



Ingredient Based Recipe Application

Final Project Design and Evaluation

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Table of Contents

Introduction	1
Problem statement	1
Design Goals.....	1
User Goals	3
Usability Goals	3
Design Options	5
Design Description and Design Rationale	7
Prototype Design Selection.....	7
How the Prototype was Built	7
What the Prototype does.....	7
Design Decisions.....	8
Pilot Study.....	13
Discount Evaluation	14
Evaluation Methodology	17
Procedure.....	17
Users and Setting	20
Techniques Used	20
Analyzing and Reporting Data Results.....	21
Evaluation Results	22
Cognitive Walkthrough Results.....	22
Evaluation Implications	24
Future Improvements	25
Prototype's URL Link.....	26
Conclusion.....	27

Introduction

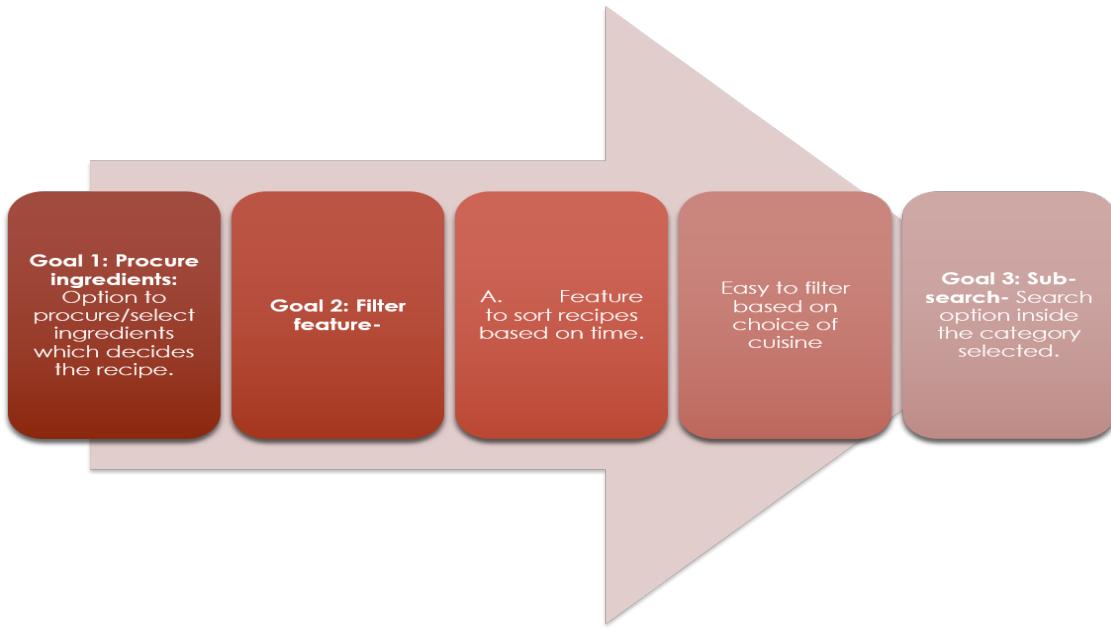
Problem statement

The problem that our group has researched this semester is how one decides what to cook using the ingredients they currently possess. We assumed that the greatest issue concerning cooking is using the ingredients readily available to decide what to eat. We decided to use three need finding methods to research this theory: interviews, questionnaires, and collecting data from other applications that address this issue. Our research has helped us determine the people that would use this design, the real problems that arise related to our theory, and how we would like to alleviate this problem. Our research has uncovered that there were more contributing factors to the problem then we had anticipated, time constraint being one of them.

Design Goals

This project will aim at creating a mobile application which will help the user to select the recipe based on availability of ingredient with the user of this application. This process should be helpful and motivating. The interface should be simple to use: select ingredients, select time, get recipe, etc.

Ingredients should be easily found, without causing frustration. The ingredients should be listed as well as searchable to easily find and select or deselect them. Time should be prominently displayed at the top of the recipe to avoid confusion about time for preparation and time required for cooking. Minimal thought should be required as to the operation of this design. The project should also motivate the user to create more meals, saving money and calories. They should be able to quickly find recipes, allowing them to cook in a short amount of time. Delicious, enticing meals will be fast and easy to use. Using this idea should provide an additional option to eating at a restaurant. Without having to buy new groceries, this design should be financially more accessible than buying new groceries, but the meals should be just as fresh.



Fig; Design goals

The following are our concrete and vital design goals behind implementation of this application:

1. Option to procure/select ingredients which decides the recipe.

The integral and burning goal of this project is to display the recipe based on the ingredients selected. The user will be provided with an interface to select the ingredients he/she has. This acts as an input to the next stage where the ingredients entered are analyzed and checked. The recipe which fulfills the ingredient requirement are displayed on the screen.

2. Filter feature to sort recipes based on time.

This design goal adds to the application functionality. After the recipe is procured based on the ingredients selected by the user, the recipes will be displayed based on time required for preparation. The recipes will be sorted from lowest to highest prep-time required. Hence, this feature will allow the user to select any recipes based on time constraint too.

3. Easy to filter based on choice of cuisine.

After the survey, considerable number of participants cook based on their mood and their cravings. Thus, we included this feature as one of the additional contributing factor. The user can filter the type of food/cuisines they are craving for. Providing

various options such as oriental cuisines or continental cuisines will facilitate this design goal.

4. Search option inside the category selected.

Upon selecting the type of food/cuisine, the user can further search for the recipe he/she is looking for. This gives an option of fine refinement in terms of recipe selected based on user's cravings.

User Goals



Fig: User goals

Usability Goals

We intend to produce an application for the users and hence keeping in mind the user's perspective and their way of approach to using this system. The goal is to present a system which is safe, effective in serving the purpose, usable to its users, satisfying the users and memorable.



- **Effectiveness:** This application accomplishes the ultimate goal of helping its users to find the recipe based on the ingredients he/she selects. The application will allow a window to select the ingredients present with the user. Upon receiving the input, the application will find and display only those recipes which fulfills the ingredients requirement.
- **Efficient:** Users can perceive the affordances of the application easily and can use without any possible errors. For this we aim to provide sequence of steps for its users upon the first usage to understand the flow and navigation of the application.
- **Utility:** Along with being effective, this application will serve its sole purpose of searching the recipes based on ingredients. However, there are some additional functionalities which are added for enhancement. These include:
 - Including the calorie value.
 - Sorting based of lowest time required for preparation.
 - Number of servings.
- **Learnability:** We will provide a sequence of actions as a demonstration video that will be very easy for the user of the application to understand and use. The application proposed will be highly user friendly and the users will adapt and learn the sequence of steps which will yield in high level of productivity.
- **Satisfaction:** As the application will serve the main purpose, we intend to satisfy its users with a very simple and easy to understand UI and functionalities.
- **Memorability:** We aim to create an application with only useful and relevant functionalities required to fulfill the purpose. As the number of features is limited to only useful ones, the level of complexity is low. Hence, the users can know and get familiar with this application upon its first usage.

