Project Design - Team CKQW
Team Members: Xinyi Guo, Shiyu Chen, Qianqia Zhang, Winnie Zheng

# *Overview*

**Brief description of system to be built**
We will build an app called KOVID, which provides information of how businesses in Cambridge operate during COVID-19. We will represent each business as a dot on the map of Cambridge, at its location. Each business will be allowed to create a business account, and the business can use this account to edit information on its business homepage to show information specific to this business. This account can also be used to post comments about the business on the business homepage for all other users to view and to reply to comments of users. Similarly, users can create user accounts and view information of businesses on our app. They can browse through the map, search for a business, or filter by categories. They can also write comments about their experience at different businesses and give ratings to the businesses. Each business will have an average rating that shows up as a part of its information on its homepage.

**Key purposes**

- Help users find the businesses that suit their needs easier
  Due to the fast changing of COVID-19, many businesses are operating differently compared to how they operated before. These changes likely affect people in the community in one way or another. For example, you may want to have dinner with friends in a restaurant, but go to the restaurant and realize that they are only offering take-out. Without this app, people would need to call the restaurant to find out whether the restaurant offers dine-in. However, with our app, users can simply search the restaurant, which would save them and the restaurant a lot of time. It also allows users to filter by category, so it is easier for users to find the businesses that are more suitable for them.

- Help businesses identify their strengths and weaknesses in reacting to COVID-19
  Sometimes it can be hard for businesses to find out about their performance. Businesses may want to improve to do better, but they may not know how. Without this app, they would need to ask customers to fill out surveys about their experience or talk to customers individually. With this app, businesses can search their names on the app and read comments posted by users to find out their strengths and weaknesses.

- Allow users to post their experience and help the rest of the community better understand each business
  Sometimes, people find it hard to find objective reviews on businesses, because businesses and commercials would only talk about the good parts of businesses. With our app, users can read comments posted by other users, which are usually more objective. This would help them better understand each business and make better decisions.

- Help businesses learn from the other businesses
  Sometimes, businesses may want to improve or solve a problem they currently have, but not know how. With this app, businesses can search other businesses, and read about how they are

reacting to COVID-19 changes. This may give people more idea about how to improve their own businesses.

**Deficiencies of existing solutions**

- One deficiency that we currently have is that we cannot verify the owner of each user account and cannot prevent an user from creating multiple accounts. This can be dangerous to the fairness of our app, because an user may decide to create multiple accounts and post good/bad comments about a business with all the accounts. This may lead to a biased impression of a business to the rest of users.
- We also cannot verify the owner of each business account. For creating a business account, we ask the creator to enter the name and address of the business, and allow account creation if they match the record in our database. However, since name and address are both public information, it is possible that users who are not the owner of the business would try to create a business account.
- Another deficiency is that we cannot verify the correctness of information posted on our app. Since everyone can create an account and then post comments on our app, we cannot verify whether their comments are objective and accurate, which may lead to spread of fake news.

# *Conceptual Design*

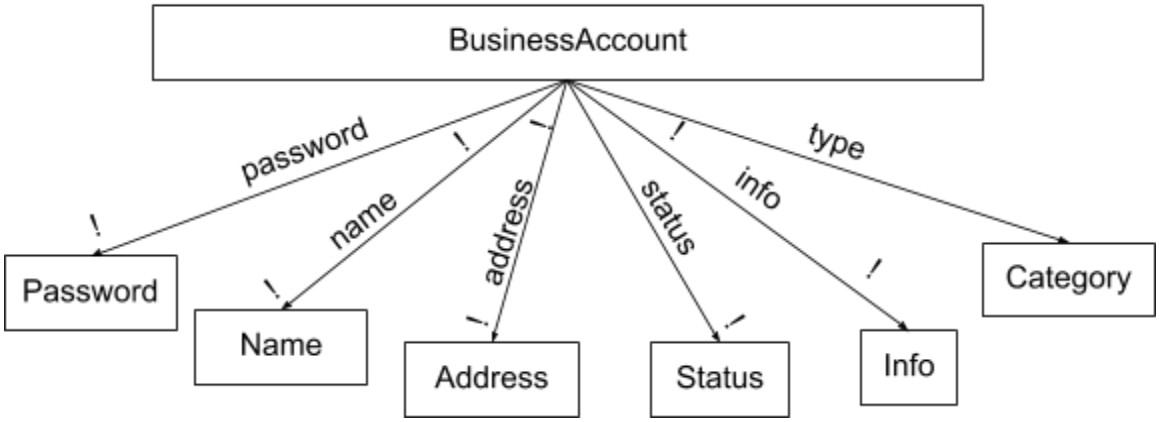
Elaborate the concepts in your conceptual sketch into a full conceptual design, giving for each of the key concepts:

- The name of the concept
- The concept's purpose
- The structure, expressed as an abstract data model
- The behavior, expressed as the actions and their effects on the data model
- The operational principle: one or more archetypal scenarios

Your conceptual design should include comments to explain any unusual or potentially confusing elements.

**Business**

- Purpose: Any verified business can create a Kovid business account and edit their name, operation status, address, and other information on their Kovid homepage.
- Structure




Constraints: 1. all b: BusinessAccount | b.name in Name and #b.name = 1
and b.password in Password and #b.password = 1
and b.address in Address and #b.address = 1
and b.status in Status and #b.status = 1
and b.info in Info and #b.info = 1
and b.type in category

2. no disj i, j: BusinessAccount: i.name = j.name or i.address = j.address

Decisions:

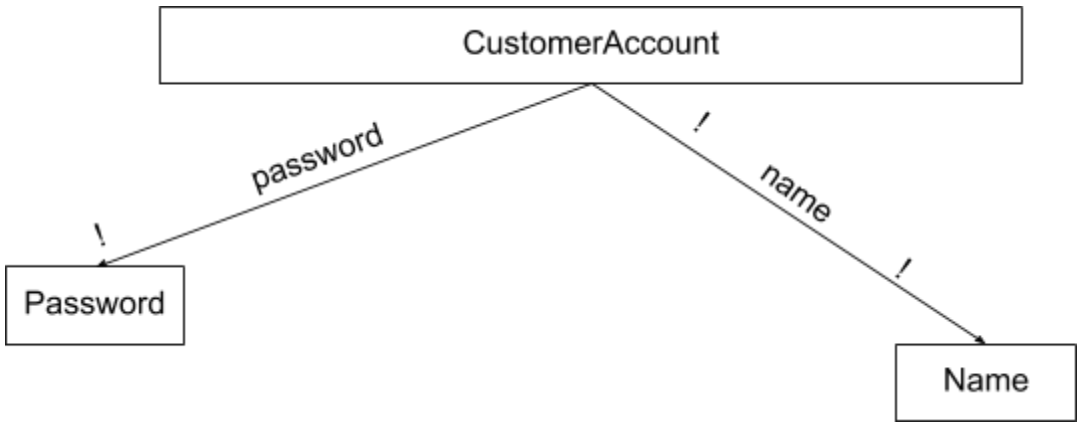
1. For each chain store or branch office of a merchandise, a separate BusinessAccount has to be created
2. Only a signed-in business can change their account username, password, address, operation status, info, and category.

- Behavior
  - createAccount(Name: name, Password: password, Address: address, Category: category): Creates a new BusinessAccount with a unique name, unique address, some password and category.

    - changeName(BusinessAccount: account, Name: newName): Changes the specified account's name to newName. Clients must be logged in to the account, or an error will be thrown. newName must not be the same as any other name in the Name set, or an error will be thrown and the account's name will not change.
    - changePassword(BusinessAccount: account, Password: newPassword): Changes the specified account's password to newPassword. Clients must be logged in to the account, or an error will be thrown.
    - changeAddress(BusinessAccount: account, Address: newAddress): Updates the address for the business. Clients must be logged in to the corresponding business account or an error will be thrown. newAddress must not be the same as any other address in the Address set or an error will be thrown and the address will not be updated.
    - changeStatus(BusinessAccount: account, Status: status): Changes the operation status for the business. Clients must be logged in to the corresponding business account or an error will be thrown.
    - changeCategory(BusinessAccount: account, Category: category): Changes the category for the business. Clients must be logged in to the corresponding business account or an error will be thrown.
    - changeInfo(BusinessAccount: account, Info: info): Changes info for the business. Clients must be logged in to the corresponding business account or an error will be thrown.
- Operational principle
    - Each business can have only one business account, and that account name has to match their certified business name (checked by cross comparison with the given database on all local businesses).
    - A business has to log in to make any update on their homepage.

