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Department of Management Sciences  
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***TEAM MOON 9***

***Milestone 3***

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*November 30th, 2023*

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## Redesign Rationale

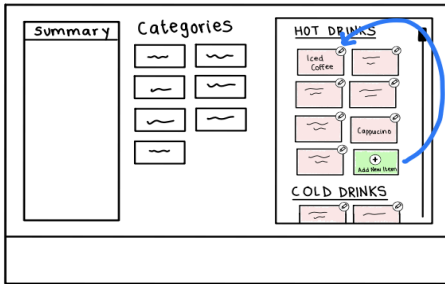
Our team began the redesign process by individually brainstorming improvements for the system based on the findings from the cognitive walkthrough (**Appendix A**) and feedback received from the Design Charette (**Appendix B**). The brainstorming process involved creating low-fidelity prototypes of the improved system. The team decided to brainstorm individually to encourage creative and unique ideas, as well as different implementations of design principles, that could tackle the issues/flaws discovered in Milestone 2's prototype. Conducting the redesign process individually initially ended up increasing the range of problems addressed by each member and introduced various solution options to similar problems.

Following the individual activities, the team regrouped to discuss the various ideas and explain the purpose of each change and how it addresses the issues discovered from the feedback and cognitive walkthrough. The team then organized these changes based on the specific issues they addressed, facilitating the refinement of our design approach. This collaborative effort culminated in the formulation of a definitive list of design changes for the final prototype.

Below are the low-fidelity prototypes created by the team members along with a brief description of the changes made.

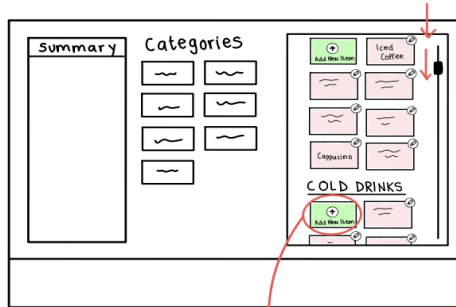
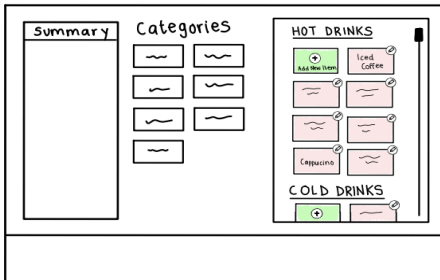
# Low-Fidelity Prototype 1

## Changes to Interface for Modifying Menu

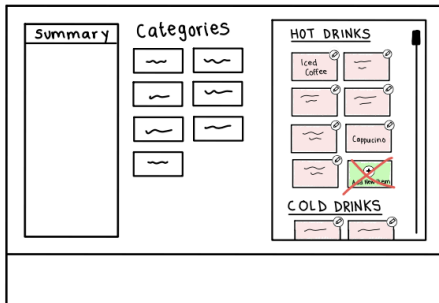


Idea #1: Move add menu item button to be first option

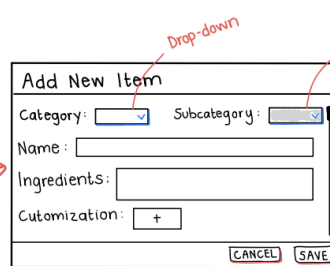
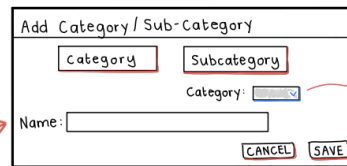
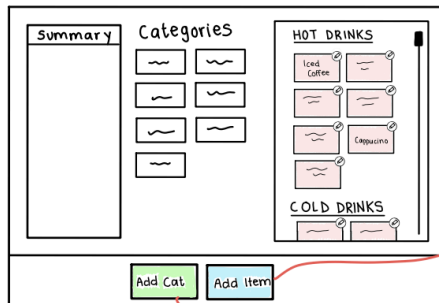
Walkthrough of prototype 1 revealed that it is not time/scroll efficient.