Design Options

We explored different types of applications with high fidelity mockups for a web application, a mobile application and a printer alike recipe machine.

Design Alternative 1:

Modality: Mobile application

Interface: Mobile and multimedia

Design Alternative 2:

Modality: Web site

Interface: Web

Design Alternative 3:

Modality: Recipe Machine

Interface: Consumer electronics and appliances

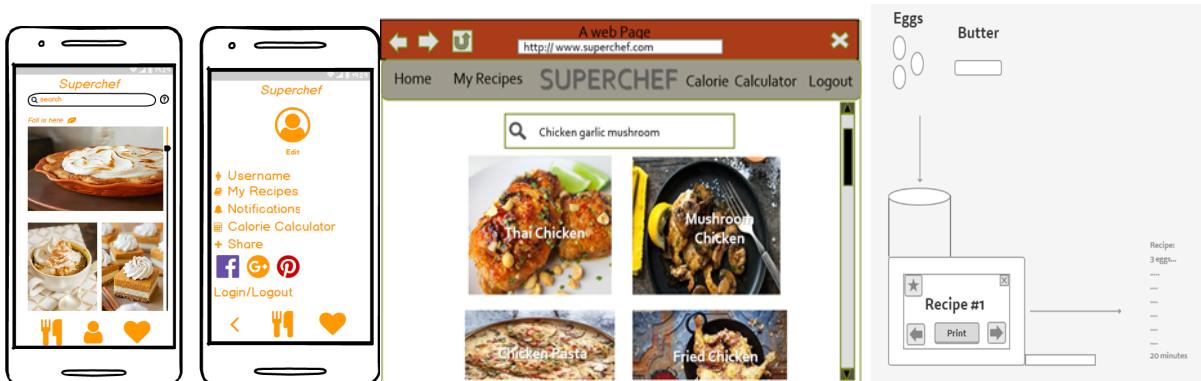


Fig: Mobile, website and recipe printing machine

Evaluation Matrix for Mobile Application is meeting all the Design goals of our application. Therefore, we will consider Mobile Application for next step of Clickable Prototype Development.

Mobile Application Design Interface has following advantages over others

- Most of the users has mobile phones handy.
 - Application is independent of internet connectivity, hence better than a website.
 - Customization for accessibility, available in mobile compared to web.
 - Platform Independent.

Over the course of the project we designed a number of high fidelity mockups for mobile application, exploring fonts, colors, placement of items as well as background images and also the operating system. We began by android prototyping and finalized working on iOS.

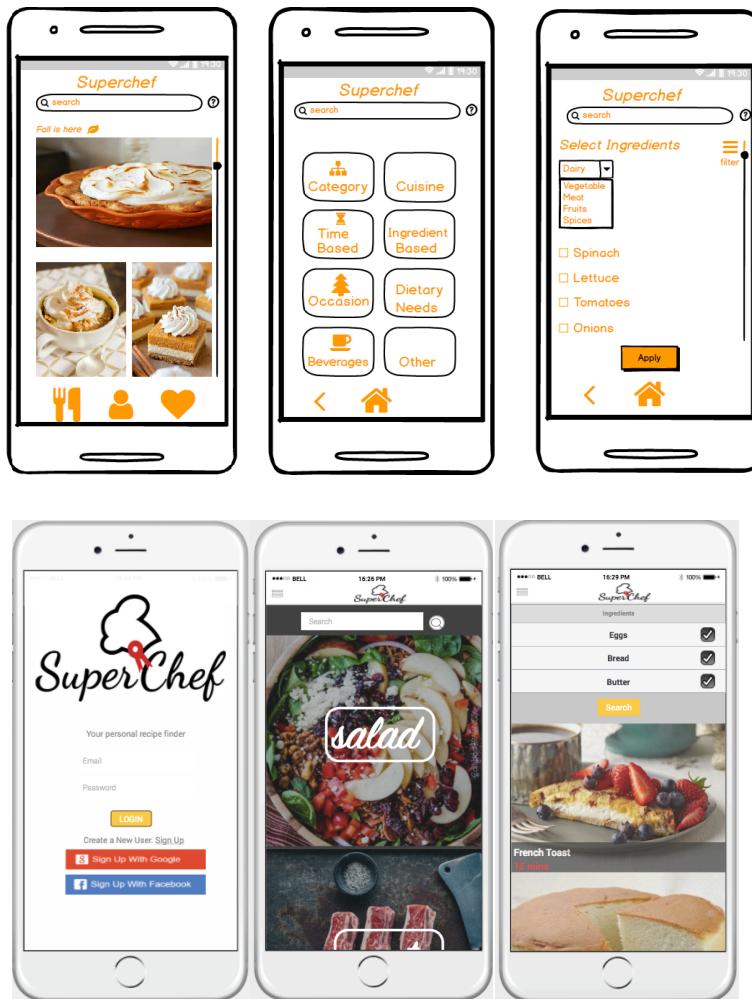


Fig: Transition of design

Design Description and Design Rationale

Prototype Design Goals:

1. Procure ingredients: Option to procure/select ingredients which decides the recipe.
2. Filter feature: Narrow the options on selection of the recipes.
 - A. Feature to sort recipes based on time.
 - B. Easy to filter based on choice of cuisine.
3. Sub-search- Search option inside the category selected.

Prototype Design Selection

The design idea we selected is the most familiar delivery method of a smartphone with a touchscreen user interface. The user would utilize the touchscreen of the smartphone for input and the same screen display would provide the system output. This tool has been used a lot in the recent years after the web application and is also ubiquitous in the developed world (which this tool is aimed towards). The availability of smartphone is very common in the general public throughout. A mobile application is online and accessible 24 hours a day, every day of the year for download and usage. Because of this, all the potential users can visit the site for support or information whenever it is convenient for them.