**Customer**

- Purpose: Any user can create a customer account to join the Kovid community.
- Structure:




Constraints:

1. all c: CustomerAccount | c.password in Password and #c.password = 1
   and c.name in Name and #c.name = 1
2. no disj i, j: CustomerAccount | i.name = j.name

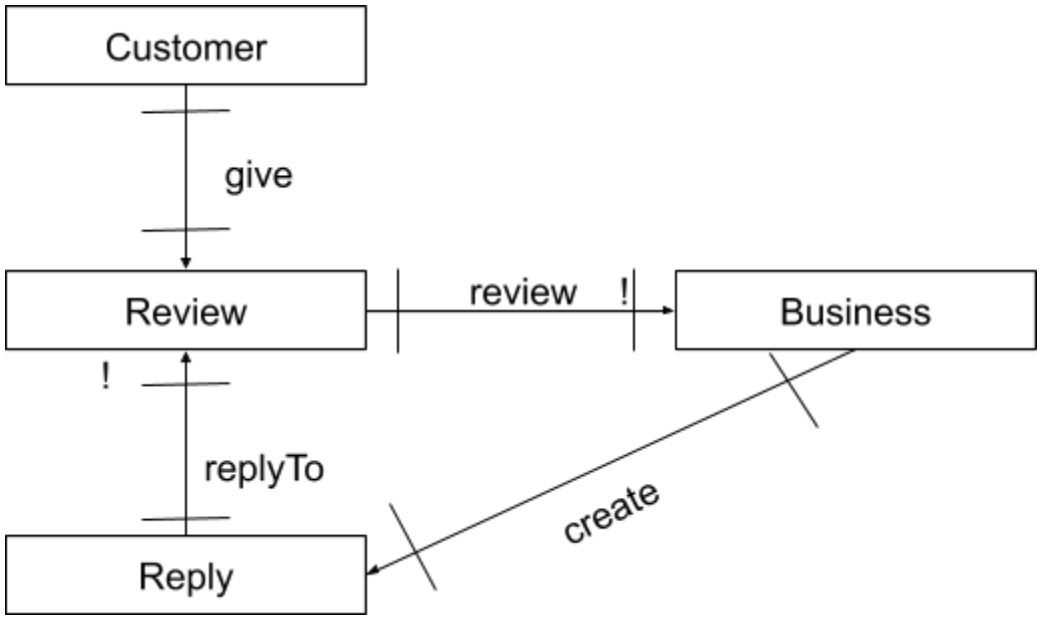
Decisions:

1. Customers need to have unique usernames

- Behavior:
    - createAccount(Name: name, Password: password): Creates a new CustomerAccount with a unique name and some password.
    - changeName(CustomerAccount: account, Name: newName): Changes the specified account's name to newName. Clients must be logged in to the account, or an error will be thrown. newName must not be the same as any other name in the Name set, or an error will be thrown and the account's name will not change.
    - changePassword(CustomerAccount: account, Password: newPassword): Changes the specified account's password to newPassword. Clients must be logged in to the account, or an error will be thrown.
- Operational Principle:
    - Customers must log in to change their account username or password.
    - Each customer should create only one account on Kovid.

**Rating/Review**

- Purpose: Customers can rate and/or review service they received from any business. Businesses can also reply to their customer reviews.
- Structure:




Constraints:

1. all c: Customer | c.give in Review
2. no disj i, j: Customer | i.give = j.give
3. all r: Review| r.reviews in Business
4. all b: Business | b.create in Reply
5. no disj i, j: Business | i.create = j.create
6. all r: Reply | r.replyTo in Review

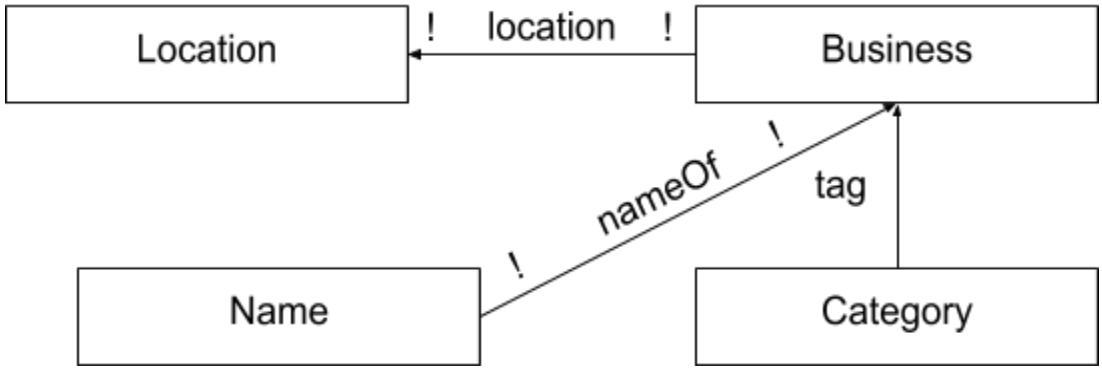
Decisions:

1. Customers cannot edit or delete reviews.
2. Business cannot give reviews, but they can reply to reviews that are given to them.
3. Business cannot edit or delete replies.

- Behavior:
    - review(Customer: customer, Business: business, Review: review): Signed-in customer can give review to business. If the customer is not signed in to a customer account, an error will be thrown.
    - reply(Business: business, Review: review, Reply: reply): Signed-in business can reply to any review that is given to it. If the business is not signed in to a business account, an error will be thrown. If the signed-in business tries to reply to a review given to another business, an error will be thrown.
- Operational Principle
    - Only customers can review, and only business can reply to reviews.
    - A business can only reply to reviews it receives. It cannot reply to other businesses' reviews.
    - Customers can give reviews to any business for as many times as they wish.
    - Businesses can reply to any review given to them as many times as they wish.

**Map**

- Purpose: The map of Cambridge shows the locations of businesses. It helps users find businesses nearby and gives them a quick overview of how each business is.
- Structure:




Constraints:

1. all b: Business| b.location in Location and #b.location = 1
2. no disj i, j: Business | i.location = j.location

Decisions:

1. Businesses can change their locations.
2. There can be only one business in each location, and each business can have only 1 location

- Behavior:
    - showBusiness(Location: location): Users can click on anywhere on the map and if there is a business located there, a pop-up window will display the name, address, status, and average ratings of that business. If no business is located there, nothing happens.
    - showOnMap(Location: location): Pinpoint the location that the user inputs.
    - search(Name: businessName): Pinpoint where the business that has the user-inputted name is located on the map. If no such business exists, print out no business under this name.

    - filter(Category: category): Pinpoint on the map all businesses that belong to the user-inputted category (i.e. all businesses in category.tag). If no business belongs to the inputted category, nothing happens.
- Operational Principle:
    - All users can view and use full functionalities of the map without logging in.
    - Users can search for a specific business if they know their name, or they can search for a category of businesses (e.g. restaurants, or salons, or museums, etc.) using filters.
    - Users can visualize where they are and what businesses are near them using the showOnMap function.
    - Users can read a summary of any business on the map by clicking on it on the map. This invokes the showBusiness function.

# *Wireframes*

You're asked to describe the key concepts of your planned user interface by giving a collection of wireframe sketches. These should be organized around your key concepts similar to what you did for A4. Each wireframe sketch should be a sketch of a screen that shows clearly what elements there are. It should be clear how transitions occur from one wireframe to another, and what each element is for. Comments or explanations can be provided as separate notes (making their connection to the elements clear).

You can prepare this wireframe by hand, in a drawing tool, or in a specialized wireframing app.