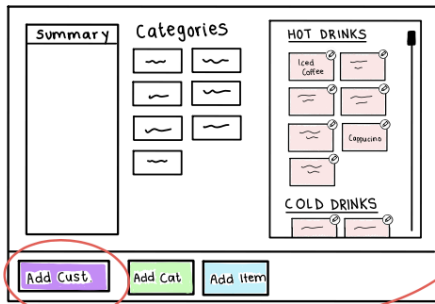


New button location makes it easier to access with less amount of scrolling

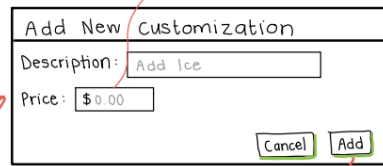


Idea #2: Completely remove add button from subcategories + add it to bottom bar

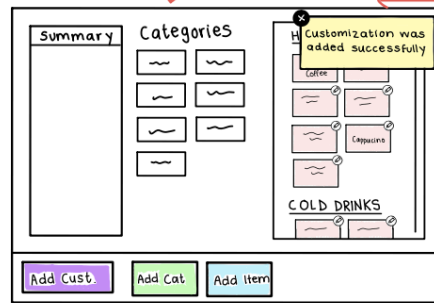




Include a button to add customization options. This would allow us to link a price with customizations that require an upcharge



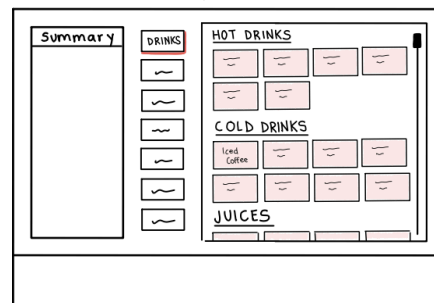
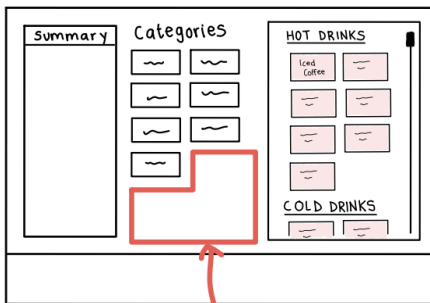
\* Slides in \*



Idea #3: Toast notification after menu modification to provide user with feedback of their actions.

## Main Interface (Ordering)

user has immediate access to more items while still having access to all categories in middle of screen



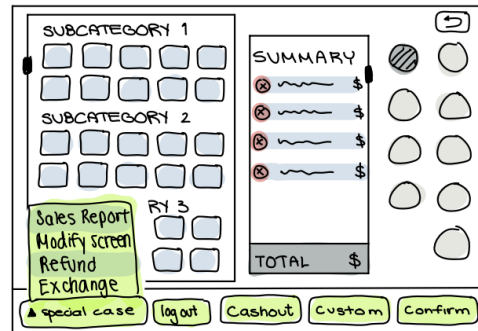
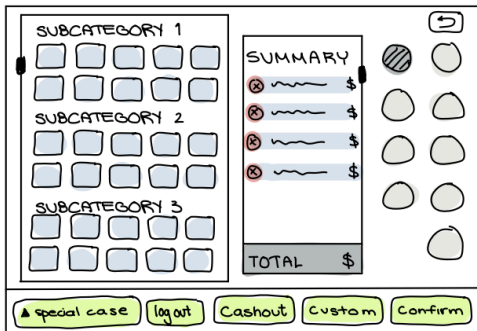
Inefficient use of screen space

The above improvements to the prototype tackle problems concerning user efficiency, missing functionality, appropriate feedback, and optimizing screen real estate. The first proposed change was to modify how managers add new items to the menu. The first suggestion was to relocate the “add item” button for each subcategory to the top (rather than at the end of the items in the subcategory); the second suggestion was to include the add button in the footer of the screen. Both ideas aimed to save users time by eliminating the amount of scrolling needed to add a new item. The second suggestion was chosen to be implemented in the final prototype as it completely eliminates the need to scroll to add a new item thus providing a greater impact to efficiency.

