

TRADEAMEAL: The food sharing app powered by communities and machine learning technology

Capstone Project Proposal

BUSINESS GOALS

PROJECT OVERVIEW AND GOAL

SUSTAINABILITY



Sixty-one percent of the 931 million tonnes of food waste generated in 2019, came from households of high, upper-middle, and lower-middle income countries. The \$218 billion dollar cost that North America wastes annually can be eliminated using AI / Machine Learning technology to track the type of food being wasted and underlying patterns.

SCALABILITY



An 1000-person survey conducted by Futerra in USA and UK, discovered that eighty-eight percent of consumers want brands to help them be more environmentally friendly and ethical in their daily life. Using Microsoft Azure's image understanding feature, real-world data about an individual and community's environmental impact, can be shared live and can establish long-term trust in order to scale in the market.

ACCESSIBILITY



There are many consumers who do not regularly engage in sustainable practices, and this may be because of lack of resources or the inability to afford its financial investment. The free with paid in-app purchases business model will open up greater opportunities for consumers to engage in meaningful, sustainable, and community-building practices, and still save money.

NEXT →

Business Goals

How will Machine Learning / AI help the business?

AI can unleash major opportunities for sustainability progress. By leveraging a human-centred design process to harness AI, a range of stakeholder needs can be addressed (improved operational efficiency, lowered costs, and demonstrations of accountability, transparency, and social purpose).

Numerous studies conducted by academics and financial analysts have also shown that companies that best manage their environmental and social impact have better operational performance, can mitigate risk, and are more profitable in the medium to long term.

NEXT →

Business Goals

Why use Machine Learning / AI to solve this task?

An Image Annotation and Identifier model will enable users to quickly post, track, and find meals in their community before they are wasted. The gamification of this process will improve user retention rate and create a lasting positive environmental impact that is accurately recorded and updated for all of the community to see. The ability for the model to provide users with information regarding freshness will motivate trust and reliability towards the product. Using Machine Learning / AI, community members can replicate similar standards of freshness, convenience and low-cost that supermarkets are known for, allowing communities to engage in a more affordable and sustainable food sharing economy.

NEXT →

BUSINESS CASE

PUBLIC CRITICISMS

Food sustainability apps like Too Good To Go, Y N Desperdicio, Impact Vision, and Olio have been in the market and gaining popularity since 2011; but their scalability is hindered due to their failure to address three **public criticisms**:

01

MEASURE

Customers see no good way to measure the true impact of a company's technology.

02

CULTURAL EXPECTATIONS

The apps do not address societal norms (for example: the cultural expectation that we have a surplus; or the need to always have extra food to not run out)

03

MISUNDERSTANDING

General client misunderstandings of the app (for example: the belief that food-sharing means sharing food scraps rather than salvageable meals and produce)

Business Case

Why is this an important problem to solve?

An Image Annotation and Identifier model will enable users to quickly post, track, and find meals in their community before they are wasted. The gamification of this process will improve user retention rate and create a lasting positive environmental impact that is accurately recorded and updated for all of the community to see. The ability for the model to provide users with information regarding freshness will motivate trust and reliability towards the product. Using Machine Learning / AI, community members can replicate similar standards of freshness, convenience and low-cost that supermarkets are known for, allowing communities to engage in a more affordable and sustainable food sharing economy.

NEXT →

Business Case

Impact on drivers of business success

Some key performance indicators (KPIs) for the app are: Brand awareness, which can be tracked using products like *HootSuite Insights* to monitor trends, and to stay aware of real-time customer conversations. Post-reach (ie. how many people have seen the post since it went live; it is the reach divided by total number of followers) vs Potential-reach (for example for each shared post, assume approximately 2% of the user's followers will also see the post). The conversion rate from website and app page views to app downloads. Customer testimonials (including comments, endorsements, interviews and reviews) and satisfaction rate (CSat score - a numerical rating scale (1-10) or sentimentality (good, fair, poor, excellent)).

The above KPIs clear the noise of junk or irrelevant data and instead provide information and relevant data on long-term objectives. Since the app is largely dependent on engagement from its community, an accurate model and strong brand loyalty are key to this business' success.

NEXT →

Application of AI / ML

Tasks the ML / AI aims to accomplish

In order to address public concerns, optimize for a business model (where sustainability and profitability can co-exist), and fill the food-sharing economy gap, the proposed business model solution is: TRADEAMEAL.

TRADEAMEAL is a mobile app that promotes the local community exchange of raw and cooked foods and produce. All users are required to undergo a digital background check to ensure the safety of the community. After registration, the user would be able to view products available for trade under the header “New this week”. The “Community Chat Room” is a hub for hobbyists and urban farmers to connect directly with consumers.

In order to ensure users are abiding by food quality standards, users must take a photo of the product they are trading prior to drop-off; at this point the ML Bot can confirm whether or not the food has spoiled, or how many days it has before it will spoil. In order to motivate users to trade with their community and disrupt the societal norm of food wastage - the trading transaction has been gamified with ratings, leaderboards, and personal sustainability progress reports. There is also a resource page that will educate users on sustainability, what it means to be part of a food sharing economy, and more.