## SEE FOLLOWING PAGES

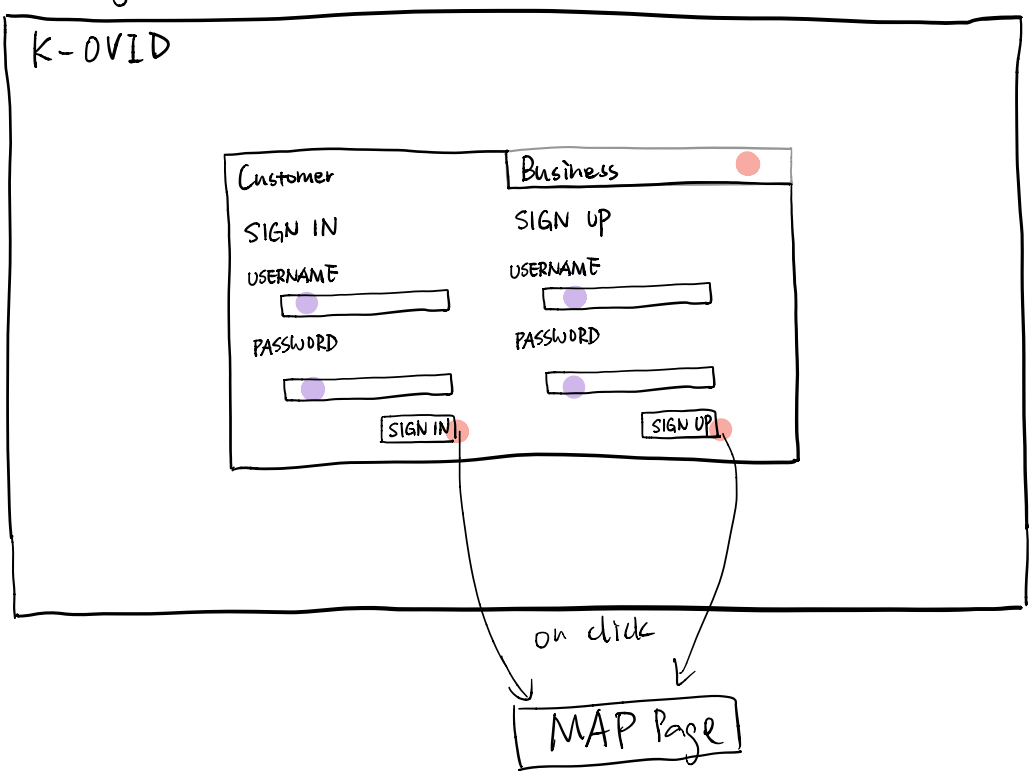
## Notations

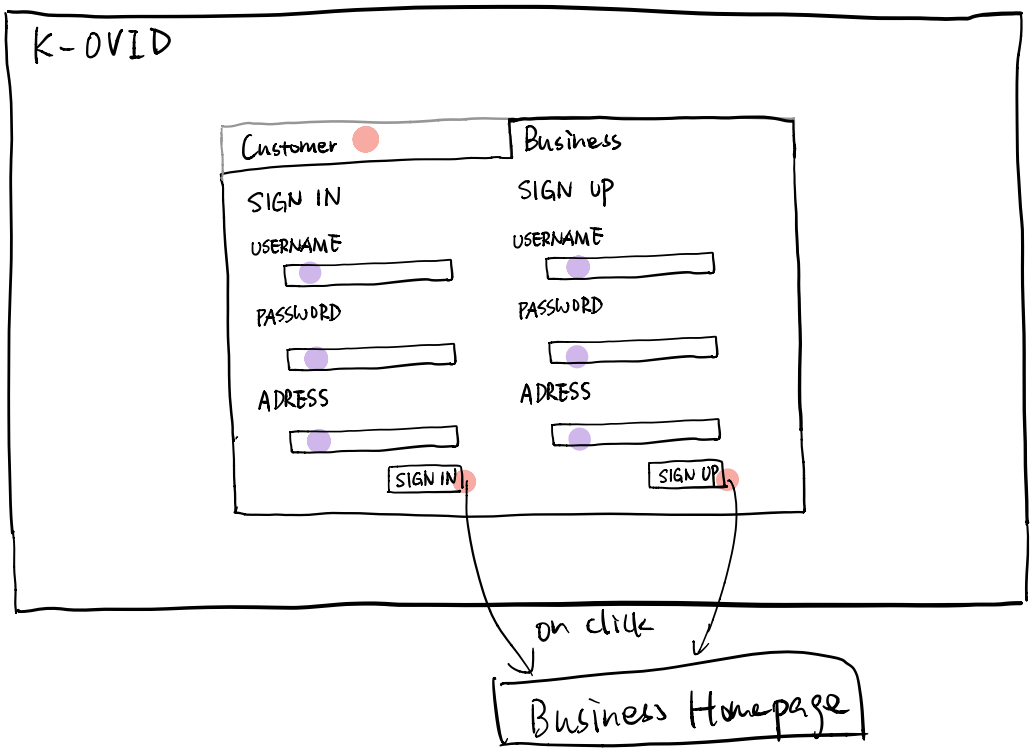
**Actions**: These are to indicate potential actions on our webpage at different interface locations, that will invoke transition in frames.

- click
- mouse-over
- type / input text

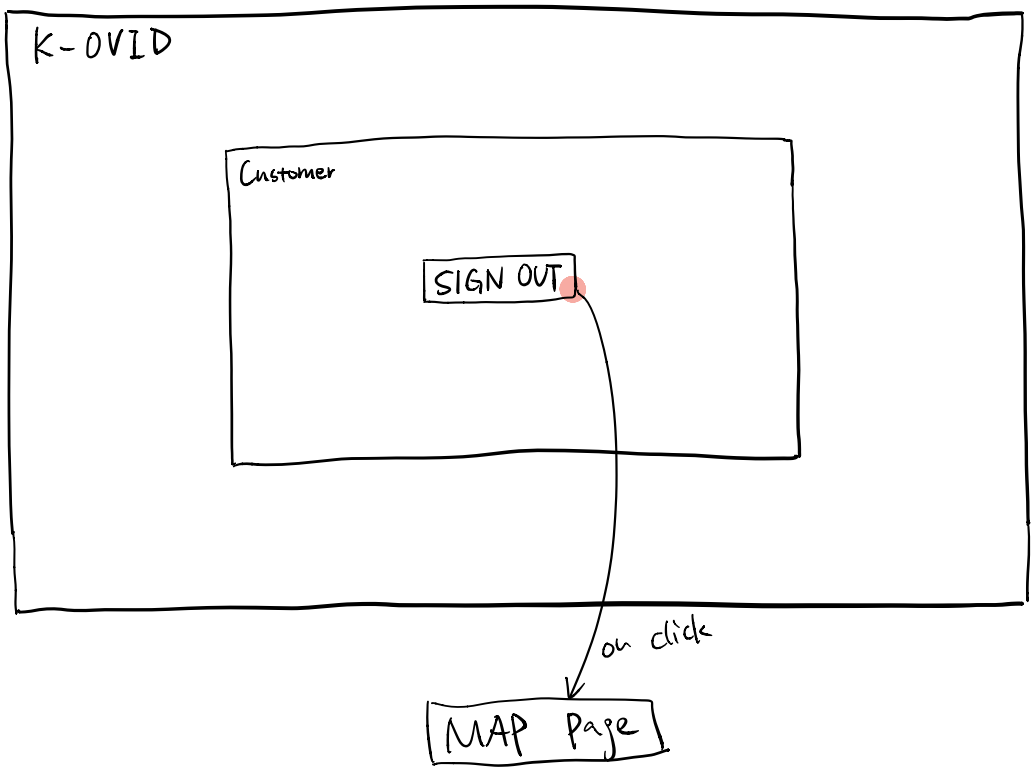
## Authentication Pages

1. Sign Up / Sign In






2. Sign Out (Customer Only)



## Notations

**Actions**: These are to indicate potential actions on our webpage at different interface locations, that will invoke transition in frames.

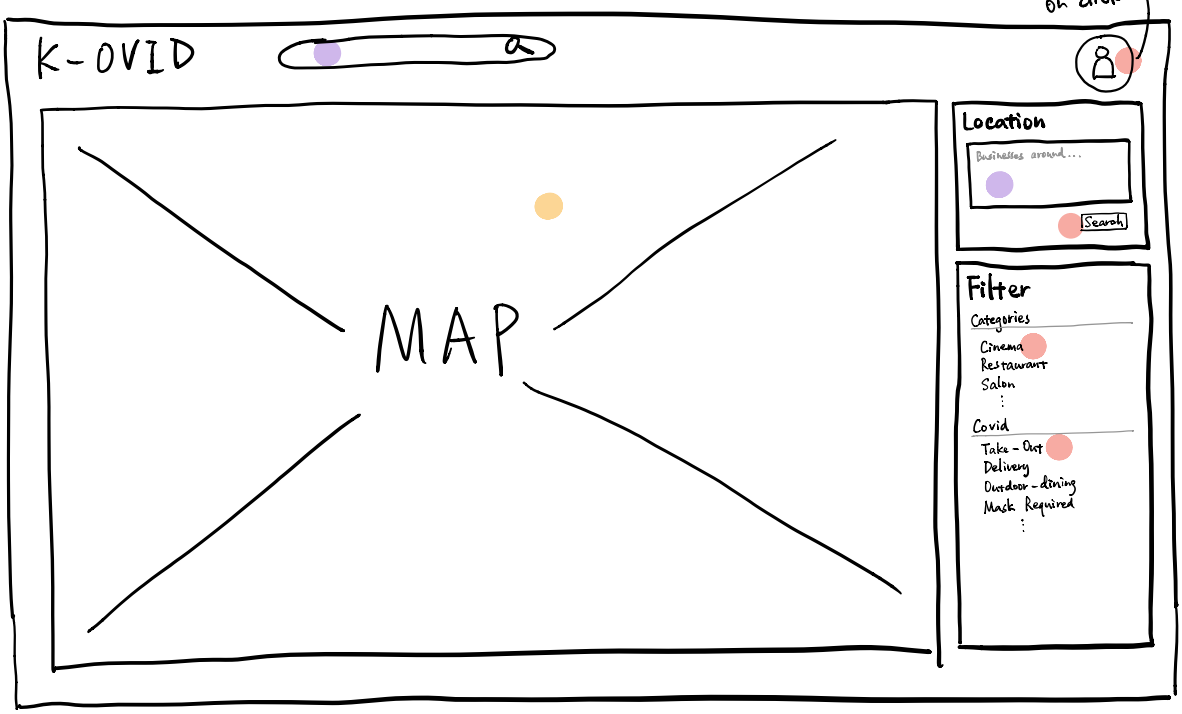
- click
- mouse-over
- type / input text