The second design adjustment was to introduce missing functionality needed for other types of customizations that users may want to have. For example, if the user wants to add a new category or modification, there should be a similar button and proceeding form to fill to add them to the screen organization. This additional functionality aligns the system more closely with the real-life environment of a cafe where new categories or item modifications appear over time. The next proposed change in this prototype was to introduce toast notifications. This was motivated from the cognitive walkthrough which helped us to identify that there was no user feedback when a new menu item was added. Lastly, learning more about design principles made it more evident that our Milestone 2 prototype was not making optimal use of the screen space. The improved design addresses this concern by optimizing the layout to reduce whitespace, allowing more items to be visible to the user simultaneously.

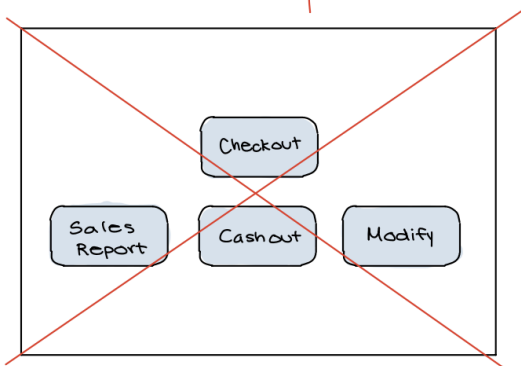
# Low-Fidelity Prototype 2

mode selection (manager view)  
 ↳ post sign in

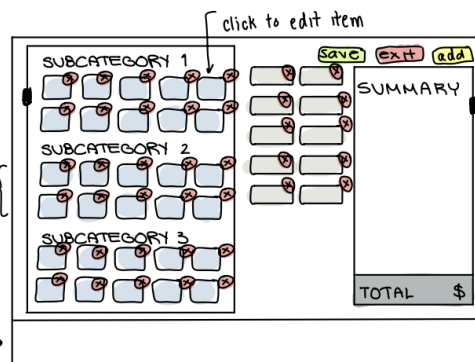


(more nested)

