Cater

A Dining Recommendation App That Understands Users.

HCDE 493
Capstone

Samuel Marks

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Bio

Hi, I am Samuel Marks. After many years in construction and warehouse management, I am making a career change and bringing my unique perspective to the field of user research and design. I am a senior in the University of Washington's Human Centered Design & Engineering undergraduate program, with a focus in Human Computer Interaction. Currently I am working as a intern videographer for the Communications Manager in the HCDE department. I am excited to begin working as an interaction or user experience designer after graduating this Spring. I am interested in designing more accessible and engaging learning experiences and encouraging interaction through immersive entertainment.

Executive Summary

Food allergies affect approximately 5% of children and 4% of adults in the United States and can often be life threatening incidents. Researchers in the U.S. have discovered an increase in the incident of food allergy amongst children, which has contributed to an increase in public awareness [National Institute of Allergy and Infectious Disease, 2012]. In response, many restaurants and food producers have created alternatives for consumers who suffer from conditions such as Celiac Disease and Lactose Intolerance, such as Gluten and Dairy Free substitutes, even still, navigating the menu and ingredient lists can be challenging and leave consumers at risk. When it comes to dining out, identifying these types of dietary restriction is only half of the challenge. Cater is a contextually-aware recommendation app that helps users balance their dietary restrictions with their unique dining preferences, offering users better recommendation listings and the ability to find meals they can enjoy in a variety of situations.

To understand users' needs better, I conducted research with 10 participants and discovered 3 global themes, Context, Interaction and Preference, that guided users' dining recommendation and decision-making processes. I also conducted a competitive landscape analysis to understand how popular products are already meeting users needs or how they fall short. From this analysis I identified common features shared by personal assistant and recommendation apps, such as shared access to location and contact information, unique profile settings, the use of machine-learning, and home and automotive integration. Based on these findings, I developed an interactive prototype called Cater that incorporates features users found to be most influential during the decision making process. With this prototype I simulated a number of use case scenarios in order to evaluate the design with 2 other participants. The results of this evaluation were analyzed and then compared with previous research, as well as with regular feedback from subject matter expert, Dr. Eyal Ofek, and capstone mentor, Jared Bauer. These ideas ultimately led to a refined set of system specifications that highlight the importance of establishing mutual benefits between users with dietary restrictions and the restaurant owners, chefs, cooks, and servers who prepare meals for them.

Introduction

Initially, my research was focused on improving speech-interfaces and voice command systems. Noting the increasingly personal relationship users share with technology, I wanted to investigate an interaction common to many users yet personal enough to reveal novel behaviors or insights. Dining was one such interaction and eventually became the primary problem space that my design would work to solve.

To begin I reviewed literature on research in contextual awareness and work in communication theories, as well as more general texts on telecommunications and Computer Supported Collaborative Work. One of the most influential papers described a system by Kjeldskov and Paay called Just-for-Us [2005]. Their study demonstrated that while contextual awareness of physical and spatial information can significantly assist in a range of human activities, successfully conveying meaning through social context requires attention to what Kjeldskov and Paay call "subtle context" and "making the implicit explicit". Subtle context refers to the complexity of social relationships that cannot be deduced simply through physical proximity alone. Making the implicit explicit is the representations of social context, "such as the presence and activities of other people in the surrounding environment". This is how I became concerned with the mechanisms and outcomes of individuals' decision making processes, and how experiences and social affiliations contribute to future preferences and biases. Again, dining appeared to be a suitable circumstance for exploring such questions.

In addition, I followed the work of Brennan and Clark, who described the importance of grounding in interpersonal communication as a means of confirming and reaffirming mutual understanding [1991]. Clark's principle of "least collaborative effort" says that "participants try to minimize their collaborative effort" to establish such a level of shared understanding. Throughout this project, the idea of least collaborative effort re-emerged, albeit with new meaning. Eventually this idea would become the engine behind the Cater application and its proposed community of users

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Once I began user research, I quickly discovered a lack of interaction between users and their speech-interface and voice command systems. I discovered that this was largely due to a misunderstanding on the part of the system that often led to poor recommendations that missed the mark in a variety of ways. While there was a strong social component to the recommendation process, users performed most of the work involved with accessing these resources on their own. In addition I discovered that a number of inconsistencies in digital resources such as images and menus led to confusion about what user could or could not determine from viewing them. Realizing that this lack of contextual understanding depends on deeper threads of interaction, I moved away from the speech interface to focus on developing common ground between users and their recommendation systems.