# Customer View

## Landing Page

Not Signed in go to Sign in/sign up page
Signed in customer go to sign out page
Signed in business go to homepage

on click

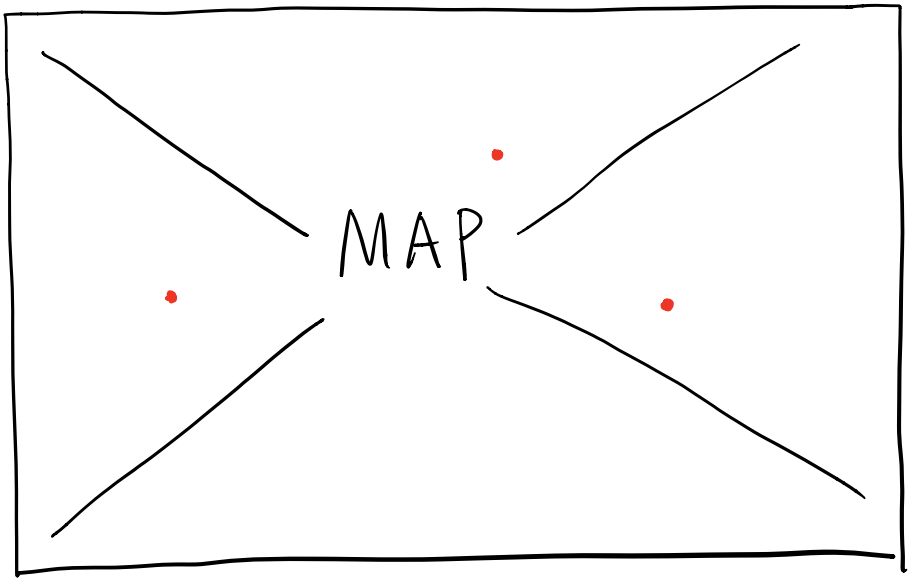


# Action Invoked Transitions

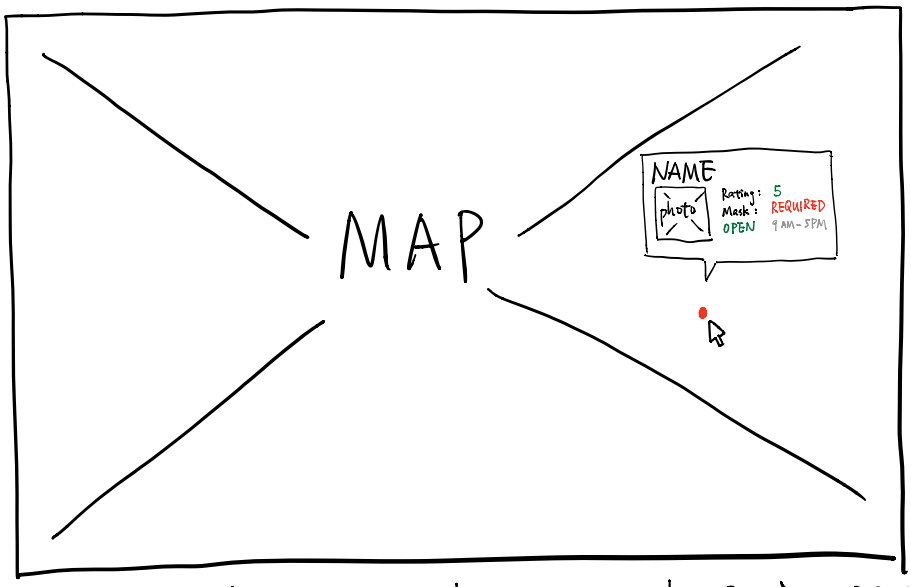
## 1. Search Bar

Flour Bakery]

Businesses with name that matches the input will be marked with a red dot.

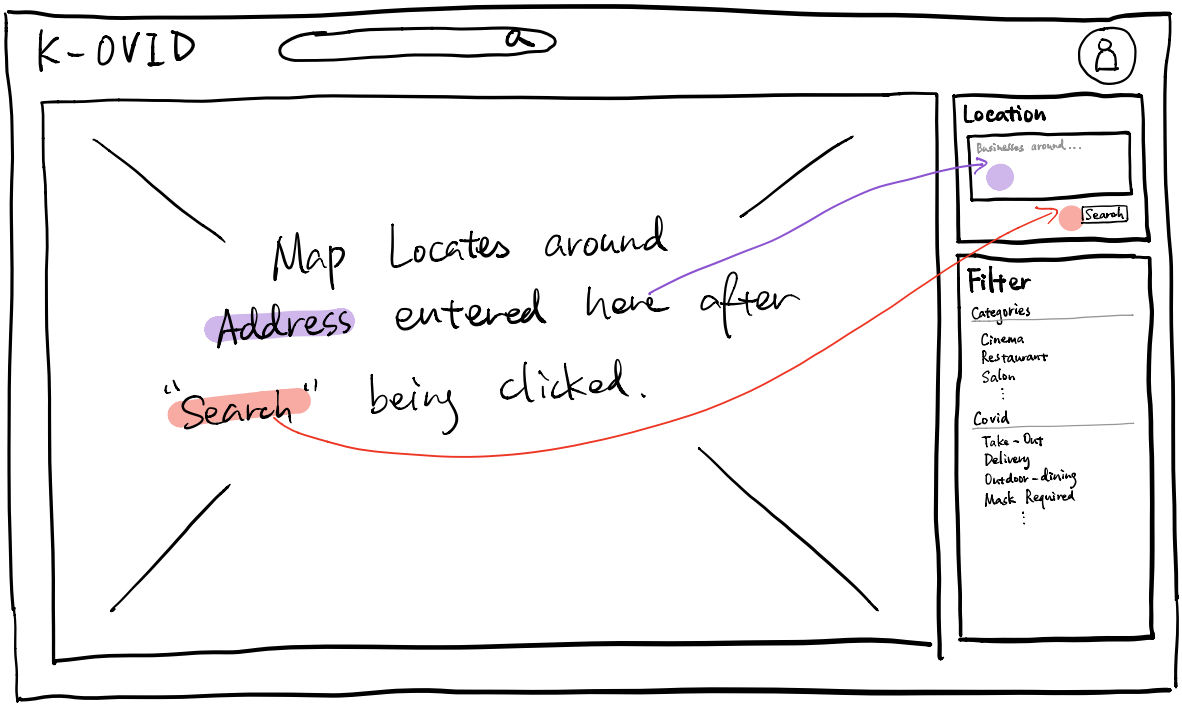



## 2. Mouse Over Map

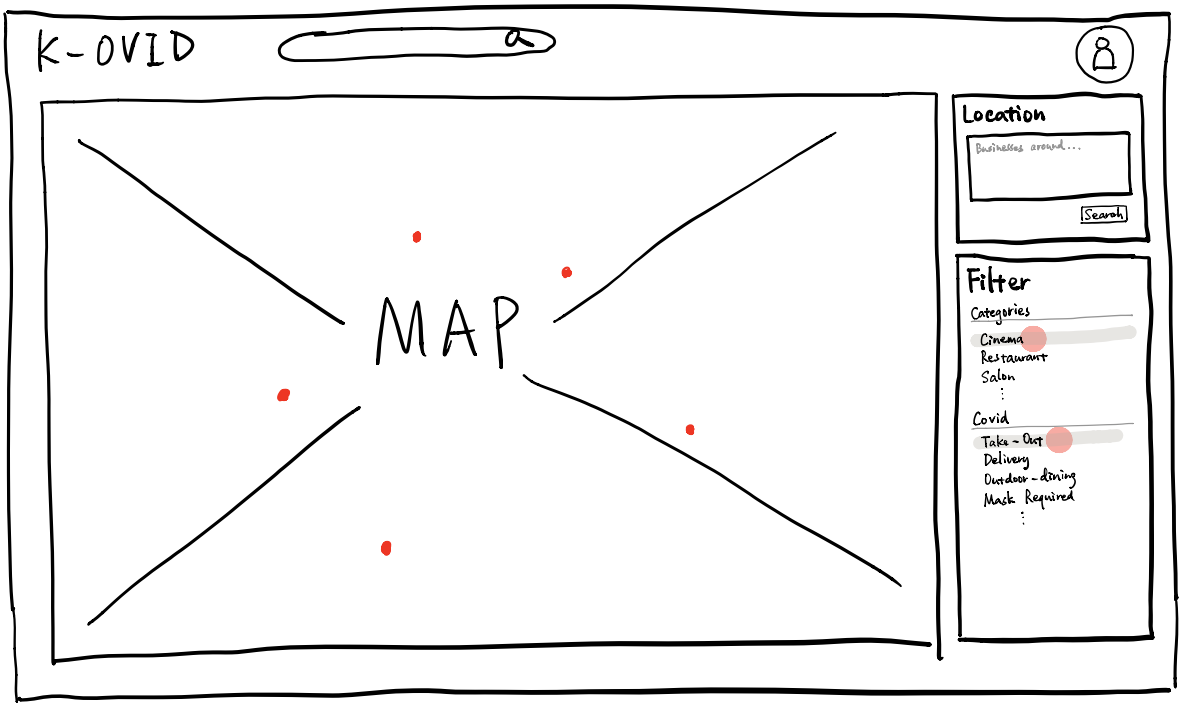



Mouse over any businesses on the map pops the preview page.