COMPETITOR ANALYSIS

Karma

Allows consumers to discover unsold food from nearby restaurants, cafes and bars

Olio

Connects neighbours and local retailers, so that surplus food can be shared and not disposed of

Flashfood

A platform for groceries to resell best-before date foods at a discount, and offers delivery

Too Good to Go

A platform for stores to sell surplus produce at a reduced price

Y No Desperidicio

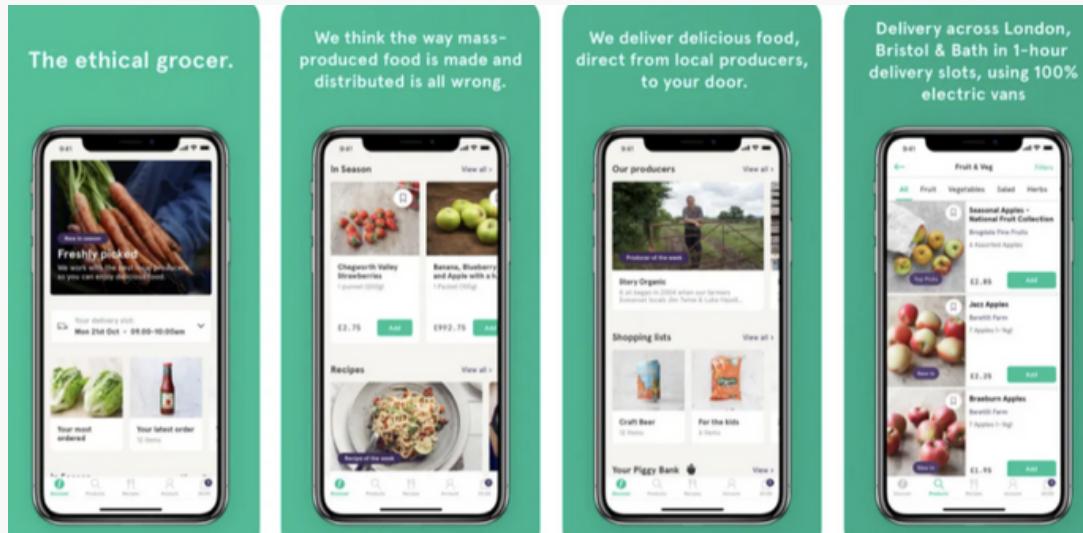
Promotes the exchange of raw and cooked food in Spain

ImpactVision

Uses advanced imaging technology to assess the quality of food

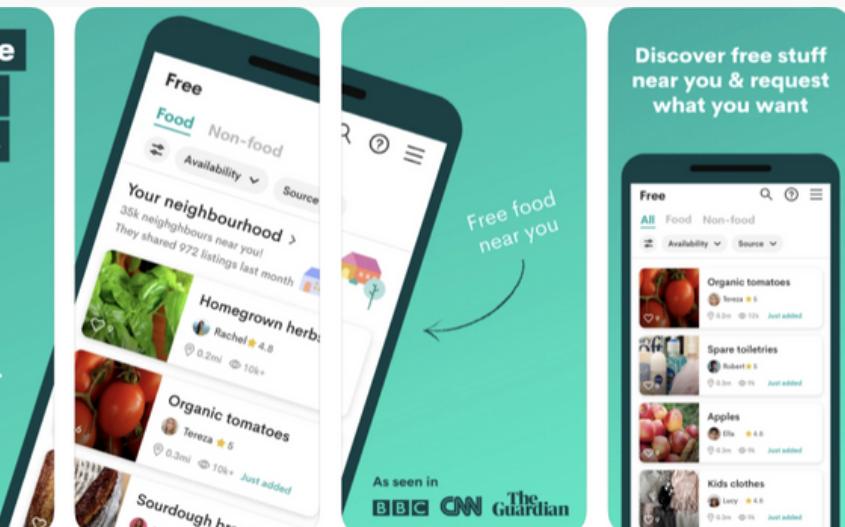
Competitor App Screens

Karma



Share more
Care more
Waste less

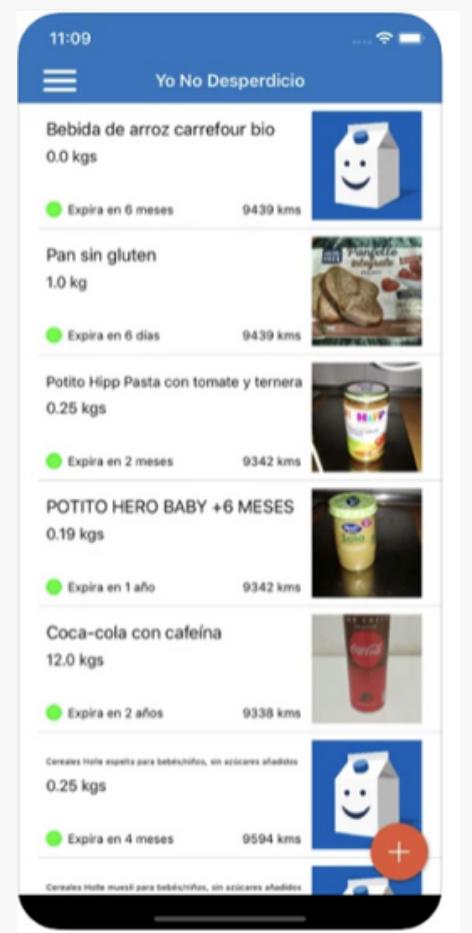
Join millions
of neighbours.
Share for free
or shop locally.