Research Process

Contextual Inquiry & Semi-Structured Interviews

I conducted user research with 10 participants playing opposite roles in a hypothetical dining recommendation scenario and gathered responses that shed light on users goals and decision making processes

Competitive Landscape Analysis

Then I analyzed and compared 12 separate personal assistant and recommendation applications to identify common features and opportunities for novel concepts.

Ideation & Prototype Design

Based on the finding from user research and competitive landscape analysis, I created an interaction model and designed an early prototype that incorporated user feedback and influential features of dining recommendation apps. I also implemented a design requirement to gather more personal information about users dining preferences and dietary restrictions.

Evaluation & Design Specifications

Finally, I evaluated the design with 2 participants to understand how users would interpret and use the Cater system. I also made considerations for the collection of useful data such as restaurant menus and ingredient lists and identified specifications for usability issues discovered during testing.

Contextual Inquiry & Semi-Structured Interviews

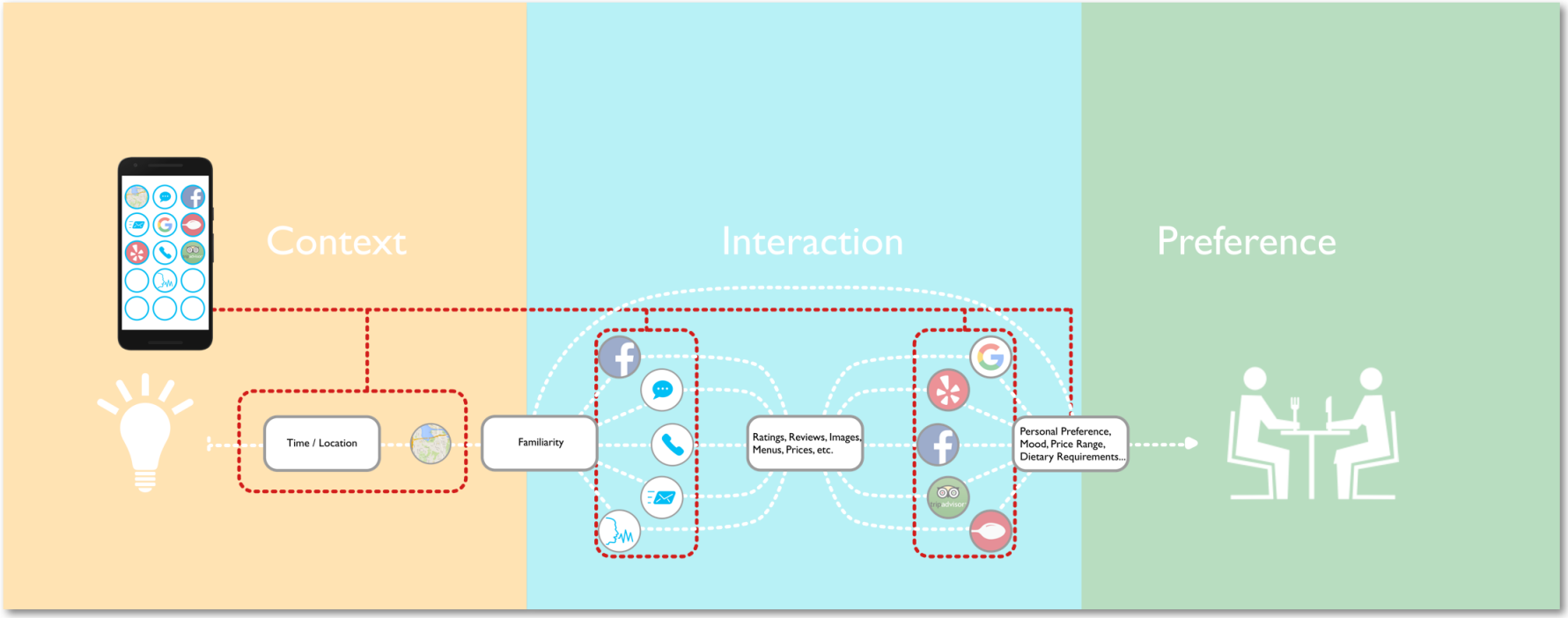
To conduct a contextual inquiry of natural interaction I designed two role-playing scenarios in which pairs of participants gave each other dining recommendations. Participants were interviewed before and after the exercise and asked to describe previous instances when they gave or received recommendations and to reflect on their decisions during the contextual inquiry. I then performed an analysis similar to affinity diagramming and discovered 3 global themes that guided users' decision making processes; **Context**, **Interaction**, & **Preference**.

