P8: Yeah, I've got a couple of allergies, so generic menus are genuinely stressful for me.

R: (shows the Personalisable Menu Board concept) What's your reaction to this?

P8: I like that it's so visual, you can take it in at a glance. My one worry is privacy. If it's reading my ID card on a screen that everyone can see, I'd want the option for some of that to not be shown to the people standing behind me.

Interview 6: P9 (4th year, Design Engineering)

R: If you could redesign the canteen experience, what would you prioritise?

P9: A genuinely personalised meal experience, something that knows my requirements and priorities instead of treating me like everyone else.

R: Anything beyond preferences?

P9: If it were more goal-oriented, say it helped me hit my protein targets for training, that would be huge. I actually think it would attract more people, because the food service would finally feel like it was built around them.

R: (shows the Personalisable Menu Board concept)

P9: Displaying unique options for each person is the clever bit. That's what makes it feel personal rather than just a static board on the wall.

Interview 7: P10 (1st year, Medicine student)

R: You're new to campus, so I'll show you a concept called TasteWay Lights involving LED paths set into the floor, colour-coded to dietary preferences. First impressions?

P10: Oh, I really like this. It gives you greater clarity straight away, you just follow your colour and you know you're heading somewhere that suits you.

R:Would you actually use it?

P10: Maybe, not really. It's done in such a simple, user-friendly manner. It seems like a fun idea for someone like me who doesn't know the campus, it really improves travel. I'm not wandering around lost, but it still sounds too funny to be true

Interview 8 P11 (1st year, Chemical Engineering)

R: Of the concepts we've discussed, which one stood out to you?

P11: The Imperial Eats app, easily. It has the potential to transform how we buy food here.

R: What specifically?

P11: It's the compare tool identifying most suitable food options, that's the part that does it for me. I could line up a few places, see everything side by side, and just pick. And if it had a pre-purchase option so I could order ahead and only show up to collect, I'd basically never queue again.

Appendix: Transcripts

Version 1 (V1) User Transcripts

User 1
"Okay, looking at this screen... wait, how do I compare these two meals? The compare option isn't really clear to use at all. Honestly, you guys could put it in a separate tab just for that to clean it up. Let me try the search feature, that works nicely. But at the top left, the logo and tagline positioning is really strange, it looks misaligned.

How about the electronics?
I like the speed! This 'works like' prototype is super quick, the response time is awesome. But why is it built on this huge breadboard? I'd definitely prefer a smaller, more enclosed device instead of this messy open circuit board."

User 2
"I'm looking for a quick bite. Where's the 'sort by' button? Change the color for that button, it's very difficult to see. Let me click on the 'All Outlets' page. Can I buy items from multiple restaurants at the same time in one basket?

When you imagine this platform on a menuboard how big do you think it needs to be? and where do you see it placed?
I wouldn't want one giant screen. I'd rather have many medium-sized displays dotted around campus in high-traffic areas so I can just walk up and interact with them easily."

User 3:
" I want to see more details on the burrito. Why is there a little eye icon next to it? It feels redundant. Remove the eye icon entirely and just keep the functionality by letting me just tap on the food item itself to view it.
How do you find navigating through the outlets?

It feels backwards. Should I choose the outlet based on the food? Like, a user might select the food first, or food type first, or maybe even filter by dietary requirements first, and then see the outlets which fit into that result."

User 4:
"The interface responds instantly. But the left filter panel is taking up way too much screen space. You should make collapsible filter sections with like an arrow or something to tuck them away. Also, when I first open this page, some filters or even all filters should be chosen automatically when the user visits it for the first time. I don't like the wearable staff display concept you mentioned, or a spherical screen. I prefer the normal tablet stand or a coat-hanger style kiosk design."

User 5
"If I look for lunch. the search bar works fast. The tagline layout is weird Let's try to filter by vegan, the menu sections are huge. these should definitely be smaller.

How about the electronics?
Regarding the hardware design: this breadboard look is a bit terrifying for a public space. A smaller sized device is much better.

Of these 20 designs which one do see being implemented around campus?
I think a tablet stand setup, or even some horizontal TVs dotted around the campus, showing the menu and letting us tap. Just please, no weird spherical displays. That's just a gimmick and its going to be impossible to read text on."

User 6:
"The 'sort by' button is completely lost, it's practically invisible. Change the background and foreground to have more contrast I think. On the 'All Outlets' page, I'm realising I can add a sandwich from one place and a coffee from another. Is that allowed? You guys need to think through the system logic for whether multi-restaurant checkout is supported. On the hardware side, the responsiveness of this prototype is great, it's very fast. A neat tablet-sized stand would fit perfectly on the library or department desks."

User 7
"When I use a food app, I don't care about the restaurant name first. I want to choose my outlet based on the food itself. I want to select 'Halal' or 'Gluten-Free' first, or select a food type like 'Burgers', and then the system should show me only the outlets that fit those results. Write that down, write that down. Also, looking at this interface, clicking this eye icon to view details is annoying. Just remove the eye icon and let me tap the row or image. The software runs smoothly though, no lagging at all when clicking around."