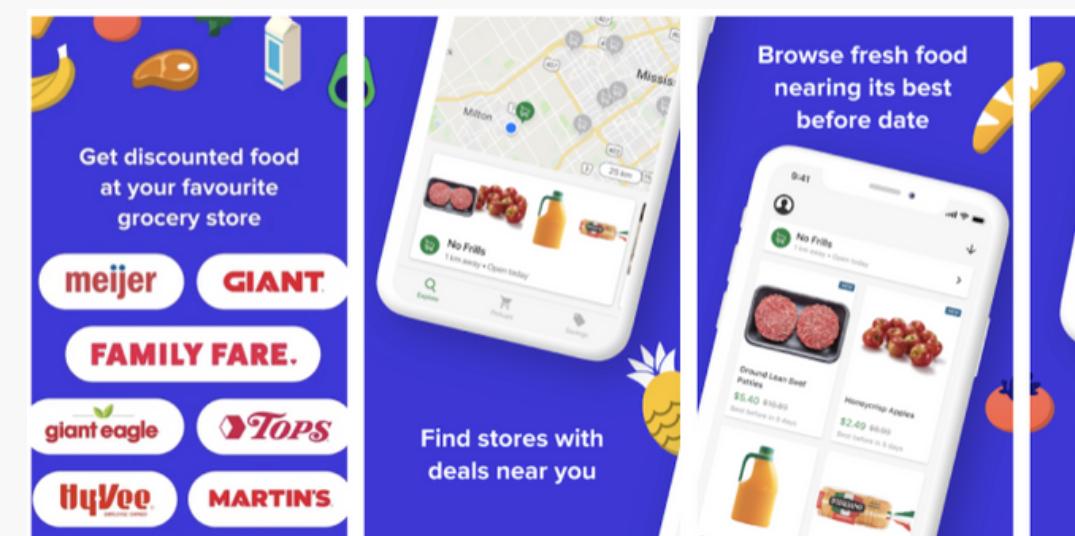
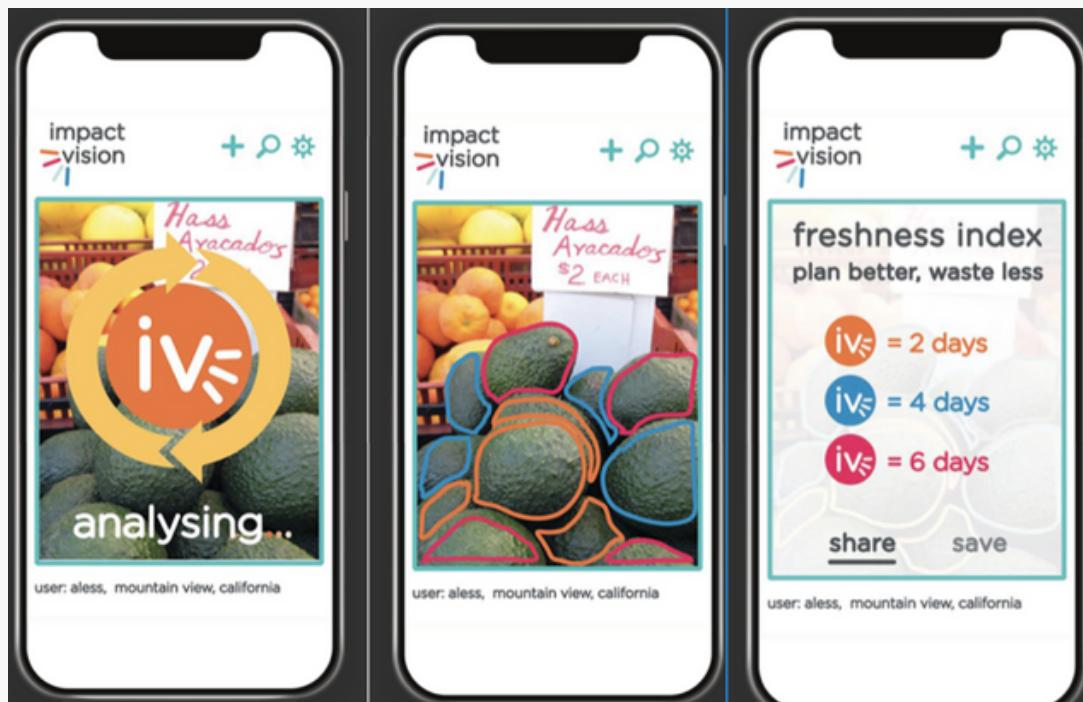
Olio

Discover free stuff
near you & request
what you want

Y No
Desperdicio



ImpactVision



Flashfood

Success Metrics

The mobile app's success can be measured by the **number of app installations** and **recurring users**, the **frequency of in-app purchases** for additional features, **public trust** in media outlets, and **environmental success metrics** such as reductions in personal and overall community energy usage, greenhouse emissions, and waste generation through the analysis of confirmed trades.

Publicly available data from competitors:

Olio: achieved over 2.6 million users, 34 ratings in the App Store, and claims of 9.8 million portions of food shared and 1.4 billion litres of water saved.