Context: Users often worked to find suitable recommendations within an acceptable distance from their location. They also considered the time of day and their relationship to other people in their party before narrowing their options to a smaller set of choices. During the role Familiarity was also noted as a major influencing factor and served as the basis for early stages of user interaction.

Interaction: For the sake of familiarity, users first looked to acquaintances in their social networks for recommendations. Users reported a higher level of trust in recommendations from these network connections, although many were compared with star rating and reviews found on recommendation apps and services like Yelp! and Google+. Users also reported a preference for digital photos of the food and restaurant, as well as access to menus and other digital information.

Preference: While cuisine tastes and ambience preferences varied, each participant noted similar methods of judging restaurants based on preference. Past experience, good food, and great service all contributed toward the likelihood a restaurant would be recalled an shared at a later time. This is precisely how trust is established between users and the difference between recommendations from apps and people.

Interaction Model



Users perform a substantial amount of cognitive work to give and receive dining recommendations using their smartphones. Following Clark's concept of "least collaborative effort", this interaction model demonstrates the ability to gather and store information that is relevant to the search before hand. Asking users to share their contact and location information and to personalize their own user profile with cuisine preferences, ambience preferences, and dietary restrictions, Cater compares this information with search results to provide more suitable dining recommendations in a variety of circumstances. To address Kjeldskov and Paay's concepts of "subtle context" and "making the implicit explicit", Cater leverages shared knowledge about users dining preferences and dietary restrictions. This way, users with similar tastes and dietary restrictions can count on sharing common ground with their network contacts and learn to rely on this community of reviewers.

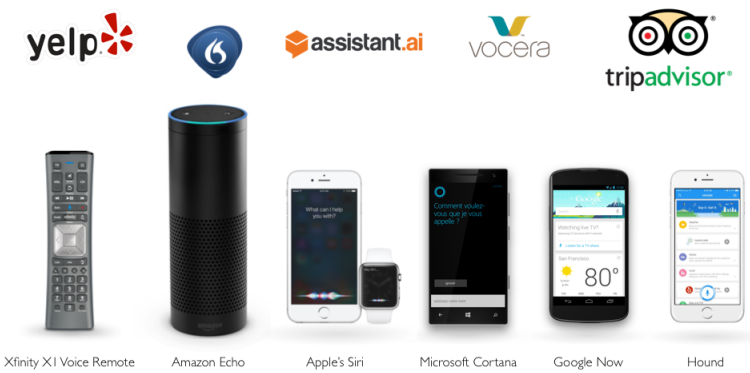
Competitive Analysis

To understand how successful products on the market are already serving the needs of their customers I conducted a competitive landscape analysis of 12 different personal assistant or recommendation based technologies.The goal was to identify common features or solution under the global themes discovered during user research: **Context**, **Interaction**, and **Preference**.

To establish **context** with users, many of these technologies request permission to access users' locations and contact information. Others use preference settings to allow users to select from specific options. For example, Microsoft's Cortana has a "notebook" feature which allows users to indicate preferences from cuisine type and restaurant ambience, to personal health and finances.

At the level of **interaction**, many products feature integration with third party services, such as Apple's Siri, which automatically draws ratings and reviews from Yelp!, and Android smartphones that are integrated with Google+ and the Google search engine. Many products also promise improved recommendations with continued use and interaction, such as Amazon's Echo that makes recommendations based on users Amazon Prime accounts. Perhaps another grab at context, many leading products are actively pursuing features to integrate with smart homes and automobiles, encouraging this continued and prolonged interaction at home and on the go.

Preference, as noted above, is sometimes indicated by users explicitly, while other times it is implied by users' behaviors and acted upon by algorithms working behind the scenes. Products like Yelp! and the TripAdvisor app offer recommendations from a variety of resources, but it is not always clear what is driving these decisions. While this may be less of a concern for specialized services like restaurant and travel recommendation apps, I believe that an untapped opportunity lies within an open dialogue with users.



Xfinity X1 Voice Remote | Amazon Echo | Apple's Siri | Microsoft Cortana | Google Now | Hound