User 8
"The search bar works well, but the logo and tagline next to it are sitting in a really strange spot. Needs a UI redesign. The comparison tool is also confusing I would put it in its own separate tab so it doesn't clutter the main viewing area.

Version 2 (V2) User Transcripts

User 1
"First page... wait, I clicked skip but it didn't take me to the right spot. Looking at the restaurants list. It should explicitly show if they have vegetarian options or not right on the card.
What do you think of the filters?
The sugar bar starts at the max value? The sugar bar should start from 0. Also, there's a category called 'Other' in the filters, which is just strange. these food tags, they're lowercase and messy.
So presentation is the issue?
Yes, you should capitalise the first letter of food tags, colour code them, and fix the sorting order of the tags. when I scroll the whole page moves including the search bar."

User 2
What do you think of the page about all the outlets at Imperial?
" 'All Outlets' page. It shows 'Average Macros' at the top. Average macros are completely useless here, especially when drinks are included.

The average for each outlet should display max and min values instead of a flat average. Where is the search bar? Oh, I missed it completely. Let me go to the compare page you need to capitalise the text here, it looks sloppy. Don't put the vegetarian filter and the vegan one in the same thing as well."

User 3
How do you think we can improve the User Interface?
"I think it would be good if the location of the outlet is shown on the UI, you could actually use the tags of the places as Google Maps links! That would be awesome. I should be able to re-expand the filter page easily. Let me try to add multiple items to the comparison tool. So an alert popped up 'Compare ONLY 2 items', I can't lie that sounds a bit aggressive."

User 4:
Any ways in which the checkout system could be improved?
"As soon as someone has an item in their cart, a 'Proceed to Purchase' button should immediately be visible in the bottom right-hand side of the screen! This needs to be a fixed overlay on top of everything so I don't have to scroll around to find my cart. When this button is clicked, the 'your cart' slide panel should instantly open up.

Any recommendations for the filtering system?
The filters should be collapsed by default, with an option to expand at the click of a button. I want to try 'Vegan' and 'Halal'. Those tags should remain visible even when their main categories are collapsed! Give the tags a small cross button on their right-hand side so users can conveniently remove applied filters without opening the whole menu again."

User 5: Industrial Design Critic (Form Factor Feedback)
"Wow, looking at this V2 'looks like' physical model, I really like the small footprint. It takes up almost no space on the desk.
Any things we can improve on?
Definitely you should be covering up all these exposed electronics then integrating the wiring inside the platform casing.
With the screen specifically?
The skip logic on the front page is broken, it skips the wrong steps. Also, look at the sugar slider it's defaulted to max. It makes way more sense if it starts from 0 and I slide it up. Also, please fix the capitalisation of the food tags, it looks unprofessional when everything is lowercase."

User 6:
What do you think of the outlets display?
"The outlet cards should tell me straight away if they have vegetarian options. I'm trying to find the search bar... yeah, it's positioned in a blind spot, I wasn't looking for it there.
Any Suggestions where the search bar should be located?
Keep the search bar fixed at the top of the viewport. I hate when it scrolls off-screen. Make the main page static and let us scroll the individual category lists sideways or vertically instead. Also, look at the category order. Why is 'Drink' before 'Main'? Switch the order of dish types to: Breakfast, Main, Side, Drink, Snack, Meal Deal, and then Add-on."

Thank you for your advice
User 7:
What parts of the display do you feel is redundant?
"The 'Average Macros' display for outlets is totally meaningless. If an outlet sells a heavy burger and a bottle of water, the average macro count tells me nothing."

In the future what would you prefer instead to communicate nutritional information about macros?
"The minimum and maximum macro ranges instead. "
Any issues with the Filtering system?

"Lumping vegan and vegetarian into a single option doesn't work. Separate them. The menu should update live as soon as I check a filter box, rather than having to hit an 'Apply Filters' button. Maybe get a fat slider added alongside protein and carbs? Fat as a slider should definitely be added."

User 8:
" I'll try to select three items to compare... Yeah, this error message 'Compare ONLY 2 items' is poorly phrased. If I close the filter sidebar, I would want a clear button to re-expand it. "
How do you find the checkout flow?
"There should be a big overlay button for 'Proceed to Purchase' in the bottom right the exact second an item enters the basket, which slides open the cart. On the third screen, I feel the filter tags could stay visible as tokens even when the accordion section is collapsed, complete with a little 'x' to dismiss them. "
How do you find the hardware?

Appendix: Transcripts

Version 3 (V3) User Transcripts

User 1

"The Pescatarian tag is assigned to absolutely nothing! Also, I went to the compare page capitalise the tags in the compare page, they're still messy."

User 2

"You might want to to consider a warning pop-up while a user is searching for and adding an item which contains their pre-set allergens. That would be a lifesaver."