Flashfood: achieved 5k ratings in the App Store

300k

20+

TWO
MILLION

Both apps have been in the market for over 4 years. A reasonable baseline success metric for the app in its first year is: **300k app downloads**, **20+ ratings in the App Store**, and **two million portions of food shared** with data backed by the ML model.

Data Acquisition

The data acquired (slide 15) had no cost. Many food image databases are available and open for use, and compiled by open source projects and educational institutions. Since the images are of food, no personally identifying information or data sensitivity issues will be needed to overcome. Database update frequency will depend on the success of the initial MVP launch. In the interim, a large batch of data will need to be added, and on a potentially ongoing basis would need to be refreshed with new data as it becomes available. For datasets that are not readily available (for example: annotated images of plant-based foods), in this case our team may need to spend weeks taking pictures to build a meaningful dataset and may require data labelling services such as those provided by Google Cloud, Appen, and Lionbridge AI.

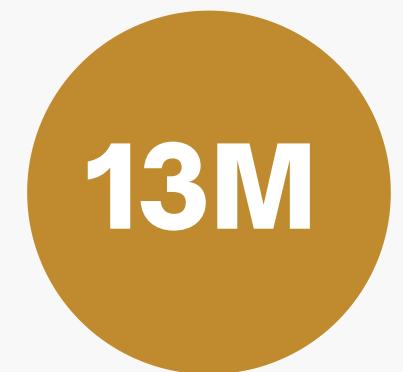
It is important to review each third-party data acquisition resources for use-restrictions. When faced with a merger or acquisition, it is important to prepare data scalability, data integration efficiency, and organizational aspects.

Data Source

The images used for the model was collected through the following sources:

- The Recipe1M+ Dataset which contains one million structured cooking recipes with 13 million associated images. The dataset is distributed as follows: 31% main course, 3% snack, 5% beverage, 5% soup/stew, 5% bread, 6% salad, 11% appetizer, 12% side dish, 22% dessert.
- The Food Repo Dataset which contains over 44 thousand food products with full-resolution images.
- Plant Image Analysis Dataset with over 1 million images of plants (to fill produce data)

The biases that are built into this current database lean heavily towards food-specific images, particularly main course meals and plant products. To better diversify this dataset, it may be important to also feed the dataset non-food items to ensure reliability and credibility with the community. In addition, a more even distribution of food type image data files is necessary.



RECIPE1M+ DATASET



THE FOOD REPO



PLANT IMAGE ANALYSIS

Data Labels



Data labelling for these images will be broken down by food-type, and its main ingredients. For example:

If the Model received this photo from the user, the Model will identify that there is a 98% chance that it is Chicken Alfredo, 99% chance that it is pasta, 98% chance there's chicken, 95% chance it has spinach, and 95% chance it is a cheese-based sauce.

This data labeling is most effective because it will allow users to filter out ingredients from recipes that do not meet their dietary needs or taste preferences; and will also enable the model to learn of patterns in food wastage depending on type of food and type of ingredients.

Model Building

The AI PaaS platform used for Model building will be via Microsoft's AI Computer Vision. This model will enable the team to move to production sooner in comparison to building a model from scratch. Microsoft's model will Identify and tag the content of an image, give a written description, and give confidence ratings on the result.

The S1 - Web/Container Instance offers over 100 million transactions at \$0.40 per 1000 transactions. This option in the pricing tier runs at 10 transactions per second. The valued estimate for 1.5 million describe operations, plus 4 million recognize operations, plus 500 000 OCR operations totals to about \$8750 per monthly billing period. As a sustainable company, it is also important to ensure resources within the company are sustainable. By investing in Microsoft's model, in the long-term we save in time and have an opportunity to build stronger trust relationships with customers, earlier.

Data App Privacy

The following data may be used to track users across apps and websites owned by other companies, and/or collected and linked to the users' identity:

- Purchases / Trades
- Contact Info
- Identifiers
- Location
- Diagnostics
- Usage Data
- User Content
- Sensitive Info