Competitive Analysis Matrix

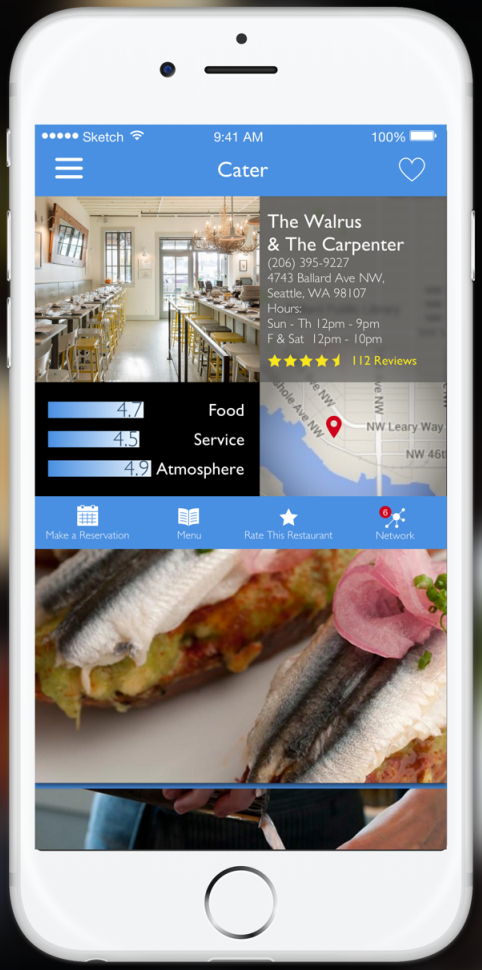
	Auto Integration	Home & Appliance Integration	Local Recommendations	Location Awareness	Entertainment	General Information/Q&A	Machine Learning	Search Engines	Speech Interface	Voice & Text Message	3rd Party App Integration	Native App Integration	Preference Settings	Device Type	Operating System	Cost
Amazon Echo	✓	✓	✓		✓	✓	✓	Amazon Search & 3rd Party Services	✓	✓	✓	✓	Adapts to preferences and speech	Stand Alone 9.25" x 3.27"	Cloud Based AWS, AVS, & ASK	$179.99
Assistant.ai	✓	✓	✓	✓	✓	✓	✓	Google	✓	✓	✓	✓	Language & Avatar Settings	Mobile App	Android, iOS, & Windows Phone	Free
Cortana	✓	✓	✓	✓	✓	✓	✓	Bing	✓	✓	✓	✓	Notebook feature gathers and stores a wide rang of preference info	Mobile & Desktop App	Android, iOS, Windows 10 & WIndows Phone	**Free** (Standard on Windows Phone and WIndows 10)
Dragon Mobile Assistant	✓		✓	✓	✓	✓	✓	Google	✓	✓	✓	✓	3rd Party Apps & Search engine settings	Mobile App	Android 4.0 and up	Free
Dragon Go!			✓	✓	✓	✓	✓	Bing, Google, & Yahoo	✓		✓	✓	Social media account, Search provider, Language	Mobile App	iOS 4.0 and up	Free
Hound	✓		✓	✓	✓	✓	✓	Bing	✓	✓	✓	✓	Voice Feedback settings, Bluetooth connectivity, measurement units, permissions	Mobile App	Android & iOS	Free
Ok Google	✓	✓	✓	✓	✓	✓	✓	Google	✓	✓	✓	✓	Trusted voice, any screen access, search filters, instant prediction, past searches	Mobile & Desktop App	Android, iOS, & Windows Phone	**Free** (Standard on Android devices & Chromebooks)
Siri	✓	✓	✓	✓	✓	✓	✓	Bing	✓	✓	✓	✓	Language, Voice feedback settings, set contact profile relations	iPhone, iPad, & other Apple Products	iOS 6 and up	Standard with a range of Apple Products
Trip Advisor			✓	✓			✓	Gathers information from over 200 sites			✓		Automatic Timeline, measurement units, payment options, save favorites, "Saves"	Mobile App	Android, iOS, & Windows Phone	Free
Vocera B3000n							?	N/A	✓	✓			Multi-User Operation Design	Wearable Device	Enterprise Class WiFi Network	Service Plans at Vocera.com
Yelp!			✓	✓			✓	Yelp Now			✓		About Me profile (friends, reviews, photos & videos, messages, bookmarks, events, etc.)	Mobile App	Android, iOS, & Windows Phone	Free
X1 Voice Remote		✓	✓		✓		?	N/A	✓				Mark favorite channels and genres	Remote Control	Xfinity Entertainment Operating System	Free with X1 DVR subscription

Subject Matter Expert Feedback

Throughout the course of research and design I regularly met with Dr. Eyal Ofek, a Senior Researcher at the Natural Interaction Lab at Microsoft Research. Dr. Ofek contributed his expert opinion on research and development in response to project updates, and encouraged me to pursue opportunities presented through user research. Recognizing trends that appeared during user research, Dr. Ofek suggested exploring a feature that would filter recommendation results by users dietary restrictions. During our meetings I learned to focus not only on end-users' needs, but also to consider the effort and resources needed to build and implement the proposed recommendation service. In addition to user research with consumers, such a system would require input from restaurant owners, chefs, cooks and servers as well.