How the Prototype was Built

We selected a prototype tool called Justinmind to build our solution. Justinmind is often used for high-fidelity prototypes and a great option to construct website wireframes, smartphone apps or a visual guide representing a skeletal framework of any application.

What the Prototype does

The user can take several different approaches to sign up for the application to get to the application's homepage. The first option requires the user to provide some very minimal information to get going on the application. This data is used to verify and allow you to log in into the system. The second option is a less laborious approach for the user; they can simply sign up using the account information of Facebook and Gmail, where the user will be validated and will be signed up in the application. Once the user signs up, the application can be used to search different type of recipes based on time, ingredients and also cuisine.

Design Decisions

Modality

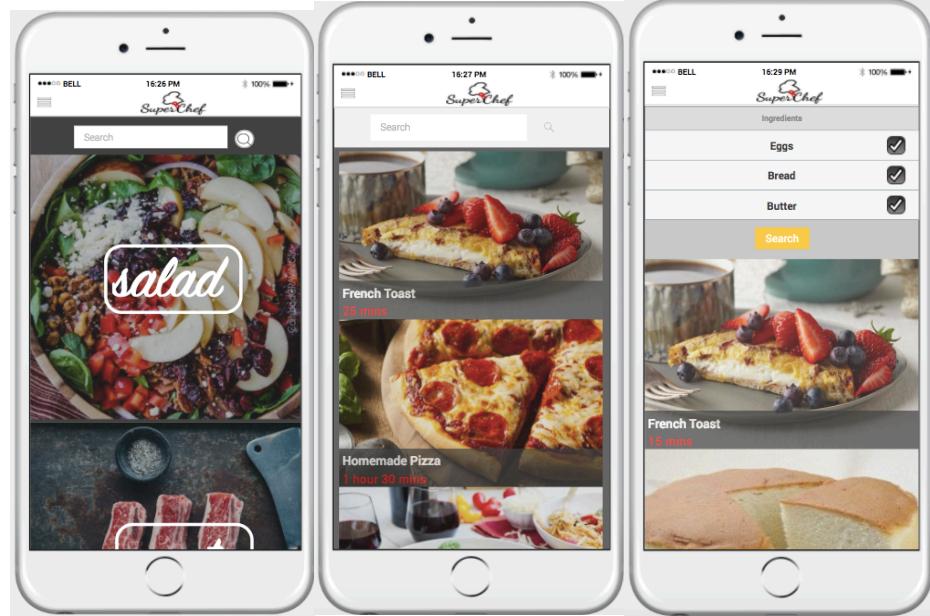
We have used touch interface for our design for many reasons. Accessibility and familiarity were qualities we found important as our goal was to reach the highest number of potential users. Access to this design prototype would cost nothing or be relatively cheap (internet). Mobile apps are very ubiquitous so it is very easy to hire programmers and admins to build and maintain the mobile apps and manage them as needed. Also, a mobile-based interface is a browser independent solution, eliminating certain constraints such as the compatibility of app to the operating browser. The application meets all the desired design goals. The user can easily register to the application with minimal Information. Standard design decisions were followed during app construction.

User Interface Standards

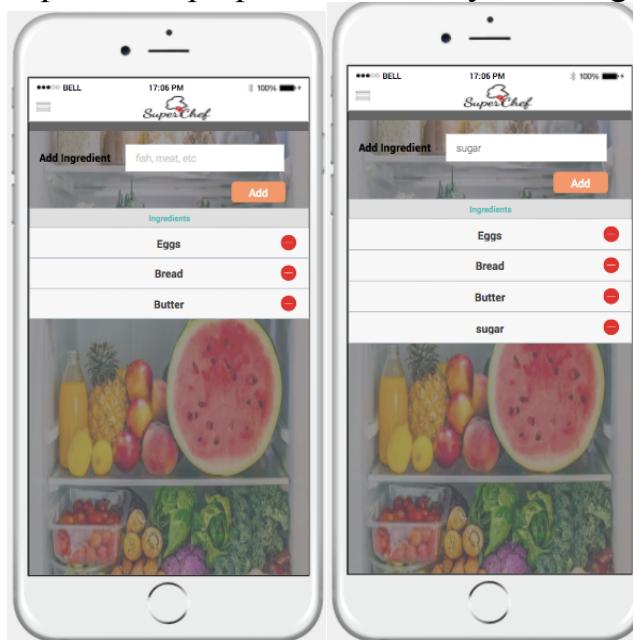
It was important to take a moderate design approach, as people these days are well verse with technology or at least had an encounter with some or the other software application, also the fact that the template provided a design that suited our needs effectively. Large buttons are provided to minimize user errors and space was provided between options to reduce slips. We wanted the user to be comfortable with the tool and did not want to overcomplicate the process of using our tool or convolute their experience with too many options.

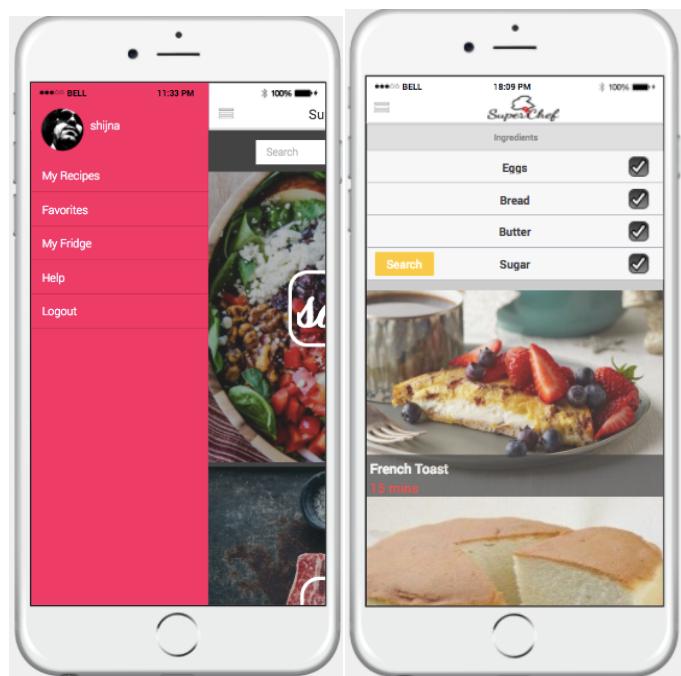
We also opted for a “consistency and standards” approach so the user would feel like they were working with a familiar design. It was important to us that the users focus on the end result, i.e. finding recipes of their choice, rather than being distracted with trying to figure out how the tool functions. This design grabs the user’s direct attention. When he/she is searching for a recipe, they would know exactly what to do. They can enter the ingredients and submit to find the resulting recipes. Every page had good balance and much needed space which provides the user with an element of glance. We also focused on keeping the content condensed with the majority of the application’s features and data displayed above the fold. It has clearly marked exits. Users can make all the actions easily reversible and to provide user control.