Evaluating Results

01

High Recall

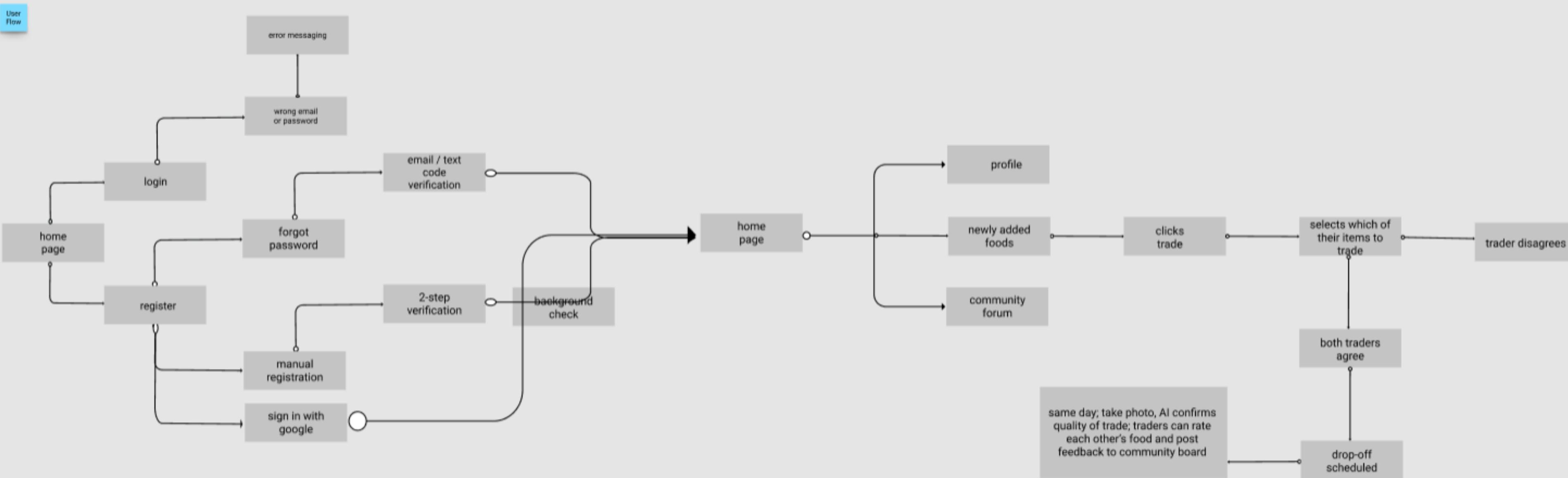
High Recall (over 80%) and at least 90% accuracy on a test dataset of 5000 images, this is because we want to know what proportion of actual positives were identified correctly. In the context of this app, truth detection is the most important quality of the model, because it will enable the app to gain credibility and trust from the community of users.