Eyal Ofek, PhD
Senior Researcher
Microsoft Research

Cater



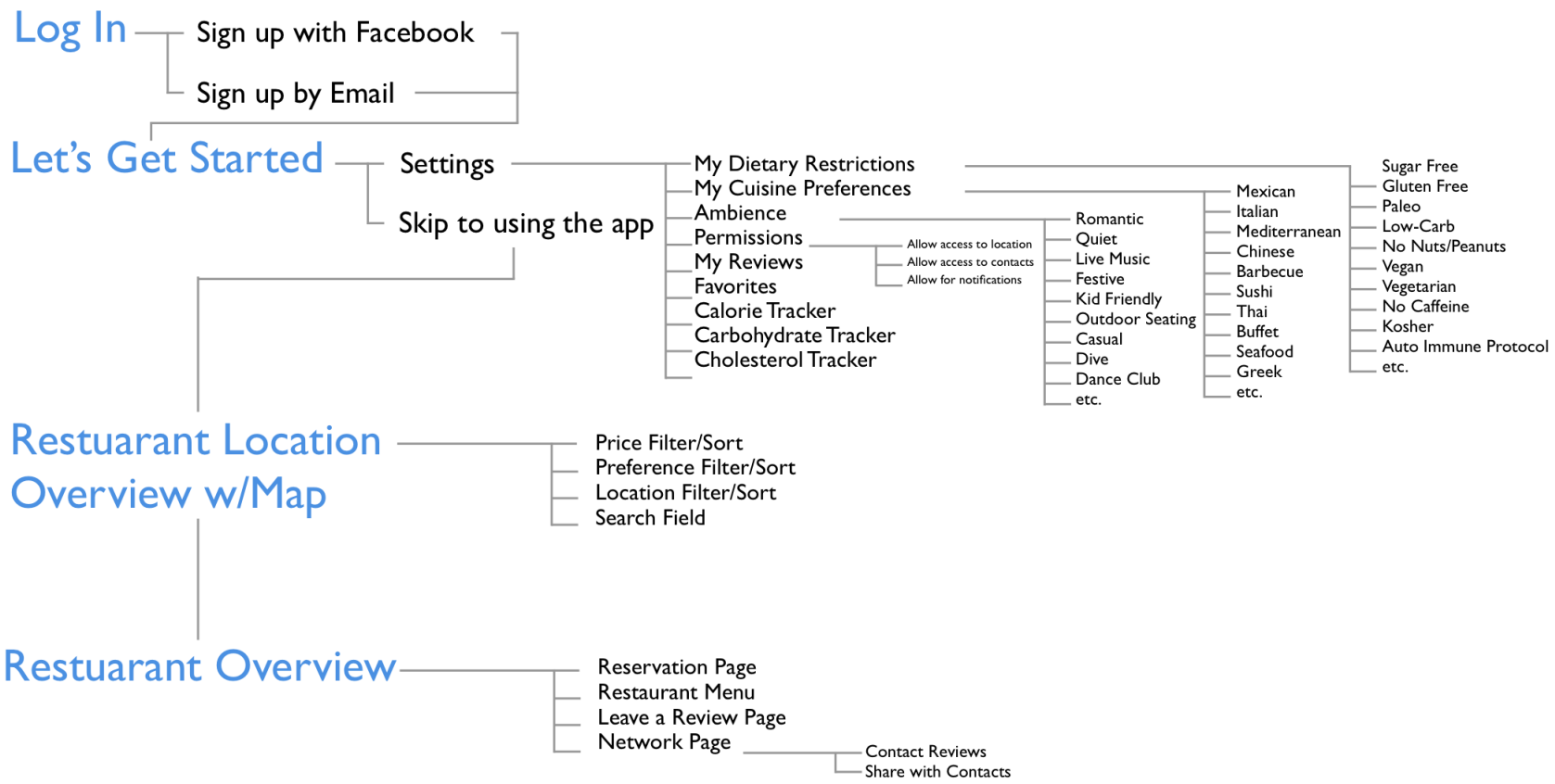
System Features:

- Integrated with Contacts
- Visible Contact Association
- Geo-Fencing for Location Awareness
- Map/Directions
- Preference Tagging
- Digital Photos
- Overall Star Ratings
- Multi-Dimension Rating & Review