To achieve the major user goals, this particular design is chosen over the others. The user goals covered in this design are the major functionality like search for a recipe.

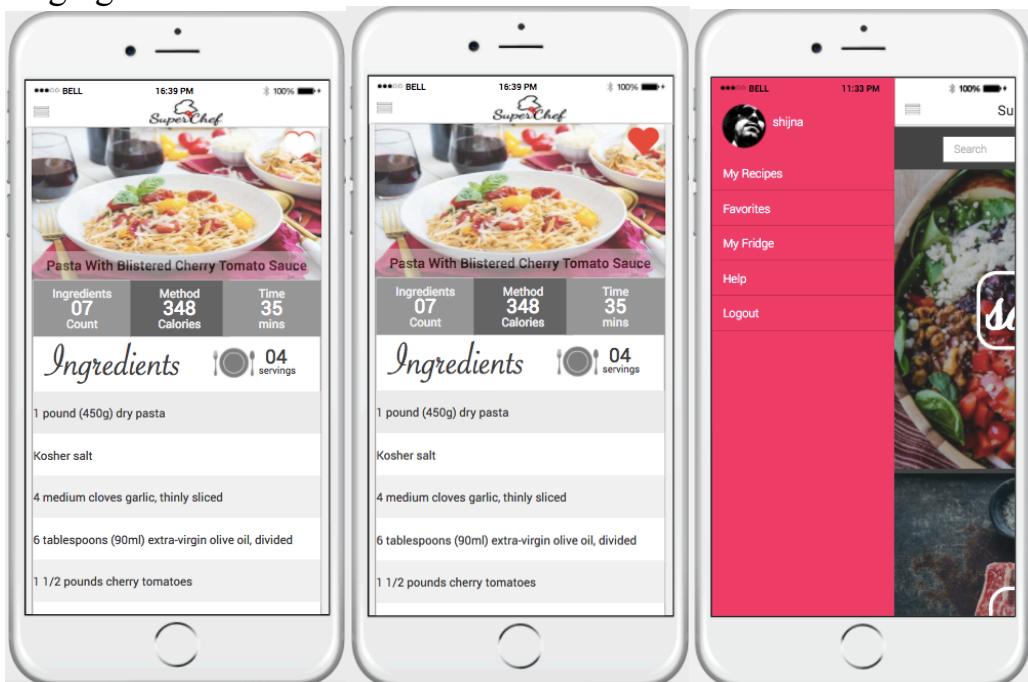


The other major functionality offered by this design is the ability to enter the ingredients into the system. The user can login to his/her profile and see the list of the available ingredients he/she have. They can also add or delete ingredients from the list. This list is dynamically populated in “My Recipes” page. Here the user can select the ingredients they want to use and click on “search” button. The system will display all the recipe names which needs only the selected ingredients to be prepared, along with the time required for preparation. Hereby fulfilling design goal 1.

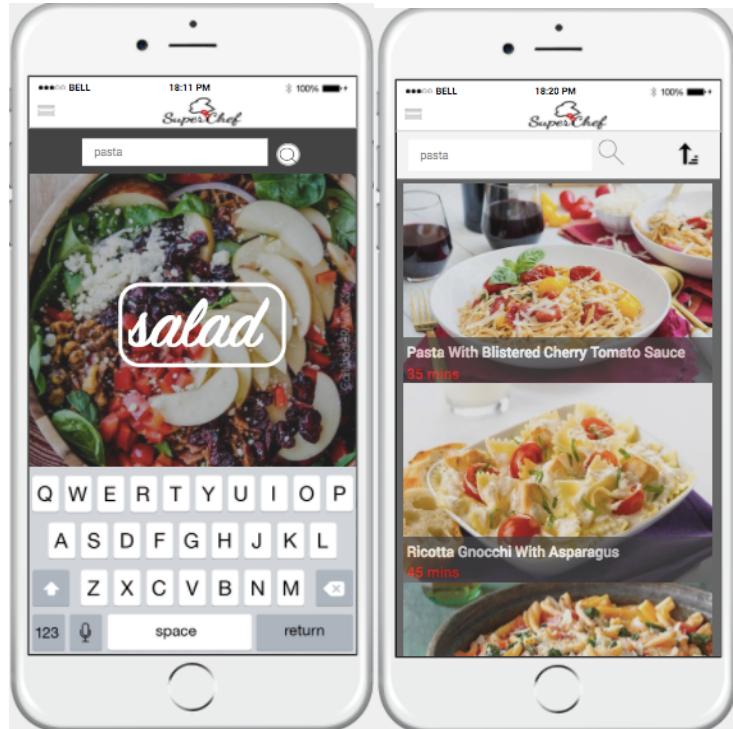




The additional feature which is provided in this design is the ability to mark recipes as favorites. The user can view any recipes and click on the “heart”. This will automatically add that particular recipe in the “Favorites” tab under the user profile. This cannot be achieved with the other design modality, recipe machine, so this modality is the optimum design. This is an additional functionality in addition to the design goals.



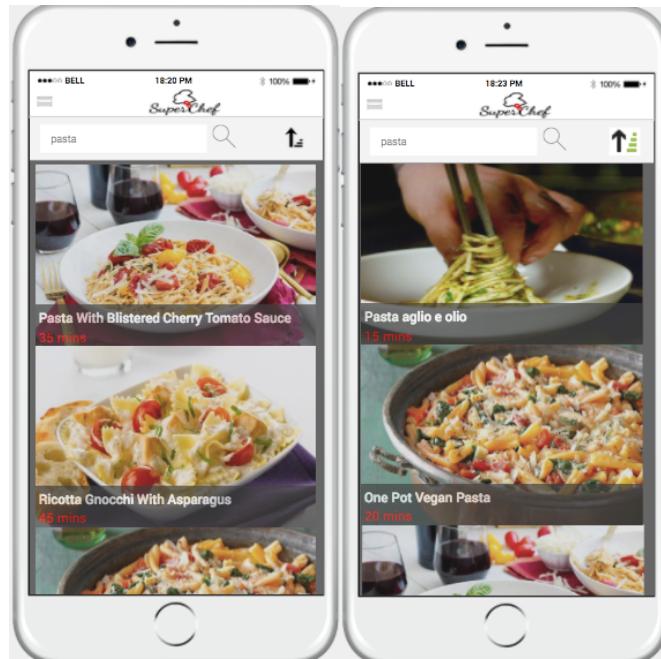
The user can directly search for the recipe from the search bar of the home page. For example, the user can type “pasta” and receive the list of pasta recipes irrespective of the ingredients present in the user’s “fridge”.