02

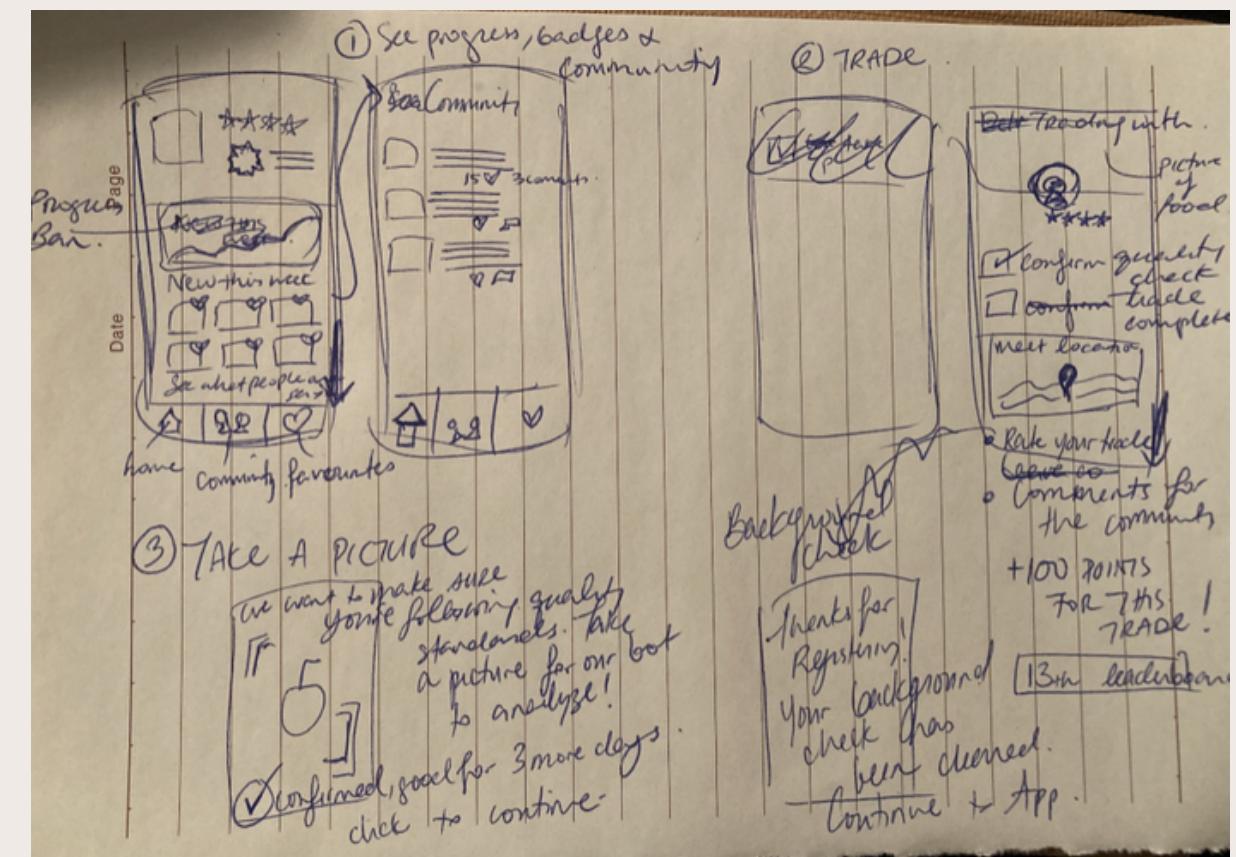
High Accuracy

User Flow

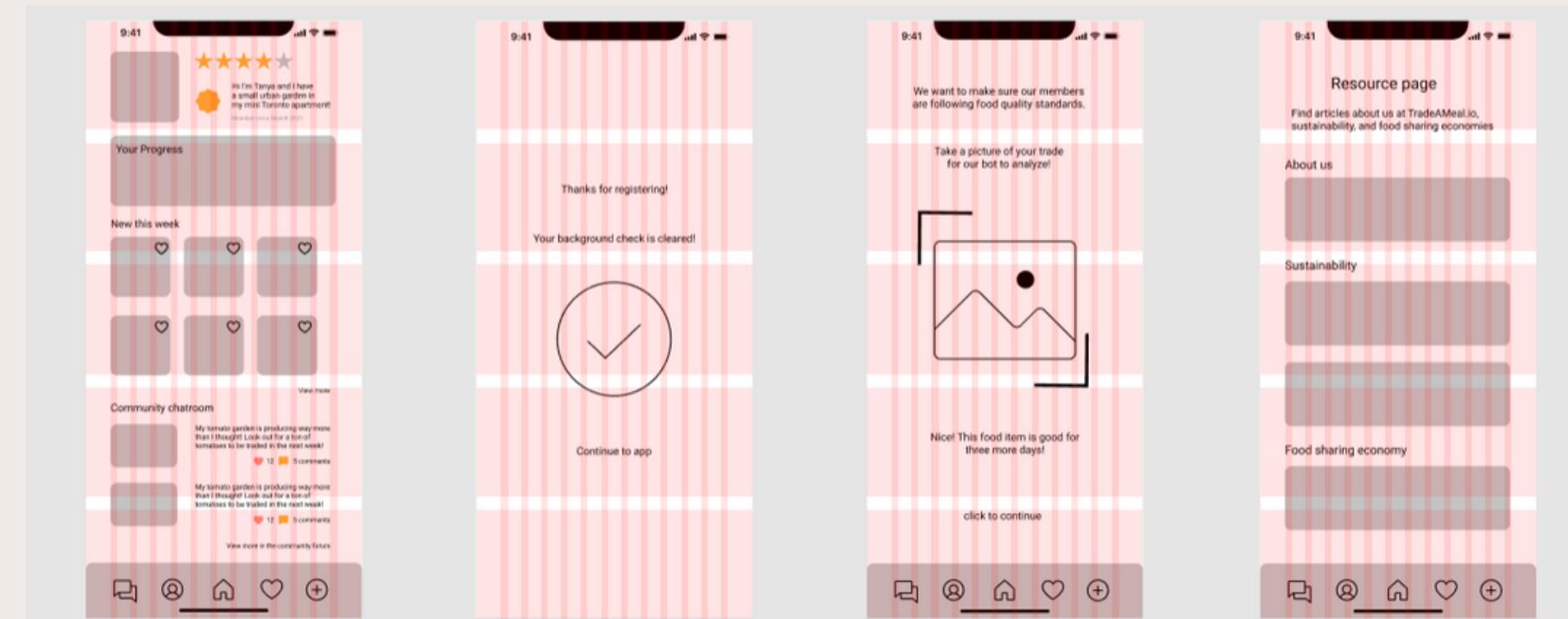
TRADEAMEAL APP



SKETCHES



TRADEAMEAL APP

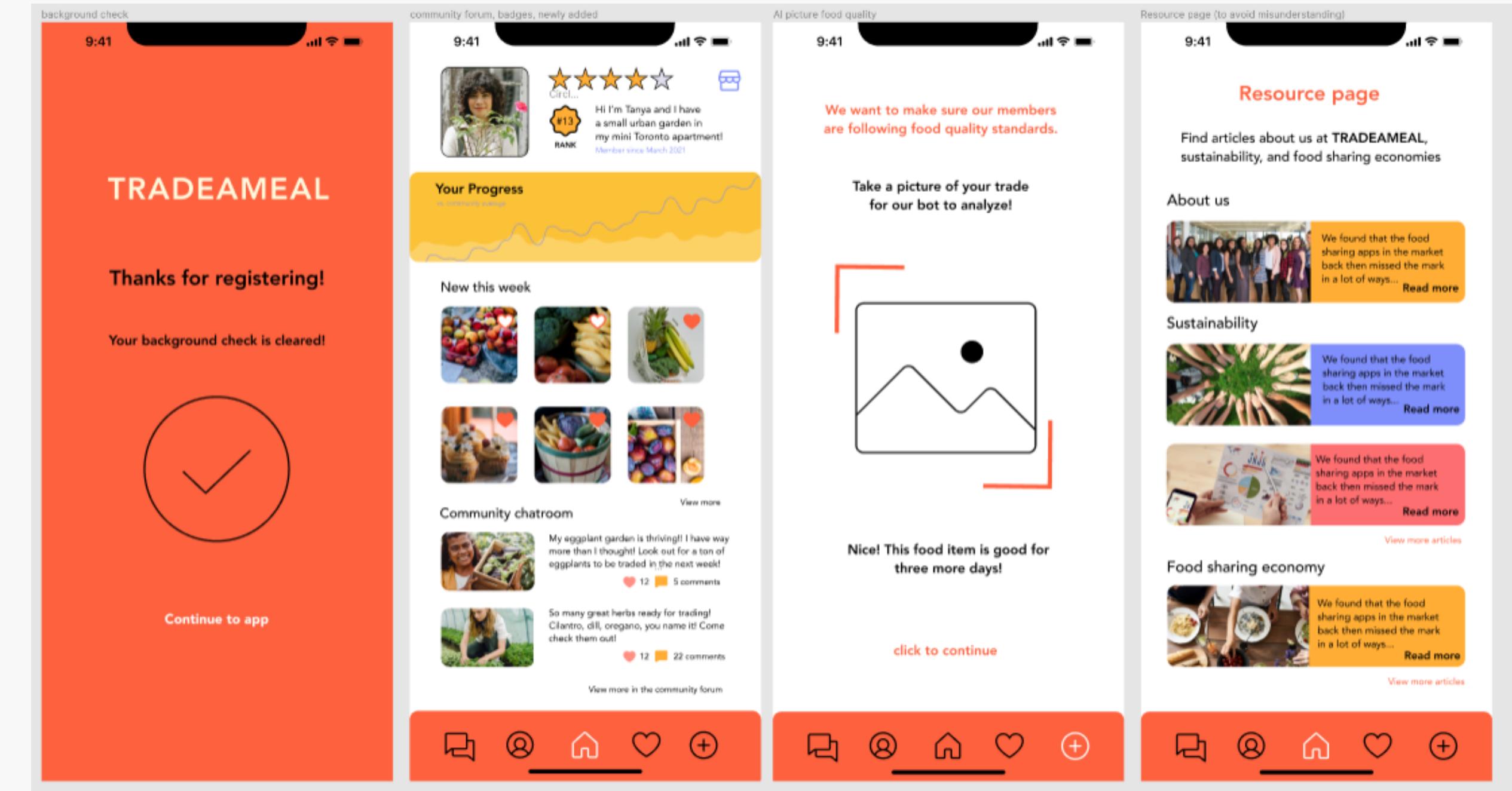


19/29

LOW FIDELITY PROTOTYPE