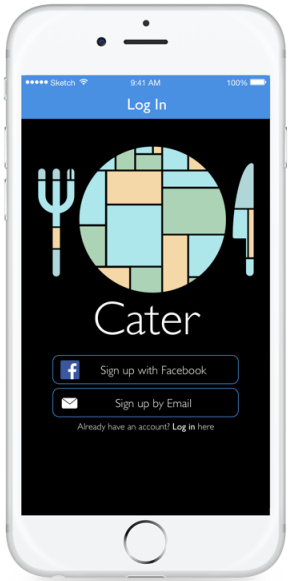
Sort and Filter by:

- Proximity
- Preferences
- Dietary Restrictions
- Custom Search
- Price Range

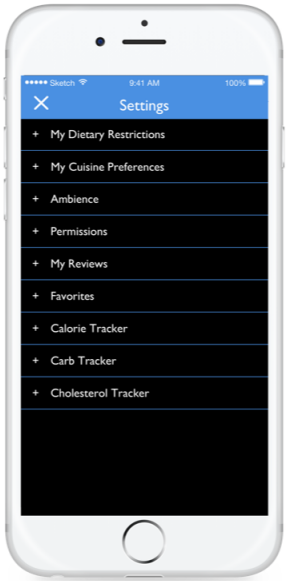
Cater: Information Hierarchy



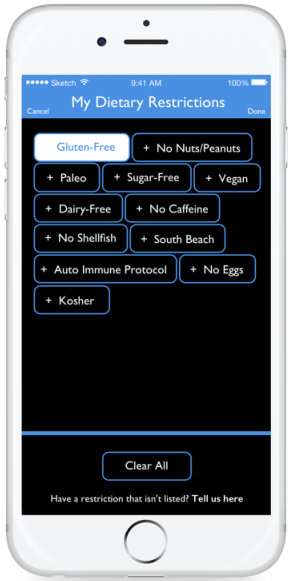
Cater: Feature Details



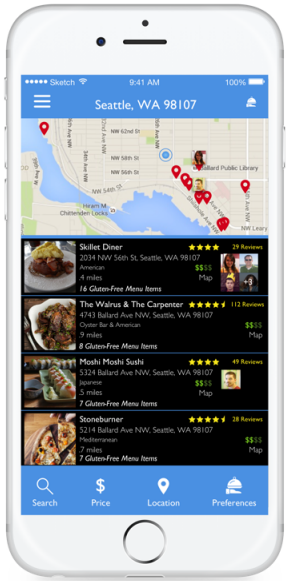
Cater features bright, yet non-intrusive colors and simple and easy to read text.



Users start by customizing a comprehensive list of profile settings. Settings include the app's permissions to contact and location information that users can enable or disable, tags for indicating cuisine and ambience preferences, as well as dietary restrictions. Settings also allow users to monitor intake by calories, carbs, and cholesterol, and view history and favorites.

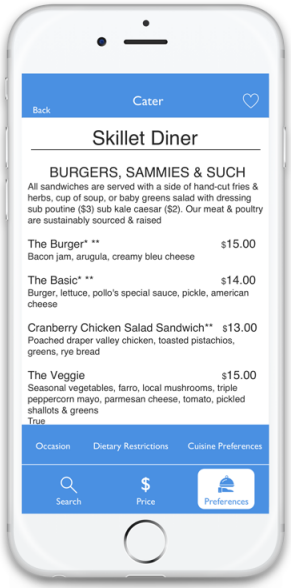


Preference and restriction settings are tag based to avoid inconsistent input. These tags can be used in weighted decision making in machine learning networks. Cater also allows users to report preference categories and restrictions that are not already listed so that Cater can grow and evolve with users' needs.

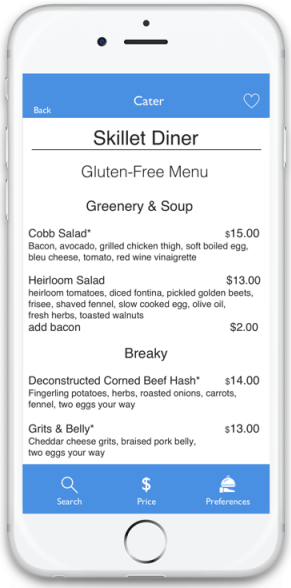


By default, Cater's search results are listed by proximity until user defined filters are applied. Users can choose to apply their dietary restriction and preference filters to every search, or select individual categories on an as needed basis.