replace with

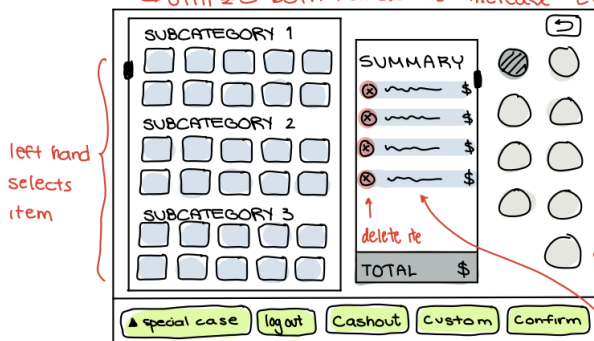


drag to move around



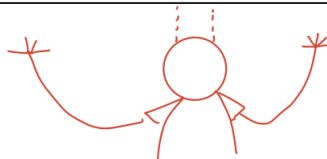
## Selection / Order

↳ utilize both hands to increase efficiency



selection is circles to further differentiate from item selection

implied click to edit  
 ↳ having an edit button on each may be too cluttered



summary relies on visual

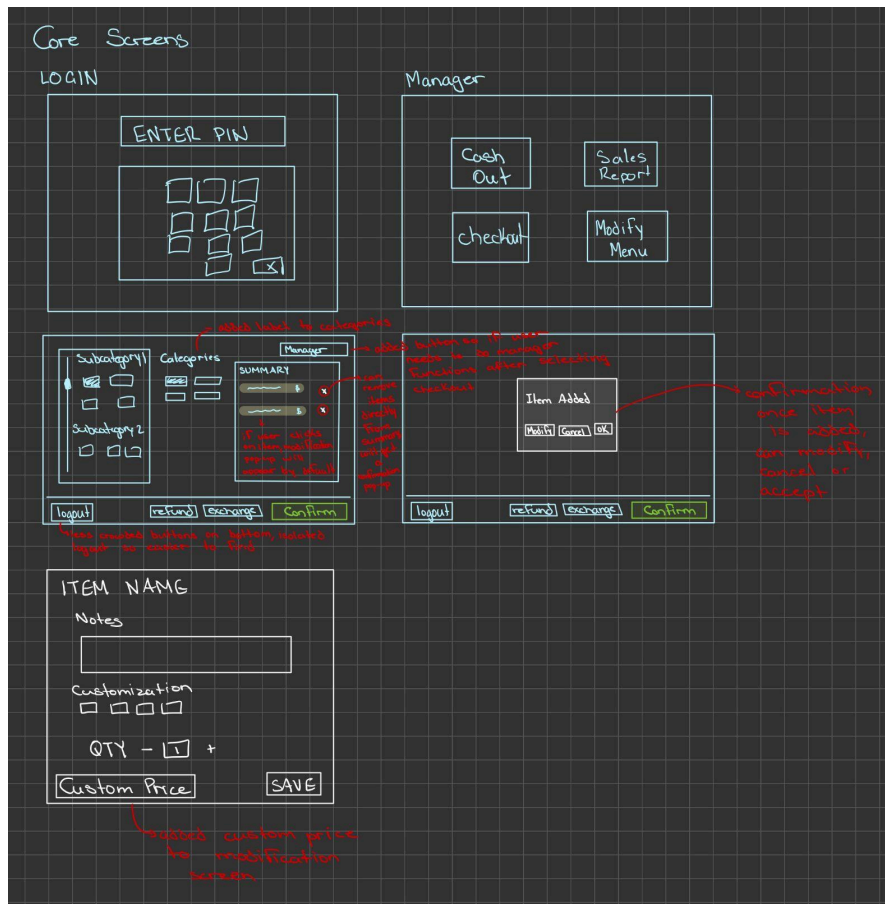
The above improvements to the prototype also aimed at increasing efficiency as well as implementing design principles for a better user experience. This prototype experimented with shifting the order summary to the center of the screen which would enable users to utilize both hands to interact with the system. This adjustment was designed to expedite tasks complete as users could employ both hands and reduce the travel time of travel across the screen when using only one hand. Although this adjustment has the potential to increase efficiency, it was not incorporated into the final prototype. The use of both hands may introduce more user errors that are likely to arise from multitasking and the layout would also introduce inefficiencies for users who choose to operate with only one hand.

One of the pieces of feedback from the Design Charette was that there were a lot of buttons in the footer of the screen which may be confusing or result in misclicking. The various buttons also introduced a lot of clutter into the screen's footer. To refine the design, some of the buttons were either removed or clustered into a drop-down menu. For example, the modify and delete buttons were removed and integrated into the functionality of the order summary. The delete functionality is now found beside each item in the summary, which was a suggestion for a more intuitive approach received from the feedback. The modify functionality is now triggered when a user selects an item from the summary, which triggers a pop-up modal to add custom instructions. This process may not be considered intuitive, however, it is industry standard and should be familiar to users with POS experience. The other buttons were clustered into a drop-down menu as these buttons were typically only accessed 1-2 times a day; hence, they did not need to be immediately present on the screen. Placing the buttons in the dropdown menu eliminated the need to have a unique manager screen. For regular users, managerial functions can simply be disabled.

The final suggested improvement was to increase the degree of difference between categories and subcategories, another feedback from the Design Charette. To enhance section differentiation of categories versus items in subcategories, we transformed the 'Categories' into elements of a different shape.



### Low-Fidelity Prototype 3



The improvements in the above prototype also introduced opportunities for efficiency enhancement as well as uniformity of the system. A suggested idea was to change the login screen to only require an employee’s pin to access the main screen. Since the POS system is not an account that is accessible from the Internet, there is no necessity for entering a username and password; rather, doing so is time-consuming and thus less efficient.

Design Charette feedback highlighted concerns about the system's clutter and the non-strategic placement of buttons. To tackle this issue, we experimented with moving the “logout” button to the bottom left, ensuring its isolation from other buttons and simulating the location of the logout buttons in the corner of the screen. This adjustment facilitates easy identification for users, minimizing potential errors. Another significant change involves implementing a confirmation notification when a user selects an item. This ensures consistency, providing users with the option to modify, cancel, or accept their selection. This standardization addresses inconsistencies observed during the cognitive walkthrough and the feedback session from the design charette, where some items triggered modification pop-ups automatically while others didn’t, causing confusion among users.