HIGH FIDELITY

TRADEAMEAL APP



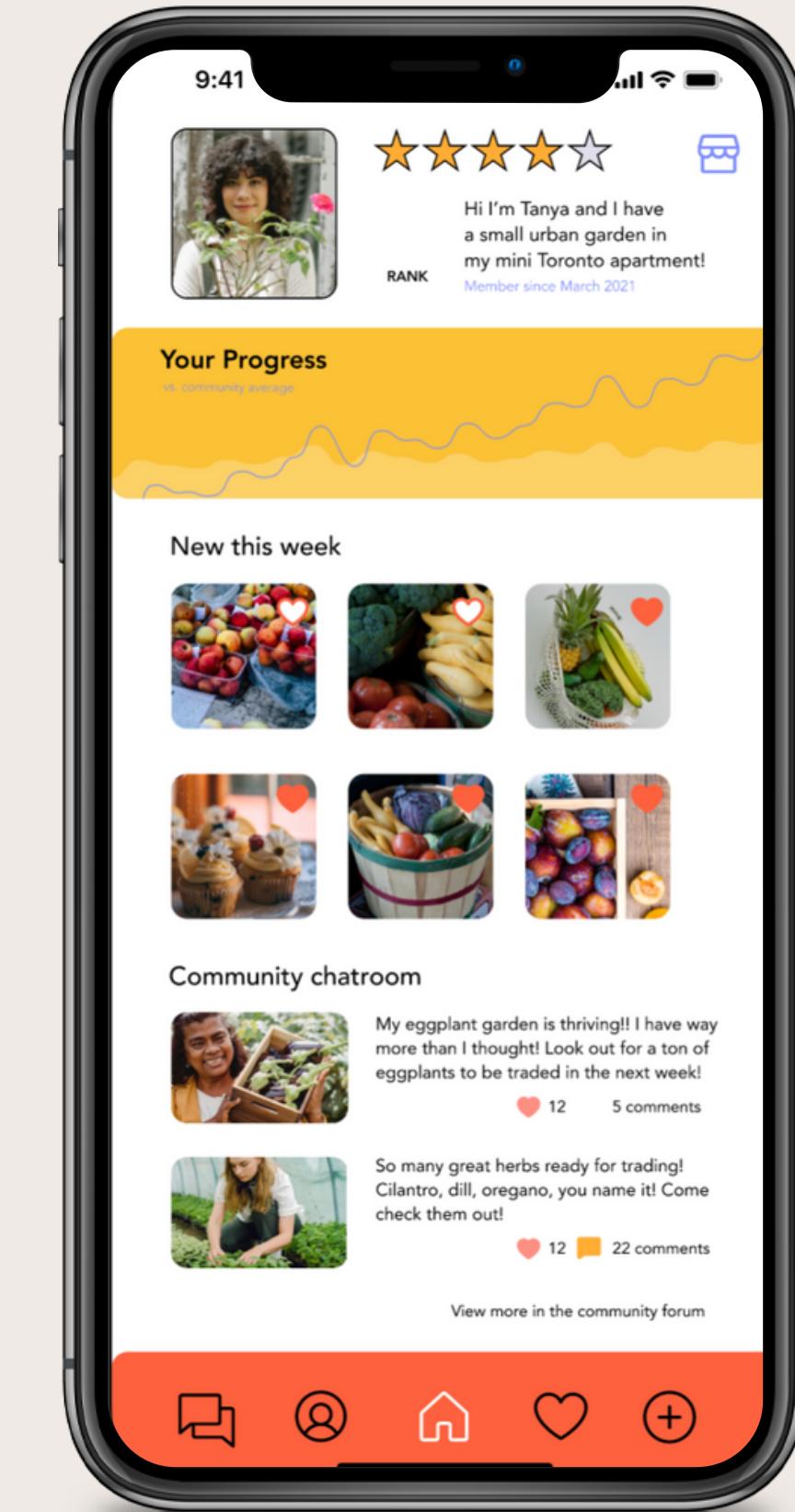
Marketing

Join millions of communities all over North America who are using TRADEAMEAL to share meals, create less waste, and become strong stewards of the environment.