Cater: Feature Details

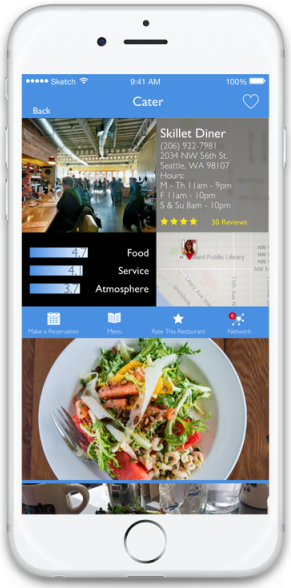


In addition to being able to filter restaurants by preferences, dietary restrictions, and price range, Cater users can also apply these filters to each menu. Users can easily find the menu items that fit their needs.



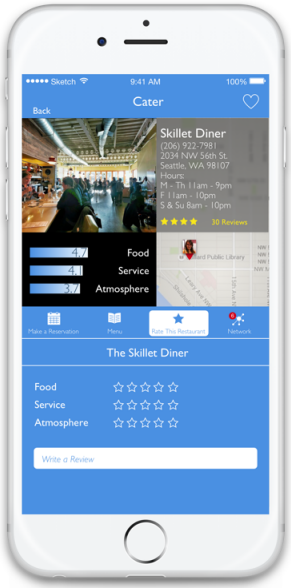
While dining, users can access the menu in a format that is optimized for mobile device screens using the Cater app. Descriptions of menu items and their prices can be found easily and quickly.

Cater: Feature Details

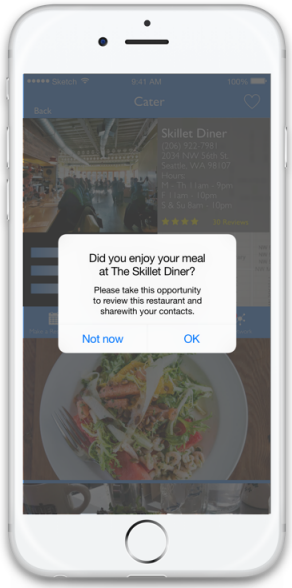


Cater features color images of each restaurant and select menu items. Users will also find the address, hours, and map directions to each location. Once users are viewing the restaurant page, they can make reservations, view a menu, leave a review, or see what people in their network have to say about it.

Cater users can see images of the people in their contacts who have visited and reviewed each restaurant, even in the map overview. Users can select featured contacts to read their personal reviews and check how they rated the restaurant.



Users can also leave their own reviews and rate the restaurant on multiple-dimensions; food, service, and atmosphere.



With it's geofencing feature, Cater knows when you have been at a restaurant and when you have finished and left. Using pop-up notifications, Cater asks for users feedback when the experience is fresh in their minds.

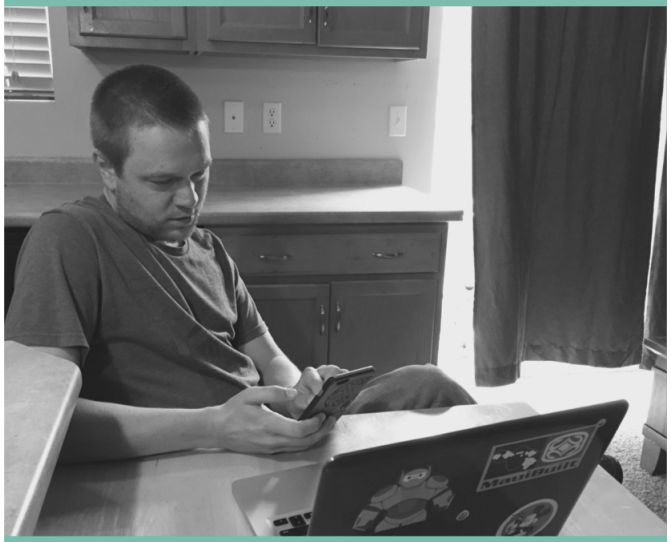
Prototype Evaluation

Participants

In order to evaluate the Cater prototype design, I recruited 2 participants who had different health conditions that limit their dietary choices. The first participant, a 37 year old male, has lived with type 1 diabetes for nearly his entire life. He regularly monitors his blood sugar levels and balances dietary sugar, and carbohydrate intake with insulin injections. The second participant, a 35 year old female, was recently diagnosed with Rheumatoid Arthritis and has been able to manage her pain by moderating her intake of foods known to be inflammatory, such as tree nuts, potatoes, and foods from the nightshade family.

Evaluation Process

The first scenario shown in the prototype video, features a fictional character that suffers from Celiac Disease who is looking for restaurants that have Gluten-Free menu items in an unfamiliar area. Acting as the evaluation moderator, I demonstrated the second scenario using a mobile app prototype in walk-thru fashion. In this scenario. The participants were asked to imagine themselves with a large party at a restaurant they did not choose. After searching the menu for suitable appetizers and entrees, the participant was shown the filtering and sorting features for restaurant menus. Each participant was asked whether they understood the app layout and it's purpose, whether contrast and text elements were easy to visualize, and if the features themselves seemed useful for the participants' specific dietary needs.