## 3. Location Search

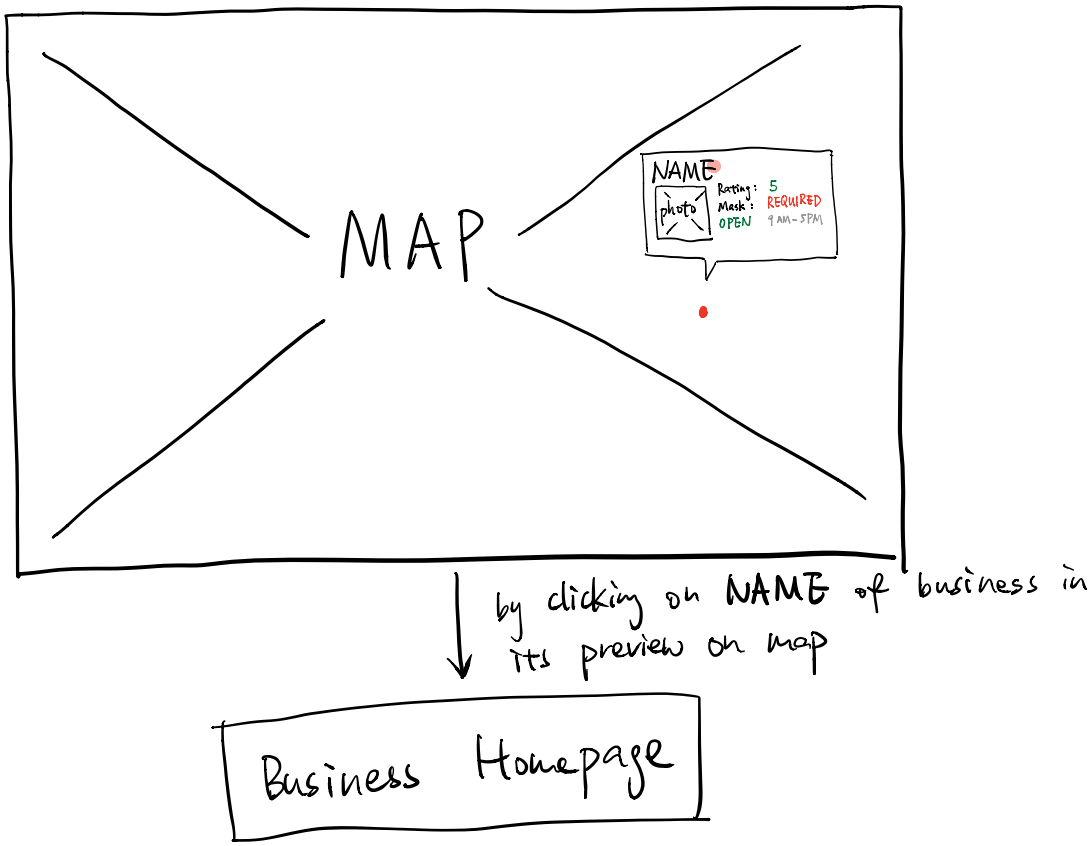



## 4. Filter




Businesses fullfilling the clickes features will be marked red.

## 5. Switching to Business' Homepage




## Notations

Actions: These are to indicate potential actions on our webpage at different interface locations, that will invoke transition in frames.

- click
- mouse-over
- type / input text

# Business Homepage

K-OVID

To Map

## BUSINESS NAME

STEAKHOUSE

DESCRIPTION

ADRESS

**OPERATING STATUS**

| | |
|---|---|
| OPEN | 9AM - 5PM |
| DINE IN | YES |
| DELIVERY | NO |
| TAKE OUT | NO |

**COVID-19 UPDATE**

| | |
|---|---|
| MASK *NEW* | REQUIRED |
| RESERVATION | REQUIRED |

**RATING**

| | | | |
|---|---|---|---|
| SERVICE | 4.5 / 5 | COVID-19 | 2.5 / 5 |

**REVIEWS**

Provide your feedback...

How would you rate the following?

SERVICE 1 2 3 4 5

COVID-19 1 2 3 4 5

POST

SERVICE 4/5 COVID-19 2/5

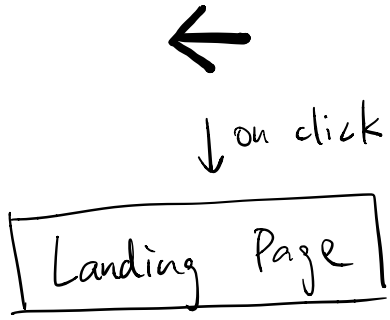
Business' Reply

SERVICE 5/5 COVID-19 3/5

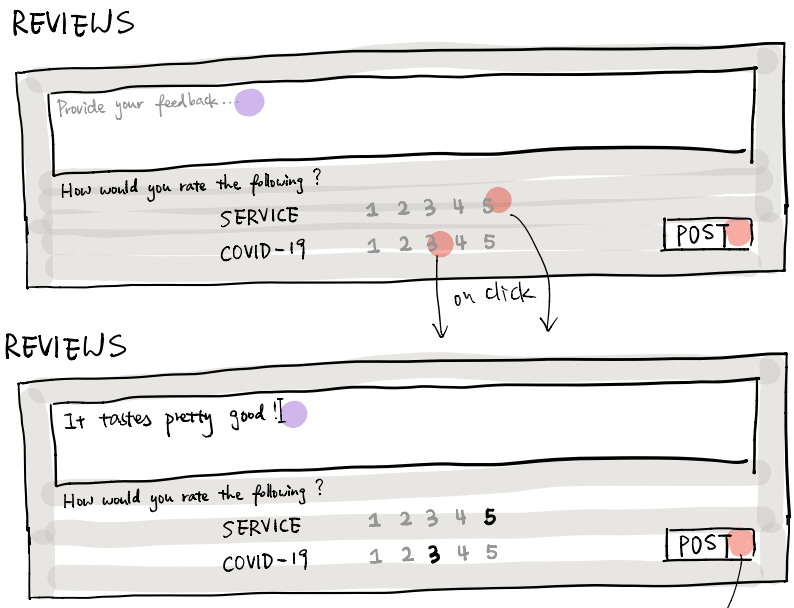
⋮

# Action Invoked Transitions

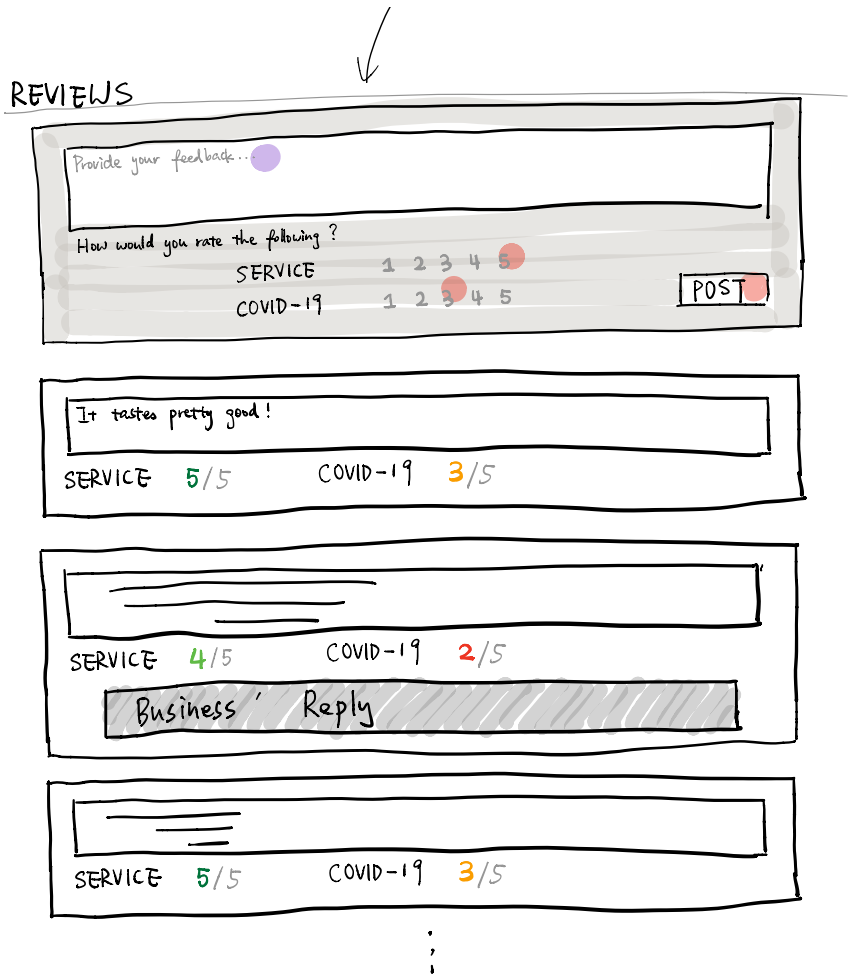
1. Back Button




2. Rating Features




On click (see next page)




## Notations

**Actions**: These are to indicate potential actions on our webpage at different interface locations, that will invoke transition in frames.