TRADEAMEAL safely connects neighbours to each other to share meals and produce for free.

How to use TRADEAMEAL:

- Create an Account and undergo a digital background check
- Take photos of the products you want to share and post (Our AI technology will create product descriptions and freshness expiration date for you)
- Keep posting, request trades, or chat with community members
- Safely meetup for trades using no-contact pick-ups. Take a picture of the product you receive, and the AI technology will track your trades to give the most accurate progress and community results.
- Give the trade a rating so that our technology can continue to ensure the community holds only the most honest members and best quality trades
- Earn points and see your impact live



USER PERSONAS

ARCHETYPE: SUSTAINABLE NEWBIE

Samantha Angelou
Age: 27
Gender: Female
Income: 32K
Education: BSc
Occupation: Zara Store Manager
Family status: Single
Location: Toronto, ON
Archetype: sustainability newbie



Samantha is always on-top of the latest trends, but her stacking credit card debt, and concerns surrounding her greenhouse gas footprint are looming negatives in her life.

Goals:

- Find a sustainability habit and stick to it
- Be part of a community of like minded folks to motivate each other

Challenges:

- User-unfriendliness of some sustainability apps
- Lack in self-motivation
- Wants to track progress

USER PERSONAS

Anita Poinsetta
Age: 43
Gender: Female
Income: 38K
Education: High School
Occupation: Customer Service Representative
Family status: Single mom, 1 toddler
Location: Toronto, ON
Archetype: struggling working mom



ARCHETYPE: STRUGGLING WORKING MOM

Anita is a full-time remote-working mom and often struggles to find the energy to make meals and cannot afford to regularly purchase takeout. A lot of the food in her fridge tends to go to waste because she forgets they are there.

Goals:

- Find an alternative and convenient access to food/meals
- Reduce food waste, and therefore also cash flow waste

Challenges:

- Too busy to travel outside of her neighbourhood
- Grocery store is about a 20 min drive away from home and tends to bulk buy, leading to lots of food waste

USER PERSONAS

ARCHETYPE: SURPLUS CONTRIBUTOR

Alex Summon

Age: 32

Gender: Male

Income: 52K

Education: Culinary School

Occupation: Personal Chef and
Business Owner

Family status: Single

Location: Toronto, ON

Archetype: surplus contributor



Alex is a personal chef that has worked for many large restaurants and catering companies. Alex's personal hobby is to cook for other people, and also finds a lot of food wasted after catering events.

Goals:

- Donate food to a trusted community
- Be part of a community

Challenges:

- Doesn't like current food sustainability apps that ship products via car/truck/plane risking more food wastage and a larger carbon footprint
- Complex recipes he doesn't have the time to write out and describe each aspect of a meal

Roll-Out

The go-to market plan

After the launch of the prototype to early adopters, with the help of funding opportunities (such as \$4 billion dollars in funding grants and other assistance programs by EPA Awards), it is imperative that the team collect feedback from the users. The UX, Data Analytics, Marketing and Research and Development team will monitor public responses and reviews to identify opportunities to immediately address and publish updates to the App to better quickly improve and serve community needs. User feedback is important in ensuring market validation, and will also help generate ideas grounded in user behaviour research and will therefore shape future iterations of the product. It is also vitally important to keep in mind that there may be dramatic change in the product depending on customer feedback. The quick turnaround for iterations and improvements will set us apart from long-standing apps in the food sustainability industry.

Post-MVP-Deployment

Designing for longevity: Media

Monitoring App reviews and media posts regarding our AI product's Vision Feature will allow the team to identify unique cases that the AI had not yet been trained on before. Updating the AI's database with these unique cases will better improve its accuracy.

For example, the model may need to be trained on various new foods, ingredients, and bacterial/fungal images that have the potential for being introduced in the future. For example: differentiating between real meat product vs a plant based meat product, or a new type of spore only found on peaches, etc).

Post-MVP-Deployment

Designing for longevity: A/B Testing

A/B Testing will be especially important when testing for successful increase in conversion to in-app paid features and subscriptions to increase incremental sales revenue, click-through rates (from login to successful trade), optimizing for repeat visitors on website traffic, email open rate, and to strategize increasing the daily and monthly active user rates.

Monitor Bias

In order to mitigate unwanted bias in the model, human intervention needs to be proactively on the lookout for potentially missed biases in the training data via statistics and data exploration, and ensure the human intervention has empathy for all the end-users.

By annotating with a large pool of human annotators, more viewpoints can be heard across a dataset, largely reducing bias at the initial launch as well as through the retraining of the model.

Thank you

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