Another important feature of this application is to search from the range of search results. Here, we type “lasagna” in the search bar and from the list of pasta recipes, lasagna recipes are displayed on the screen. Due to the limitation and functional disability in the process of prototyping, we included the pasta and lasagna search options. Below are the screen prints. Hereby fulfilling design goal 3.



Sorting the recipes based on time is another functionality we provide in this application. After successfully procuring the list of recipes, obtained either by direct search or by cuisine search, the user can sort the recipes by having the least time required recipe first. For this we have provided a button at the top right side. When the user clicks on the button, the list is sorted with the least time required first displayed and also the button turns green, stating that the list is sorted. If the user wish to unsort the list, click the button again. Hereby fulfilling design goal 2.



Pilot Study

As we were working on moving our prototype into Justinmind and making the design changes from the discount evaluation, we did not yet have a second version of our application to A/B test.

We did not plan on making any major changes to the layout and button placement, but decided to perform an A/B test to ensure that the handedness of the user would not impact usability in our final prototype design.

Our null hypothesis was “There is no significant difference between time it takes for right handed users and left-handed users to use the recipe application”.

Our dependent variable was the time it took for the user to complete the task of finding a recipe. We measured this by timing the user from beginning to end (logging into the app to successfully searching a recipe).

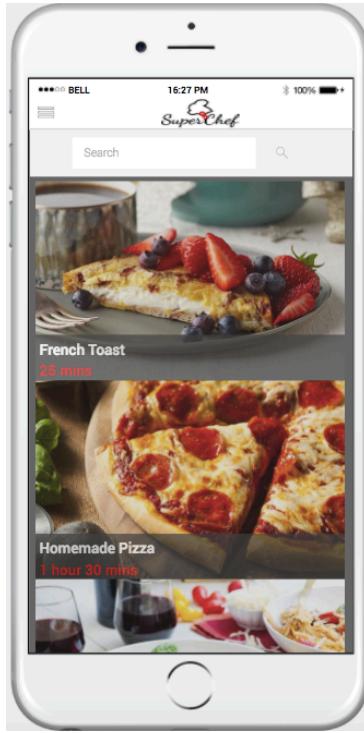
Experiment design was between subjects’ design. We chose this because a user can only be left handed or right handed, so we will have to compared results between participants.

After running the pilot study and analyzing the results, we found that (as expected), there were no significant differences between the usability of our application with left-handed users and right handed-users. While it may be more difficult for left-handed users to select options located in the top right corner or for right-handed users to select the option to move back by swiping right on the screen, those buttons and swiping the screen are used and placed according to standard convention. Since the results of this study were not significant and users are accustomed to these icon locations and methods, we chose not to make any changes to compensate for the handedness of our users.

Discount Evaluation

Most of the feedback for changes to our design came from the discount evaluation. The goal of the evaluation was an initial assessment of our prototype. We wanted to improve upon our initial design using heuristics from Jacob Nielson. Participants were taken from other groups near our table during class. They were asked to perform simple tasks such as find where ingredients are stored, find a recipe for a salad, etc. During their tasks, they would assess our prototype against a list of heuristics. Their advice helped us achieve a more reliable interface.

This feedback was as follows:

Discount Evaluation Feedback and Fixes	
<p>Heuristic Violated: Flexibility and efficiency of use Issue: Takes too much time to look through all Severity: 2 Critique: Search functionality Fixes: Search bar was added</p>	
<p>Heuristic Violated: Help users recognize, diagnose, and recover from errors Issue: No way to go back to previous pages Severity: 5 Critique: Maybe add a back button? Fixes: Included swipe option to go back to previous page</p>	

Heuristic Violated: Consistency and standards

Issue: Icons for categories were unclear

Severity: 6

Critique: Clear labels could be added over categories pictures

Fixes: Added labels



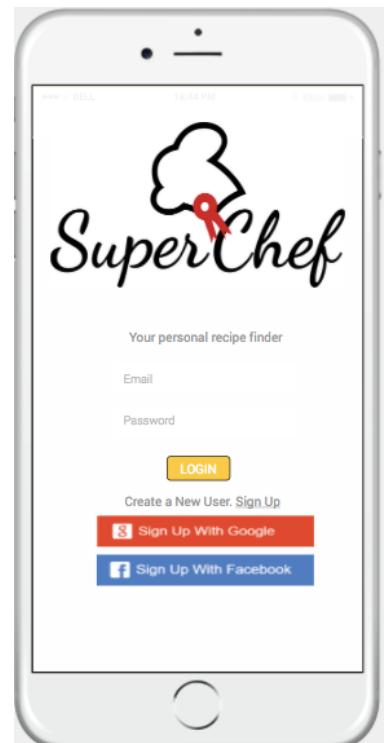
Heuristic Violated: Consistency and standards

Issue: Could not identify application at login

Severity: 4

Critique: Add name

Fixes: Superchef logo was added



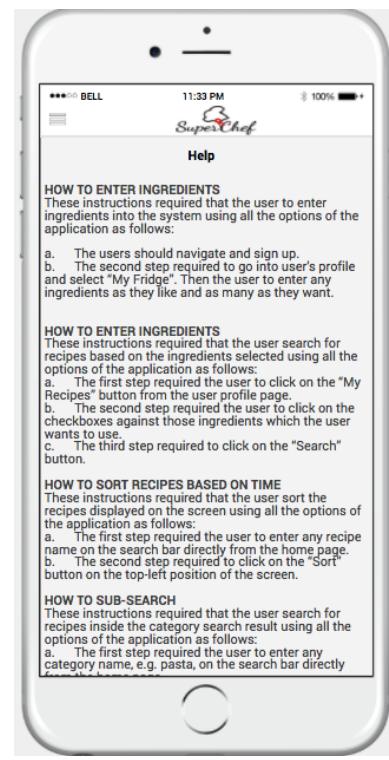
Heuristic Violated: Help and documentation

Issue: Confusing interface

Severity: 2

Critique: Have an explanation for all the important design goals

Fixes: Added help to explain all functionality



Evaluation Methodology

We have done the needfinding and we've designed the application as well. After developing the prototype of the design application, which is meeting all our design goals, the next step is to get the feedback from the set of user which belongs to the same group and who are going to use this application. We have already targeted a specific group of people and the plan was to give all users a set of specific tasks to perform. According to our needs findings, tasks were designed in such a way that they would perform the major functionality of the app. Apart of that, we've also given users the freedom to play with the app so that they can report the problems faced by them and which are addressed in the real application. The users performed specific tasks and their feedback was taken into account and further feasible changes were made accordingly to the prototype. One of the major aspect of the application was the usability of the applications, and so, usability of the application was also taken into consideration.