- click
- mouse-over
- type / input text

# Businesses View

## Landing Page

Map Page
on click

K-OVID

←

SIGN OUT

# BUSINESS NAME

STEAKHOUSE

EDIT

DESCRIPTION

ADRESS

OPERATING STATUS

| | |
|---|---|
| OPEN | 9AM - 5PM |
| DINE IN | YES |
| DELIVERY | NO |
| TAKE OUT | NO |

COVID-19 UPDATE

EDIT

| | |
|---|---|
| MASK *NEW* | REQUIRED |
| RESERVATION | REQUIRED |

RATING

| | | | |
|---|---|---|---|
| SERVICE | 4.5 / 5 | COVID-19 | 2.5 / 5 |

REVIEWS

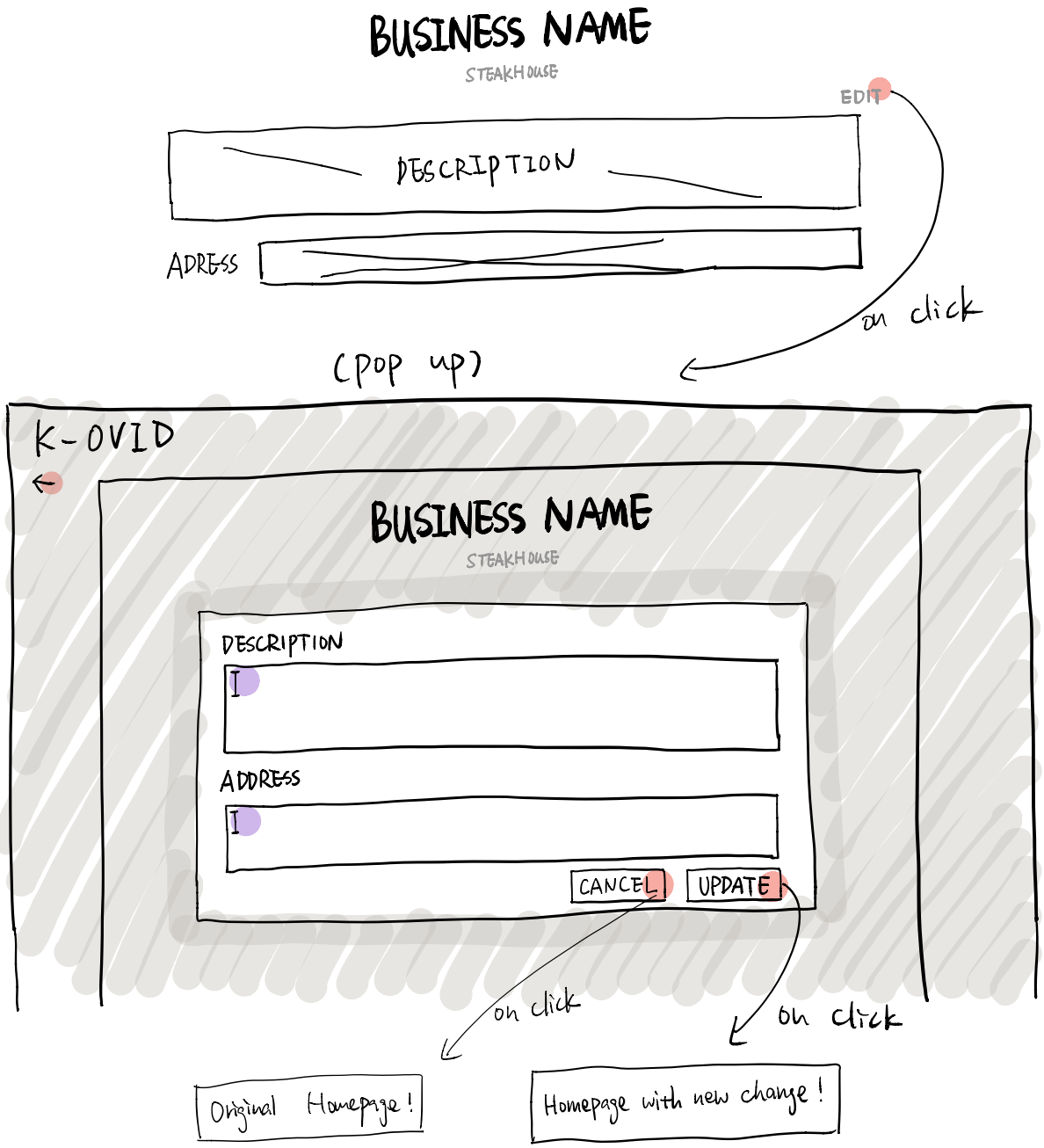
SERVICE 4/5 COVID-19 2/5

Business' Reply EDIT DELETE

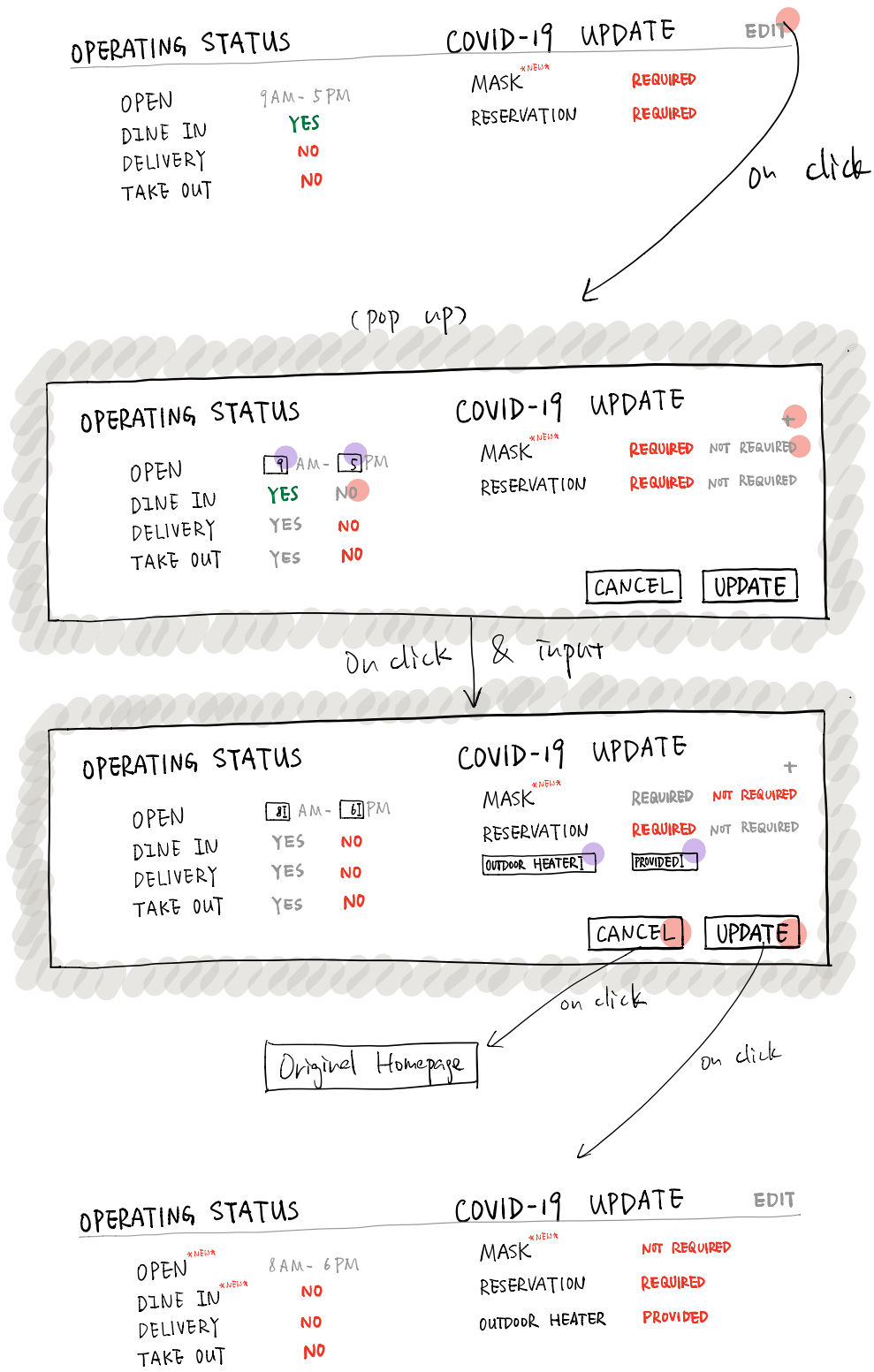
SERVICE 5/5 COVID-19 3/5 REPLY

⋮

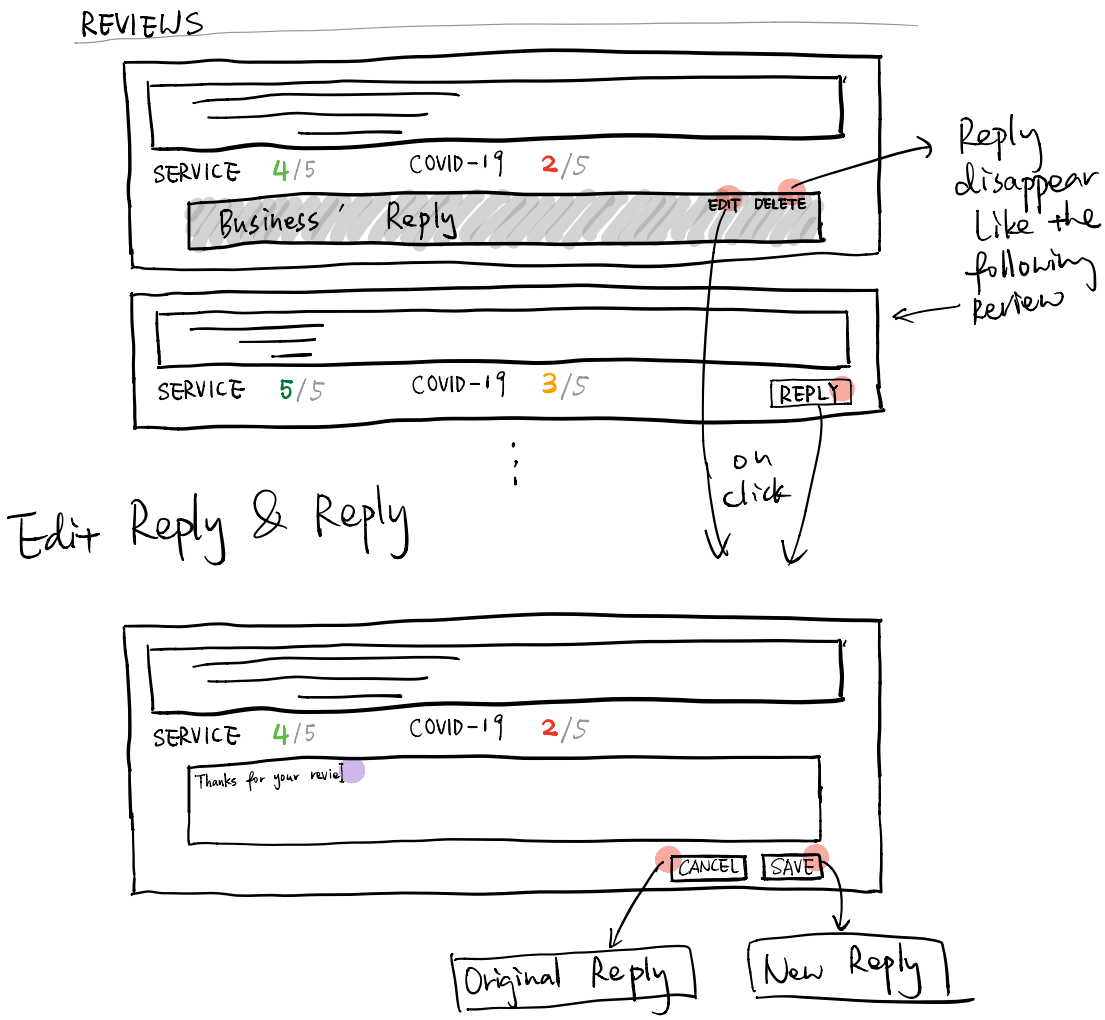
1. Edit General Info



# 2. Edit Operating Status



# 3. Reply to Customer



# *Design Commentary*

**Rating/Review System with Business Response**

We decided to implement a rating and review system that allows businesses to respond to customers' feedback. Considering that the feedback can come in various forms, such as a suggestion, a comment, or a question, we want to maximize our customer and business's interaction. Allowing the business to reply to the customer, businesses can express their care and indicate any improvement they made or take into consideration. We will list the customers' reviews by time from newest to oldest order with newest on the top. On top of it, customers' feedback that received replies from business will be placed on the top also in newest to oldest ordering before the newest feedback. A limitation of this design is that with more replies from the business, it will be harder to read rate/review from the past.

Alternative Design: An alternative design we have thought of is to have a Q&A concept, where the customer can ask questions and businesses respond to them. We later rejected this design because it has a very similar structure to our review system. It's possible for customers to have similar questions and it might become annoying for the business to answer similar questions.

**Feature Display**

We decided to display the ratings by the features, service and COVID precautions. The user can choose the feature they want to rate upon, or can rate all if they would like. Doing so, we can calculate the score for service and the COVID precautions separately and display them for each business. We believe that this will provide customers a more detailed breakdown of the businesses during this difficult time. A limitation of this design is that maybe sometimes COVID precaution does not apply to a business, such as a restaurant that only supports online ordering, then there's no reference to how to rate the business.

Alternative Design: An alternative design we have thought of is to have just one overall rating for each business. We rejected this design because given that this application is aimed to help businesses and customers during this difficult time. We believe that a separate COVID rating is necessary for both businesses and customers to have an awareness about this on-going pandemic and continue to take precaution about it.

**Map View Only and redirect to Business homepage**

We decided to have a pop up preview when the customer mouse over the business on the map. The idea is to have a general overview on the basic information of the business, such as hours of operation and the ratings for service and COVID. The pop is view only, which means there are no functionalities for the customer to rate or review the business. The only thing we're allowing is that clicking into the preview can redirect the customer to the business homepage which then they have access to all information and can make rate/review the business. The limitation of this design is that it might be more inconvenient for the customers to go to another page to perform the action.

Alternative Design: An alternative design we have thought of is to allow customers to comment directly on the map. We rejected this design because we want to make use of the business homepage, hoping that doing so will encourage the customers to read the information and the feedback from other customers. Also, from our design, the preview pop up is too small and crowded to work with, so we want to redirect the customers to a larger platform.