## Redesign Takeaways

Based on the above prototype improvements, the team was able to elaborate/enhance the individual ideas and come up with a definitive list of changes to implement in the final prototype. These changes are outlined in the table below.

Final Prototype Changes	Reasoning
1. Replace a login username/password combination with a 6-digit pin (e.g., employee number) for the login screen	Most POS systems utilize a 4 or 6-digit pin for their cashier login rather than typing out a username and password as done on Internet applications. This increases the ease of use and speed of logging in.
2. In menu edit mode, move the “add item” button in under every subcategory to the footer of the screen	The initial design required users to scroll to the bottom of a subcategory to add a new item. Having a button “add item” on the footer of the screen increases accessibility and eliminates scrolling time which can speed up the task completion time., it permits more menu customization functionality which better simulates a cafe environment.
3. In menu edit mode, introduce two new buttons: “Add Category”, and “Add custom modification” to the footer of the screen	This supports more customizability to the manager and makes the application more applicable across different cafe locations. For example, if the menu wants to have a new category for “Combos”, the manager can add this category to the menu. Likewise, if your location now has a new syrup to be added to lattes, you can add that as a new custom modification.
4. On the main screen (where orders are placed), remove less frequently used buttons from the screen footer and cluster them into a drop-down menu.	The previous prototype displayed several buttons that had various utilities and frequencies of use on the footer of the screen. The locations of these buttons were also somewhat randomly placed and thus lacked design uniformity. To reduce clutter, less frequently used buttons (e.g., refund, exchanges) for less common use cases were grouped into a drop-down menu. The dropdown menu would still be accessible on the main screen but provides more visual organization.
5. Remove the Manager-Only screen	<p>Upon login, the previous prototype would direct managers to a manager-only screen which only contained buttons for specific managerial functions (e.g., sales report, modifying menu). This was intended to separate managerial functions away from a cashier’s screen.</p> <p>After deliberation, we considered situations where managers will also need access to cashier functionality (e.g., low staffing), such as placing an order. We decided then to move managerial functions onto the main screen into the drop-down menu outlined in the above improvement. <b>Note:</b> These managerial buttons will be disabled for non-manager users.</p>

<p>6. Move the Logout button in the top right corner and turn it into a recognizable icon</p>	<p>The previous prototype had the 'Logout' button located in the middle of the foot. This was not an intuitive place for the button, especially given the industry standard of having the logout in a corner.</p> <p>Placing the logout in the top right corner will make it easier for users to locate the button and reduce the possibility of a user clicking the wrong button since it is isolated in the corner. This is also typical of where other applications place their logout functionality which makes it intuitive.</p>
<p>7. Adding label for menu categories and using different shapes to differentiate category vs sub-category sections of the screen</p>	<p>Design charette feedback indicated that there was not enough differentiation between a category (e.g., drinks) versus a subcategory (e.g., hot drinks, cold drinks, juices). To reduce this confusion, we will first add a label above categories saying "Menu Categories". Additionally, we will use different shapes and colours to differentiate categories and subcategories. This change will enhance user navigation by introducing more visual differentiation, aiding quicker identification of different sections.</p>
<p>8a. To modify items in the order, users can just click on the item from the order summary instead of a button saying "Modify". Clicking on it will lead to a pop-up modal to add modifications.</p> <p>8b. To remove items from the order, introduce a remove icon button beside each order item instead of clicking a button "Remove".</p>	<p>In many Internet web and mobile applications, if a user wants to edit something in their order, they would simply click on the item and be directed to a screen to edit. This industry practice inspired our change to the modification change. Although it may seem unintuitive not to have a button explicitly saying "Modify Item", the intuition arises from the use of applications that employ this form of modification.</p> <p>The change to the delete order item button could not be achieved similarly to the modify order item functionality; the delete button still had to be explicitly found on the screen. The proposed change is then to use a commonly-used icon (e.g., garbage icon and X ) to be placed beside each order item to indicate to users that pressing that is how to delete that specific item. Additionally, having the icon beside each order item tells the user that a remove icon is associated with that specific item.</p>
<p>9. Add pre-defined discount options in addition to a custom discount functionality</p>	<p>Design Charette suggestions included introducing pre-defined discount options (e.g., 5%, 10%, 15%) which would eliminate the need for users to constantly input discount amounts each time. This was justifiable as many applied discounts are not completely random and typically follow a pattern of multiples of 5; hence, having these options can make the discount process quicker to perform.</p>