Procedure

The procedure was pretty much straight forward where the selected user was asked to follow the two steps

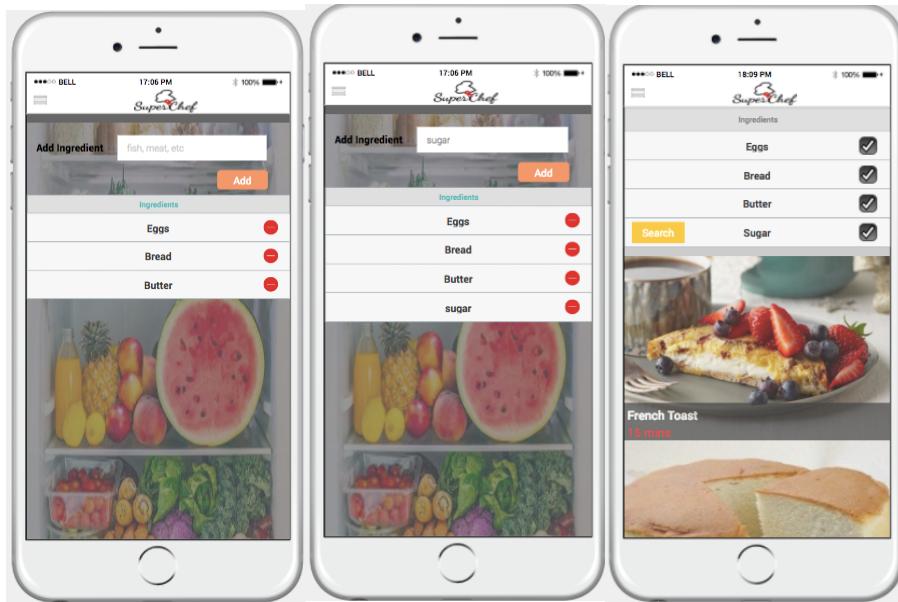
1. Users were placed in front of the laptop computer provided by us, or were given the link and asked questions after the tasks had been completed.
2. Users were provided with a set of general tasks.

The users were also asked to think aloud while they're performing the task and if they're using the app in any way. This gives the observer to observe and report the test result of the test subject. Following are the general set of tasks which were presented to the user to perform.

Task 1

These instructions required that the user to enter ingredients into the system using all the options of the application as follows:

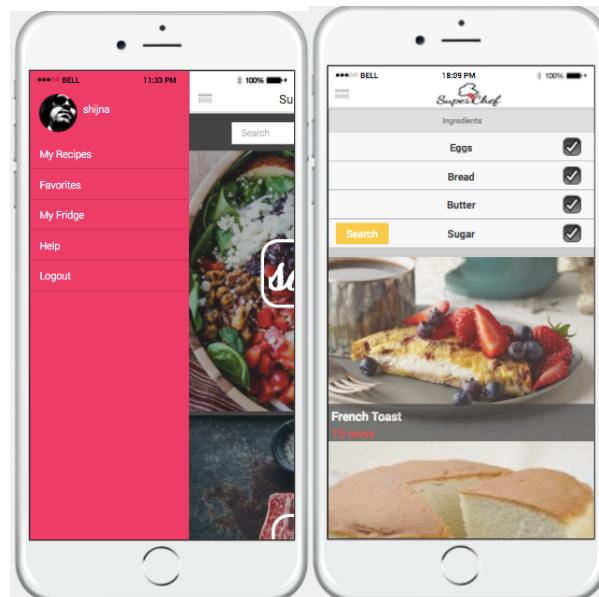
- a. First, we asked that the users to navigate and sign up.
- b. The second step required to go into user's profile and select "My Fridge". Then asked the user to enter any ingredients as they like and as many as they want. We were flexible here and allowed the user to enter whatever ingredients they liked personally because we wanted to give them room for a hands-off approach so they could really explore the tool.
- c. The third step required that they go back to my profile page and click on "My Recipes".
- d. The fourth step asked the user to check if all the ingredients the user entered is filled in correctly.
- e. The final step involved discussion with the us.



Task 2

These instructions required that the user search for recipes based on the ingredients selected using all the options of the application as follows:

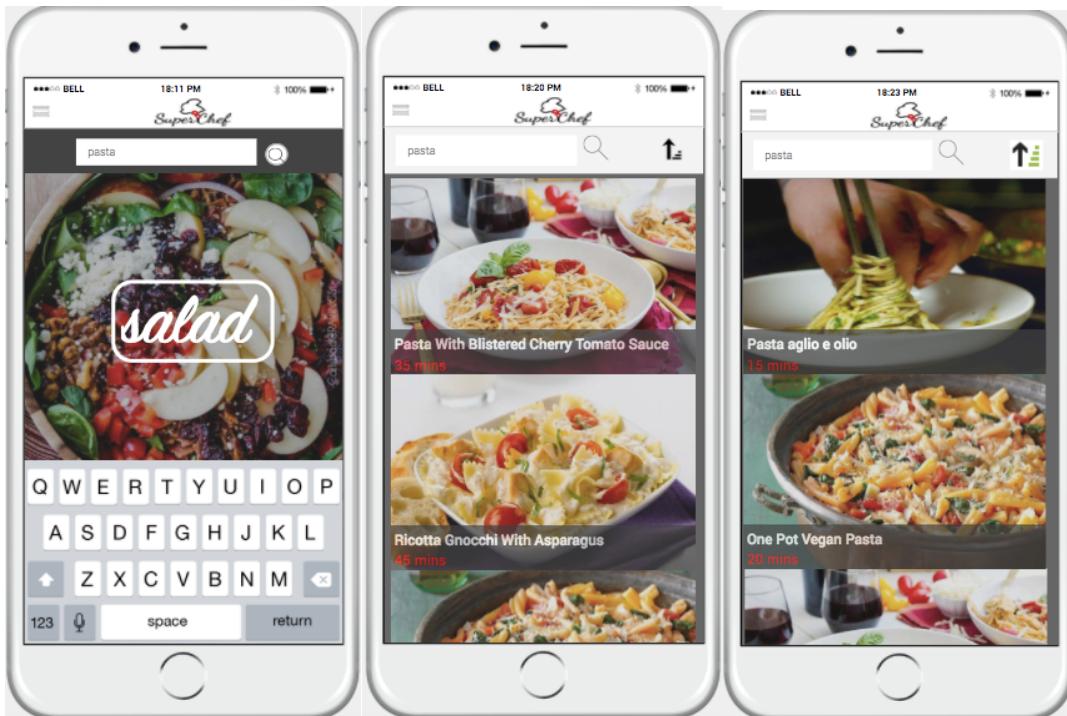
- The first step required the user to click on the “My Recipes” button from the user profile page.
- The second step required the user to click on the checkboxes against those ingredients which the user wants to use.
- The third step required to click on the “Search” button.
- The next step allows the user to analyze the list of recipes displayed.