**Authentication**

We decided to restrict business username and address to match their register name and address with the database of Cambridge Local Business that we are provided with. Doing so can avoid other users to fake a business with malicious attempts. Given that the name and address are previously registered on the database, we will know for sure that the business is at the very least the right address and name for the customers to review. Therefore, if there are other users attempting to fake the account, the actual owner can discover it easily and take actions. A limitation of this design is that there is no way for other people to delete the account except for the owner of the account, that way in the case of fake accounts, it is not ideal for the real owner of that business claimed by the fake account.

Alternative Design: An alternative design we have thought of is to have confirmation from other nearby businesses to authenticate the identity of the user that register the account. This raises the issue of how to authenticate businesses that are the first to register, which we don't have solutions to. We also thought of checking the address only, given that the customer will guarantee to visit a location with an actual business registered in the database. We rejected this idea as well, given it can lead to many misunderstanding and confusion on where and which businesses the address leads to.

**Business No rate/review**

We decided to separate the business account and customer account completely. This means, if an user is login into the business account, then he/she will not have access to any of the customer functionalities, which includes the interactive maps and the rate/review functions. If a business owner wishes to use such functions then he/she must create a separate customer account. The reason behind this design decision is that we want to keep a sense of unity of what business accounts and customer accounts can do. A limitation of this design is that it will be a little inconvenient for a business owner, that he/she must log out then sign in as a customer.

Alternative Design: An alternative design we have thought of is simply allow the business owner to have the customer functionality. We rejected this design because supposedly, the business account will then be able to post and respond at the same time. This can cause confusion for the business owner if the button is accidentally mispressed.

**Ask Customer Location**

We decided to implement a function that asks the customer's location so we can limit the business shown on the map based on a set range. This will give customers the flexibility to search places either around him/her or around where he/she is going or even searching for another friend. This way, we can make use of our map an dreasinaly filter out business that's out of range for the customers to choose from. Also, this takes care of the issue of privacy, given that its customer's choice to input the location. A limitation of this design is that we do not support GPS, and it is very likely that customers tend to not know the address of where he/she is, and thus making the searching process more difficult.

Alternative Design: An alternative design we have thought of is simply omitted the location function. We rejected this design because the distance is an important factor for customers to decide whether or not they would want to go to a place. Ideally, one will wish to go to a place that's close by and with a high rating. Without the location function, the customers will have to make their own judgement based on the map. Although the app is built for Cambridge, it will still be difficult to navigate around with a map.

**Rate/Review, allow one or the other**

We decided to allow customers to rate or review a business. The idea here is to give customer choices of what to leave as feedback and rating. We will allow the customers to leave either the comment section blank or the rating section blank. If both empty, then no action is done. A limitation of design is that the feedback might get underrated by other customers if there's no rating to show signs of appreciation/depreciation. Vice versa, the rating might also get questioned by other customers if there's no comments to support it.

Alternative Design: An alternative design we have thought of is requiring the customers to give both comment and rating when using the rate/review system. We thought that it would make everything more consistent and cohesive. We later rejected this idea because ultimately we feel like it's the customers' freedom to express themselves in the form they desire.