# Medium-Fidelity Horizontal Prototype

Link to Horizontal Prototype:

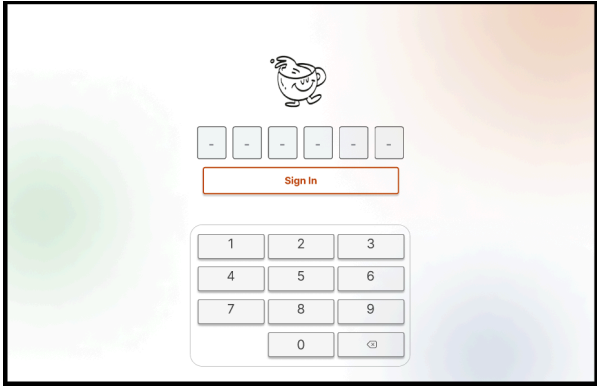
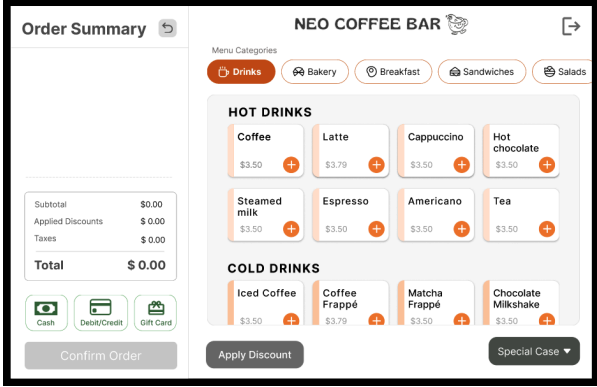
<https://www.figma.com/proto/v0P7CpPnHlqtsBV2dR9m7x/MSCI-343?node-id=58-1546&starting-point-node-id=58%3A1546&show-pr-oto-sidebar=1&mode=design&t=EtE5D4Qlv8wpktNc-1>

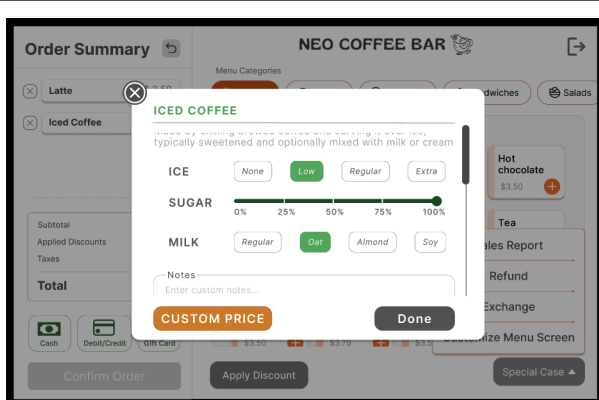
Link to Horizontal Figma page:

<https://www.figma.com/file/v0P7CpPnHlqtsBV2dR9m7x/MSCI-343?type=design&node-id=0%3A1&mode=design&t=4d0Qql1DoKpA4cZx-1>

The **horizontal prototype** includes the following screens: the main menu screen, the login screen, and the menu modification screen (a managerial function). Unlike a web or mobile application where interactions would lead to completely new screens, interactions on a POS system lead to pop-up modals; hence, we have included these within our horizontal prototype. For example, the main menu page includes modals used to edit items or apply discounts (as organized on Figma).