Task 3

These instructions required that the user sort the recipes displayed on the screen using all the options of the application as follows:

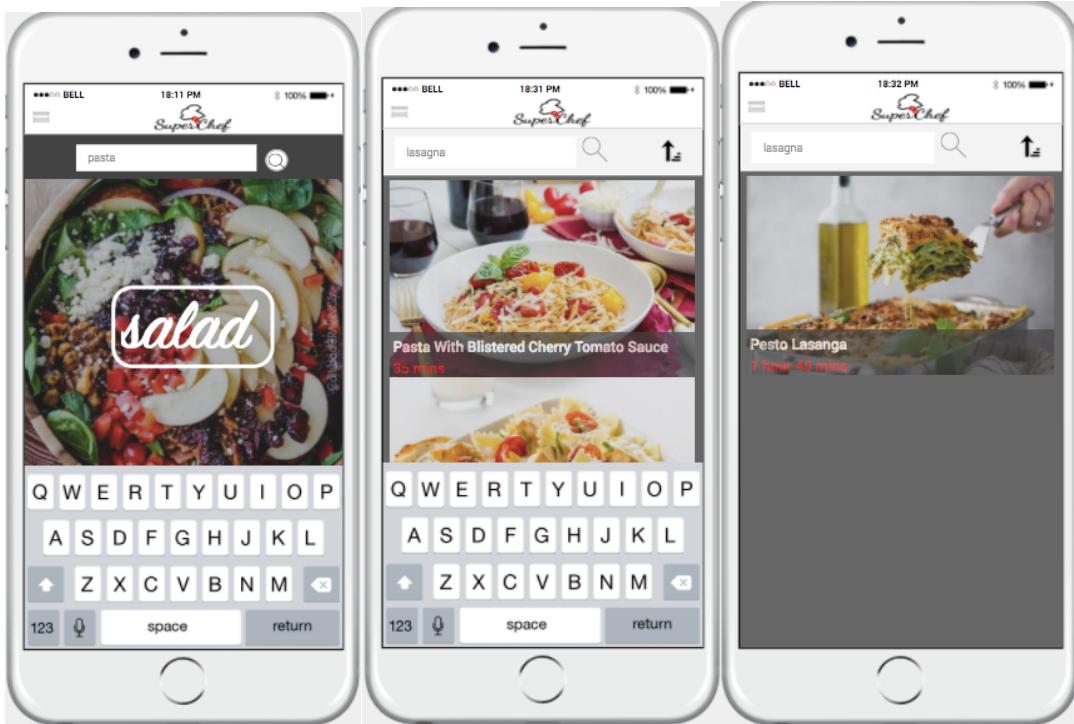
- a. The first step required the user to enter any recipe name on the search bar directly from the home page.
- b. The second step required to click on the “Search” button.
- c. The third step required to click on the “Sort” button on the top-left position of the screen.
- d. The next step allows the user to analyze the list of recipes displayed.



Task 4

These instructions required that the user search for recipes inside the category search result using all the options of the application as follows:

- a. The first step required the user to enter any category name, e.g. pasta, on the search bar directly from the home page.
- b. The second step required to click on the “Search” button.
- c. The third step required the user to enter any recipe name, which falls into the category entered, into the search bar.
- d. The fourth step required the user to click on search.
- e. The next step allows the user to analyze the list of recipes displayed.



During this entire exploration process, the user was asked to think-aloud. This allowed the observer to get a deeper view into the user experience. We felt it was important to get full insight into any confusing, inconsistent, or unclear aspects of the design as well as any display flaws regarding the presentation of the GUI. The process was finished with a recap session to go over the notes the observer took as well as giving the user an opportunity to provide any other final thoughts regarding their experience.

Users and Setting

The test users were classmates, friends/acquaintances and family members of the group, which was the easiest approach given time and budgetary constraints. We selected people of different graduate levels, age groups, and social status to gather a well-rounded data from many different demographics. We chose an informal environment (i.e. field) for our testing with users. This decision was made on the assumption that our users would rather search for recipes in a private environment. Additionally, we felt that the comfort users feel in this setting outweighed the necessity of providing a strictly controlled laboratory environment. If the observer was very familiar with the user, we decided that it is appropriate to perform the observation in either one's living room only if the user is comfortable with that setting. We did not provide any incentives, so it's important that we made this experience as painless and convenient as possible for the user. Finally, the group concluded that providing the exact same environment for the available subjects would place a burden on the users and observers to be available at specific times/locales.

Techniques Used

The evaluation study conducted would mostly fall into the category of a field study. We chose a field study due to a variety of factors. We felt that given the state of our prototype and the subject matter involved, a field study would offer us the greatest ROI. We opted to have the user

d dictate decisions and observations during the tasks in order to help reduce their memory load. We concluded that being too rigid in our structure and giving no choice to the user would leave us without any information about the aesthetics and discoverability of our design.

As the observers, we tried to focus on Heuristics to guide us during the recap summary discussion with our test users. However, this was unscripted as we wanted the test users to freely describe their experience and especially provide feedback on any pain points. Following the tool exploration, we conducted an information discussion to recap their findings, pain points, and their overall experience.