**Search Name and Filter Separate**

We decide that for our interactive map, we will separate the business name searching function and the filer function separately. The name searching function will locate businesses with names that match the string input by the customers. On the other hand, the filter function will include searching the businesses by their type, rating, and location. We believe that implementing them separately can help the customer better search for the businesses that they're looking for. We thought that having a search bar specifically for name and the rest filters pre-set for them, simply leaving them with dropdown/list of options can be more organized and easy to understand.

Alternative Design: An alternative design we have thought of is to have a single search bar, and the customer can search for business by type, rating, location ,and name. And each search will become a filter on the previous result, so like piling on the previous search. We then rejected this idea because there's no guide for the customer on how they can search, what type of search is valid and what's invalid. This can lead to more confusion for the customers. It's also possible that ratings or type can be in the names of the business, so specifying which is which by separating them seems like a better idea.

# *Ethics Protocol Analysis*

**Possible Future #1**
Our app is really popular among people in Cambridge. Lots of residents of Cambridge are using it and gaining more information from our app. They also frequently post comments about different businesses, so we quickly gained a long list of comments for each business. Business owners used these comments to modify their reactions to COVID-19, and learned a lot from the other businesses. Our app promoted a healthier environment in our community, and made everyone's experience during COVID-19 better.

**Possible Future #2**
The app is built and released specifically for the city of Cambridge. It was not populated, and there were many fake accounts created on behalf of the real businesses. Fake informations are everywhere, some businesses even lie about their situation of COVID precautions, leading to a big COVID eruption in the city. Positive cases spiked, and hugely affected the large bodies of students in the area. People lose trust in the app and stop using it. More and more businesses closed down, and the pandemic raged on.

**Stakeholders**
- Residents of Cambridge
- Students
- Parents
- Business owners of business in Cambridge
- Potentially business owners of business outside Cambridge, who are also trying to learn from businesses in Cambridge
- Smartphone/computer users and non-smartphone/computer users
- People of different ages
    - Children
    - Young adults
    - Adults
    - Elderly
- People of different race
    - Black
    - White
    - Latino and Hispanic
    - Asian

**Outcome Lens**

*In what ways does what you're making turn out better or worse for your stakeholders?*

Our app can affect how people react to COVID-19. This app can make our stakeholders better off by providing them more information about how businesses are operating and save them time from searching for information online; it can help business owners identify their strengths and weaknesses in how they are reacting to COVID-19 to help them improve and learn from other businesses; it can also help build a sense of community and help people better protect themselves from COVID-19. On the other hand, this app can make our stakeholders worse off if there are fake news spreading on the app, which may waste stakeholders' time or even increase the risk of COVID-19.

**Process Lens**

*How did the process treat stakeholders?*

Our process treats stakeholders equally by giving every user an opportunity to comment about their experience and leave comments, and giving every business access to a homepage that specifically belongs to this business so that each business can receive comments and ratings from users and improve. However, this app is likely not friendly to people who do not have a smartphone, or rarely use a smartphone. When we show results for search and filter, we try not to order the result in a specific way, so that each business has an approximately same possibility of being viewed.

**Structure Lens**

*How are the outcomes distributed among different stakeholders? What are the differences in how different stakeholders were treated by the process?*

Different stakeholders are more likely to search for different types of businesses. For example, Asian stakeholders are more likely to search for Asian restaurants, and White stakeholders are more likely to search for coffee shops or piazza restaurants. Therefore, a comment about an Asian restaurants probably impacts Asian stakeholders more than others. Different groups also have different likelihood of leaving comments about their experience, so groups that leave more comments and are more active on the app likely will be affected more than inactive groups.

**Value-Laden Design Choices**

Design question 1: how do we show the result of filtering (i.e. searching for a specific type of business, like find all restaurants, find all malls, etc.) to the stakeholders?

| Possible Choice | Values Promoted? | Values Demoted? |
|---|---|---|
| Show the result in order, ranked by the rating of each business | Process lens: this choice is easier for our users, because it makes users more likely to find good businesses that suit their needs.<br>Structure lens: this choice favors businesses with higher ratings, since they would be at the top of the page, and users would be more likely to visit them, while businesses with fewer ratings or lower ratings may never be seen.<br>Outcome lens: this gives business owners more incentive to improve their business so that they are more likely to be viewed. | Outcome lens: this choice will cause popular and higher rating businesses to be more popular, because they are the ones users see first. |
| Show the result in random order | Structure lens: this choice gives each business an equal chance of being viewed.<br>Outcome lens: this makes future businesses more likely to join our app, since they know they still can be viewed even with little ratings or low ratings. | Process lens: this choice may make it harder for users to find businesses that suit their needs, because the businesses with lower ratings are more likely to not be good fits. |
| Show the result as dots on the interactive map | Structure lens: this choice gives each business an approximate equal chance of being viewed. Users are more likely to view the businesses that are closer to them, but all the businesses that are close to each other have an equal chance of being viewed.<br>Process lens: this choice utilizes the map, which makes it a lot easier for users to identify the location of each business and find the businesses closer to them. | Structure lens: this may favor businesses in more densely populated regions.<br>Outcome: this may give business owners a bit less incentive to improve on their business and improve their rating. |

Design question 2: how should business accounts be created?

| Possible Choice | Values Promoted? | Values Demoted? |
|---|---|---|
| Ask business account creator to enter the name and location of the business, and allow creation if the | Structure lens:this choice makes the process easy, and all business owners should know their business name | Outcome lens: non business owners may try to create business accounts, since the information we ask is public |

| | | |
|---|---|---|
| information entered match our record in the database | and location, so it treats all stakeholders equally.<br>Process lens: this choice is convenient to users, because accounts can be created instantaneously. | information. |
| Ask business account creator to email us about creating an user account, and provide proof of ownership of the business before the account is created | Outcome lens: this choice makes sure that only actual business owners can create business accounts, so the information must be accurate. | Process lens: this choice is complicated and takes time, so it is more work on the stakeholders.<br>Structure lens: this choice may make it hard for business owners who need an account soon, since providing documentation to prove ownership and waiting for the account to be approved by us takes time. |

Question 3: should modifying comments and ratings be allowed?

| Possible Choice | Values Promoted? | Values Demoted? |
|---|---|---|
| Do not allow users to modify comments and ratings | Outcome lens: the comments and ratings would always reflect the immediate impression after visiting a business.<br>Process lens: this choice makes the process of posting comments and ratings easier, because there are less operations available and stakeholders would not accidentally click on edit when they want to post a new comment | Structure lens: this choice may disadvantage businesses that are not very impressive the first time, but can attract more customers in the long run, because there would be many non impressive comments from customers' first visit that cannot be changed. |
| Allow users to modify comments and ratings | Outcome lens: the comments and ratings would reflect the long term impression of stakeholders.<br>Structure lens: this choice may disadvantage stakeholders who type very fast and do not proof read, because they may realize that they made a typo after | Process lens: this choice makes the process of posting comments and ratings harder, because there are more operations available (edit is available on top of the original ones) and stakeholders may accidentally click on the wrong button. |

| | | |
|---|---|---|
| | posting a comment or clicked on the wrong rating, and would not be able to change it. | |

**Choose & Justify**

Question 1: how do we show the result of filtering and searching to the stakeholders?
Choice: Show the result as dots on the interactive map

- We believe this choice makes it easier for users to find the businesses that they would like to choose, because it incorporates the location of businesses into the result, so users can easily check out the businesses that are closer to them.
- Even though this choice gives businesses that are located in more populated dense area more views, we believe this is natural, because in real life those businesses are more frequently visited too, and we do not want to push our users to visit good businesses that are very far from them.
- Even though this choice gives businesses a bit less incentive to improve their ratings, because their ratings do not affect their chance of being viewed, they would still want to improve their rating, because users will still click on the dots of the businesses to gain more information about them before users decide which business to visit.

Question 2: how should business accounts be created?
Choice: Ask business account creator to enter the name and location of the business, and allow creation if the information entered match our record in the database

- We believe this choice makes it easier for users to use, since they can easily create a page without preparing documentations, and the accounts are created instantaneously
- This choice does not favor or disadvantage a specific group of stakeholders
- Even though this choice does not prevent non business owners to create business accounts, we believe this can be easily caught if it happens. This is because when the actual business owner tries to create an account, we would throw an error and tell the business owner that an account has already been created, then the business owner can let us know about the situation, and we will delete the wrong account and create a new business account for him.

Question 3: should modifying comments and ratings be allowed?
Choice: Do not allow users to modify comments and ratings

- This choice reflects customers' first impression of a business, which is likely more accurate
- Users would not be pressured by businesses or other people to change their comments, especially negative comments
- Users may visit a business again and change their impression about the business and want to change their comments. This choice does not allow it, but users can post a new comment that reflects on their new impression,
- One less operation allowed makes the page cleaner and easier to use

**Build**

Now it's time to build the app! We will follow the ethical design decisions that are described above. If we decide to make any changes to our design decisions, we would revisit the process above and make ethical changes.