Below are the screens (and modals) of the horizontal prototype:

Horizontal Prototype	
Screen	Description
 <p>The login screen features a central logo of a smiling coffee cup. Below the logo is a row of six input fields for a 6-digit PIN, followed by a 'Sign In' button. At the bottom, there is a numeric keypad with digits 1-9, 0, and a backspace icon.</p>	<p><b>Name:</b> Login Screen</p> <p><b>Description:</b> Users can enter their 6-digit pin to sign-in and access the app</p>
 <p>The main menu screen is titled 'NEO COFFEE BAR'. It includes an 'Order Summary' sidebar on the left showing a total of \$0.00. The main area displays menu categories: 'Drinks', 'Bakery', 'Breakfast', 'Sandwiches', and 'Salads'. Under 'HOT DRINKS', there are items like Coffee (\$3.50), Latte (\$3.79), Cappuccino (\$3.50), Hot chocolate (\$3.50), Steamed milk (\$3.50), Espresso (\$3.50), Americano (\$3.50), and Tea (\$3.50). Under 'COLD DRINKS', there are items like Iced Coffee (\$3.50), Coffee Frappé (\$3.79), Matcha Frappé (\$3.50), and Chocolate Milkshake (\$3.50). At the bottom, there are buttons for 'Confirm Order', 'Apply Discount', and a 'Special Case' dropdown menu.</p>	<p><b>Name:</b> Main Menu Screen</p> <p><b>Description:</b> This is the default page when users log in where cashier users place orders and managers can access their managerial functions using the 'Special Case' drop-down menu at the bottom right of the screen.</p>

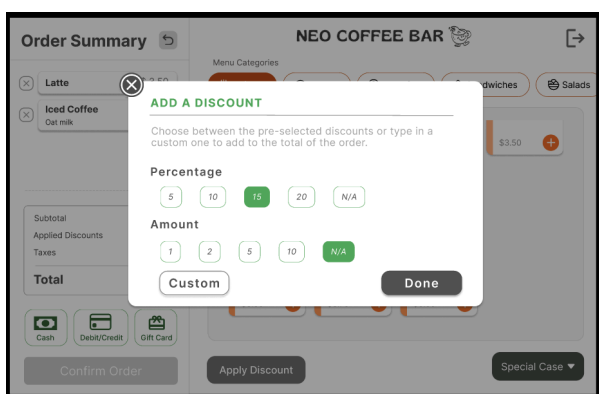


**Name:** Item (Iced Coffee) Modification Pop-up Modal

**Description:**

Users can modify items based on customer requests accordingly. For example, you can substitute the milk for oat milk.

This modal can be accessed by clicking on an item under the Order Summary. In this case, we clicked on "Iced Coffee" to get the pop-up modal.

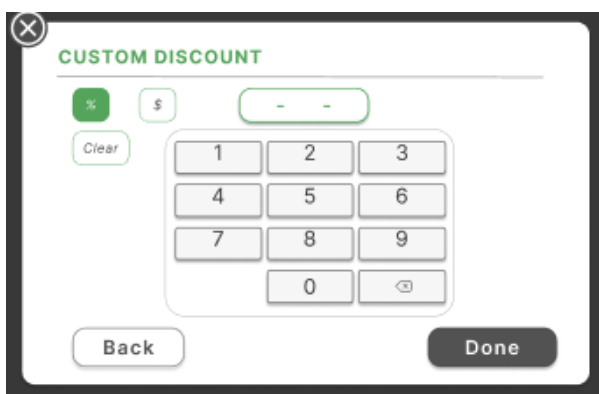


**Name:** Predefined Discount Screen Pop-up Modal

**Description:**

Users can apply a predefined discount to the order by either selecting a standard discount option (either percentages or cash amounts).

Users can access this modal through the 'Apply Discount' button located on the bottom left of the main menu screen.

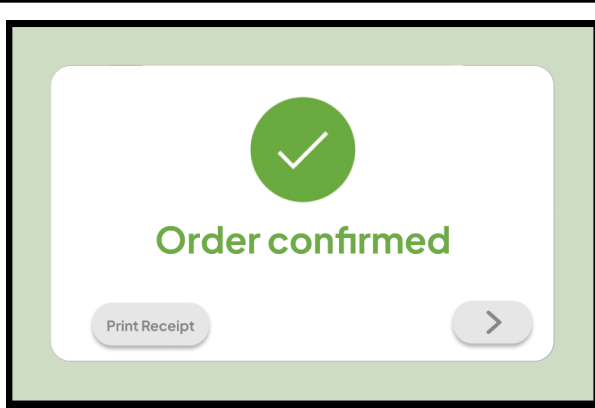


**Name:** Custom Discount Screen

**Description:**

Users can apply a custom discount to the order by inputting a percentage or amount to be discounted off the order.