User 3

"At the end of the ordering process. The screen says 'Tap Now' at the very last page, but it's totally unclear that the user is supposed to tap their physical card against the kiosk reader. It just looks like a clickable digital button on the screen. People are just going to click it with their finger."

User 4

"At the filters panel when I'm viewing a specific outlet. It's showing filters for food types that this restaurant doesn't even serve. It would be better if you grey out filters and things which don't apply to dishes in a selected outlet. Also, I found a logic error: I tapped my card, loaded my profile, went into my account settings and deleted a filter, but it didn't update or save in my account when I re-logged."

User 5

"It shouldn't let you make a new account with an existing, registered NFC card! Right now, even though an NFC card is already associated with an existing account, if I go to the 'Create New Account' screen and tap it, the system just lets me do it and overwrites or breaks things. That should absolutely not happen. It should stop the user.

On a positive note, this integrated model is incredibly easy to use. I intuitively understood how to navigate the site."

User 6

"Let's place a large order three burgers, two cokes. When I get to the order confirmation page, it literally just lists 'Burger, Burger, Burger, Coke, Coke' in a long string. That looks terrible. Instead, it should just display it nicely."

User 7

"The 'Tap Now' text on the final screen is confusing. Make it clear it's an offline card tap action! Also, regarding the user profile filters: if an existing user taps their card and views their active filters, but then decides to remove or add more filters on the fly, those changes aren't being saved. If a user tries to change filters in that screen, there should be a prompt that says 'Tap your card to save your changes'. "

User 8

"t's incredibly intuitive. I didn't need any instructions to figure out how to navigate from the outlets to checkout"

Imperial Staff Interview:

Interviewer: what is your overall impression of the system?

Staff member: Pretty good idea. I can't say too much though it's not my call, we'd have to follow Imperial Taste policies.

Interviewer: Is there anything similar already being used or being built?

Staff member: Yeah, the sustainability department's building an internal "Too Good To Go" type thing.

Interviewer: Who'd benefit most from our platform?

Staff member: Students, and people in general. A lot come in not knowing what to do and struggle to ask this would take that pressure off.

Interviewer: What about queues and workflow for your staff?

Staff member: We've never tried anything like it, but it might make queues and workflow easier. Only worry is confusion with orders if staff aren't trained, it could get disorganised.

Interviewer: How would pricing work?

Staff member: Tap your card for student or staff prices; visitors pay about 10% more. You'd need to research where the money goes and how it's tallied against orders Id talk to the Taste Imperial financial team.

Interviewer: A rating overall?

Staff member: Around 5 out of 10 as it stands — some difference, not huge. The UI though, I'd give a 7.

Interviewer: And staffing?

Staff member: Big upside — less workload, fewer hours, fewer staff needed.

Interviewer: What would you want before backing it?

Staff member: A trial on the floor, to see how it holds up system- and staffing-wise. You wouldn't know until you really try it.

Version 4 (V4) User Transcripts

User 1

"Oh cool! It works on iPad now. I can see how it could work on kiosks around campus. The touchscreen seems pretty easy to use. Probably easier than using a mouse."

User 2

"Nice so you guys are putting a lot of kiosks on campus. That'll be good as I have classes in different buildings and so accessing them is easy. The map feature is really cool especially the 'You Are Here'. The instructions seem pretty accurate. This is awesome, I didn't even know that The Loud Bird existed in SAF."

User 3:

"What if I order 1000 items of everything? I'm adding 500 house pickles and 500 masala dosas. Oh cool, it just shows me the dish and the quantity at the end. That looks good on your confirmation page. The map loaded up pretty quick. How did you get the instructions to get there so accurate, did you manually put it in?"

User 4:

"I like this tapping mechanic. Its quite satisfying that I can login by just tapping my card and my filters are applied instantly. Its also reassuring to see the confirmation messages that show that a tap has been received, usually I would have ended up tapping several times wondering if it worked."

User 5:

"Its good that you fixed the multiple accounts bug. Now the whole process feels secure, everything stored on my own card. I also like that I have control over closing the app instead of it doing it automatically, it helps me be certain that my personal information is safe and can't be seen by other people."

User 6:

"Let's see if it handles the different kiosk locations correctly. Nice, the directional routing on the final screen updates perfectly based on which kiosk I'm standing at. Also, the instant screen response when tapping the NFC card feels like magic, zero lag."

User 7:

"What if I create an account with one card but save information with another card? Oh good you've put in a block. So it is actually heavily secured by NFC ID. The platform otherwise looks really cool."

User 8:

"The comparison screen looks good that the tags are capitalized and color-coded with the matching design theme. The entire checkout experience is smooth. I tap my card below the screen. The web page logs me in instantly, I order, and the order confirmation page shows me the map routing immediately. When I'm done, I hit 'Log Out' and it stays on that confirmation until I'm ready to walk away. Excellent work."