Analyzing and Reporting Data Results



To perform the tasks, we had taken into account 20 users for the evaluation of the prototype. The users followed the same tasks and were very much satisfied with the app. Following graph shows their reaction towards the application and the functionality provided by the application. We've asked user to provide an overall feeling they have about the application on a scale from Very satisfied to Very dissatisfied.

The users were also given the freedom to play with the application to provide us any valuable feedback they have about application. The users were very impressed and were open to provide some feedback to improve the application and they gave the below feedbacks:

- Back button on all pages.
- User should also be able to login using social networking credentials.
- Expiry date of ingredients with reminder of expiry
- Scanning feature to scan the ingredients directly from the refrigerator which is then saved into the system.
- Reminder to buy ingredients which are frequently used by the user.
- Automatic categorizing the ingredients as the user enters.
- Auto filling the ingredient name.

Evaluation Results

While our test users generally found the tool easy to use, they did provide some useful feedback regarding the aesthetics, help and documentation, and make a few other suggestions for improvement. Upon first accessing the app someone suggested that the logo could be reworked while others liked it and even positively commented on the name of the application. This boils down to a personal preference; however, as noted sometimes videos and animations can be more distracting than static information. A common complaint was that the user would have preferred that a description of the app be presented when navigating to the home page. Another piece of feedback had to do with the typography and graphics. It was said that a more sophisticated look could be achieved if we had made some different design decisions regarding the aesthetics. For convenience and focus on content and functionality, we chose to make that a low priority and kept the Justinmind default options. Some users noted that the general formatting in some of the result pages felt rushed. The alignment and complexity of the boxes given could be refined to provide an experience that is easier to peruse. These changes would have been implemented through iterative studies if this application was to be released to app stores. When using the any of the functions like adding and removing ingredients in “My Fridge”, selecting a recipe, the users found it difficult to read as the check boxes were of the same color as the background and couldn’t easily differentiate between the characteristics that were checked compared to the ones that weren’t. We feel that this was mostly an aesthetic design decision that was overlooked during construction. It was recommended by multiple users that this be made clearer or the color theme changed. Overall, users felt that the tool was easy to navigate and the buttons were clear and consistent with the associated functionality. It didn’t take our users long to feel comfortable interacting with the tool and users did not indicate that the process was bloated or inefficient. The group as a whole noted that users were able to navigate quickly and without much confusion. This indicates to us that our original goal of a design with high accessibility and learnable qualities has been achieved. Finally, since the tool is accessible across multiple platforms and our basic requirements appear fairly ubiquitous in the developed world, we also feel strongly that our prototype is accessible to a large population.

Cognitive Walkthrough Results

The information provided to us was summarized for the entire prototype we provided. Insights provided in both the results section and the proposed changes

sections provide additional information that could be used to refine/expand on the cognitive walkthrough.

Will users be trying to produce whatever effect action has (Will users want to do the action?)? Why?

- The application is for search the recipes based on the available ingredients. The application also enables us to filter and search for the exact recipe we are looking for. So, we can produce the actions that were intended.

Will users be able to notice that the action is available (is it visible)? Why?

- The buttons are clearly visible on the page and as result the users can search available courts based on their choices. Also, the help option provided gives the user the gist of the working and usage of the entire application.

Once found, will they know it's the right one for desired effect (is it correct)? Why?

- They will know what to do as the desired effects are found.

Will users understand feedback after action? How?

- The users are given a list of available recipes according to their preferences and ingredients as result they should be able to understand feedback.

Evaluation Implications

Overall, the evaluation plan seemed to work well taking the direct observation approach with our users talking-aloud, followed by a summary discussion. This provided real-time feedback from our users, as well as a final moment for them to reflect and provide any additional information. One thing we could have done differently was to include some strangers in our user test base. The risk we ran by using family and friends was that they may not be comfortable being critical of our work. So, we tried to express to them that we were looking for criticism and design flaws and hoped that they would feel comfortable with providing constructive criticism to the observer. While it would have been favorable to include strangers in our user test base, it would have only been feasible if we were able to include some type of incentive. As graduate students, we didn't feel that this was a realistic option. While our concept is new on our scale, there are other sites that provide similar pieces of our design. If given the time to discuss with professional web designers we believe we could have gleaned more information about color palettes, prioritization of feature implementation, and what site content that users would find helpful (categories in searches/results). Usability testing would have also have been a priority for our summative evaluation.

Current Functionality

Although the functionality is somewhat limited, the current prototype provides the user with a realistic example of the practical uses for this application and a full appreciation for the look and feel of the design that would carry over to the final product. The prototype, as it is now, provides access to all of the following functionalities in varying degrees:

- Login/Logout.
- View the user profile.
- Search for the choice of cuisine.
- Add ingredients into the system.
- Display recipe based on available ingredients.
- Mark recipe as favorite.
- Search the recipes directly from the search bar.
- Sort the recipes based on least time taken first.
- Help section that will provide users with setup and usability instructions.

Future Improvements

- Scanning feature to scan the ingredients directly from the refrigerator which is then saved into the system.
- Allow creating a group of people based on similar culinary interest.
- Feature of broadcasting messages in group.
- Include the option to calculate calories by selecting the ingredients and the quantity.
- Allow users some limited customization by changing the theme of the application pages.
- Provide answers to FAQs.

Prototype's URL Link

Please find the prototype link. As mentioned earlier, we elected to use Justinmind to construct our Touch interface high-fidelity prototype. The tool allows a user to navigate through the primary critical functionalities, although, the result set displayed to the user is hard-coded. This is not visible to the user and provides them the experience of a fully functional tool. All recommendations for improvements and further modifications are found in the “Future Improvements” section above.

<https://www.justinmind.com/usernote/tests/30282282/30459057/30760434/index.html>

Please find the prototype specification file embedded below:



Walkthrough video of the application is embedded below:



Conclusion

The most valuable lesson taken away from this experience is the understanding that the onus of the usability of a solution really resides with the designer. It's up to you, as the designer, to retire one's ego and instead to focus on providing your users with an intuitive and user-friendly experience. In order to execute this, it's critical to get as much feedback at an early stage to create the right building blocks for a successful solution. Once the foundation and functionality is sound, minor adjustments can be made to provide the user with a more aesthetically appealing experience. It's important to get a diverse group of test users, as one might see or recognize a design flaw that others wouldn't even consider. And finally, it's critical to cultivate a comfortable environment with your test users that encourages them to participate in a free-flowing discussion and allows them to express constructive criticism without hesitation.