Prototype Evaluation

Findings

From this evaluation I learned that the prototype app was difficult to read, particularly on the restaurant overview page which displays a map, restaurant address, star ratings and price range. Both participants said that after applying dietary filters, the line of text that displays the specific dietary options was difficult to see. This was in contrast to the format of the menu which, both participants had no trouble viewing. Neither of the participants had trouble understanding and applying the tag filter options.

The second participant said that the app would be very helpful in her situation, but recalled other times at restaurants when she was disappointed because her entrees arrived with garnishments and other ingredients that were not listed on the menu. She also expressed concern for requesting substitutions or alternatives from servers stating specifically, “I just don’t want to be a hassle”.

The first participant said that the Sugar-Free option on the dietary restriction tags was not sufficient for his needs because he is not restricted from eating sugar. Instead he said that a more helpful feature would be one that allowed him to track and monitor dietary sugars and carbohydrates and notify him when he had reached a specified amount.

Both participants were impressed by the color images and found them to be useful in the decision making process. Aside from the above mentioned difficulties in legibility, neither participant reported difficulties understanding the app’s layout or visual hierarchy.

Final Specifications

Follwing the results of user research and prototype evaluation, I identified a number of ways to improve the functionality and design of the Cater app. These specifications are listed here and serve as the emphasis of future research and design.

- High Contrast Colors
- Large Bold Text for the Most Important Features
- Hi-Resolution Color Images
- Detailed Maps and Links to Directions
- Sorting and Filtering By Price Range, Cuisine and Ambience Preference, Proximity, and Dietary Restrictions
- Tracking Calculator for Dietary Limitations, such as Sugars, Carbohydrates, and Sodium
- Clear Descriptions of Filter Application
- Clear Description of Needs/Interests Shared by Network Contacts
- Detailed List of Restaurant Item Ingredients and Preparation Methods
- Simple Way to Communicate Dietary Needs and Request Substitutions From Severs, Cooks and Chefs
- Simple Way to Upload Restaurant Menus and Ingredient Lists

Reflection

This capstone project presented many challenges and unique learning opportunities. One of the most important lessons that I learned was how to communicate the important and actionable findings from research in a clear and concise manner. This was especially challenging given my independent involvement in this project and I learned to rely on input from my subject matter expert, Dr. Ofek, as well as my capstone mentor, Jared Bauer, to refine my ideas and presentation.

I also faced challenges inherent to working independently. Adhering to the scheduled curriculum, finding user research participants, and accomplishing project milestones while managing other coursework and internship duties, I had to hold myself accountable to stay on course with the project porposal. One way I learned to manage the workload was to keep close record of scheduled appointments and deadlines and refer to these notes regularly.

One of the most valuable aspects of the Human Centered Design & Engineering program is the collaborative environment that students work in. Learning to accept criticism and suggestions from classmates and peers, and to look for opportunities to share and get feedback on my designs was a very valuable lesson I learned throughout the process. While user research was also a source of enlightenment, I learned to welcome and trust input from others to interpret and leverage this information.

Last but not least, I learned so much about user experience from research and evaluation participants. I learned to consider not only the logistical needs of users, but also the emotions that accompany these unique experiences and perspectives. For example, while an app like Cater can benefit large populations of users, it took careful and nuturing interest in users to identify the sense of burden and embarassment they felt in asking for special accomodations. Not only does such an app need to be easy to use, accurate, and fuctional, it also needs to make it easy for users to communicate their needs and avoid situations where servers gasp in exasperation at unusual requests. Ultimately, users are paying for their dining experiences and should not be made to feel uncomfortable for stating their needs.

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Appendix

Milestone 1: https://drive.google.com/open?id=0B3tND5zNKth-YlY0SzhTeWJqWnc

Milestone 2: https://drive.google.com/open?id=0B3tND5zNKth-Zld3OUlMaW5USnc

Milestone 3: https://drive.google.com/open?id=0B3tND5zNKth-bVdIWjNTQkZBVkk

Milestone 4: https://drive.google.com/open?id=0B3tND5zNKth-YlFBMDJDaWtrVm8

Project Video: https://drive.google.com/open?id=0B3tND5zNKth-ZVFkb0J5eG5zRHM

Project Poster: https://drive.google.com/open?id=0B3tND5zNKth-d3V3MXlqdlNJclk