Users can access this modal through the 'Custom' button located on the Predefined Discount Screen Pop-up Modal

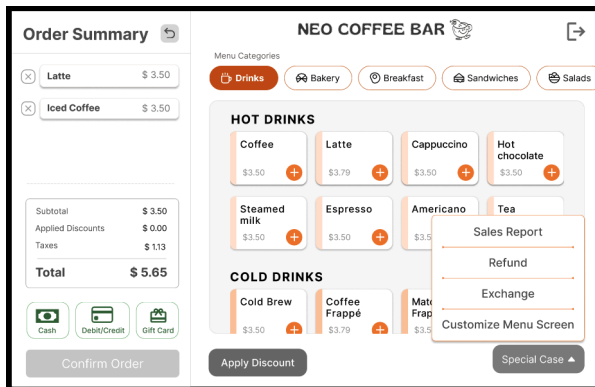


**Name:** Order Confirmation Screen

**Description:**

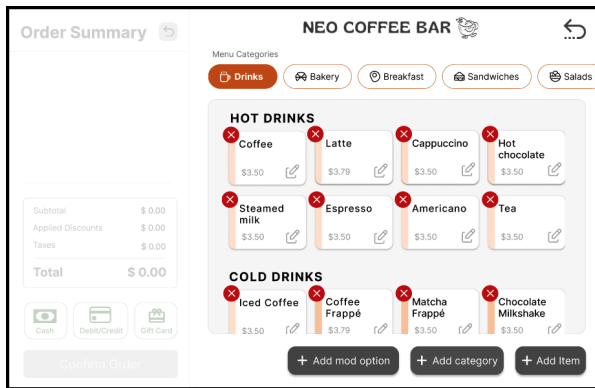
This screen is used to notify users (provide visual feedback) that the order was confirmed.

Users can either print the receipt or click the arrow button to go back to the main menu screen to serve the next customer.



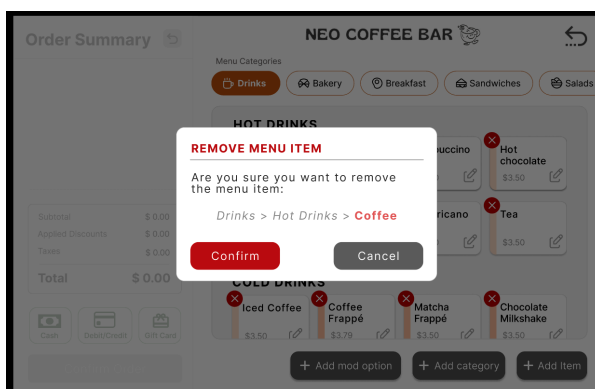
**Name:** Menu Modification Screen

This screen which is only available for managers, allows for them to perform managerial functions like 'Customize Menu Screen' and etc . It can be accessed by clicking on the "Special Case" dropdown menu on the main menu screen. Click on the "Customize Menu Screen" to access the screen.



**Description:**

The menu modification screen allows managers to remove items from subcategories (e.g., discontinued items), add new items, add new categories, and new modification options. Each of these actions will lead to a unique pop-up modal.

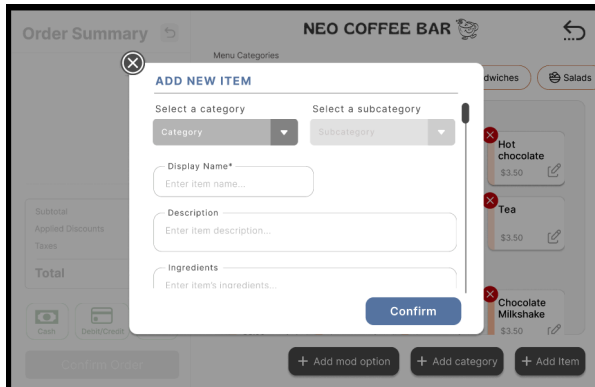


**Name:** Remove Item Pop-up Modal

**Description:**

Users will receive a confirmation pop-up if they decide to remove a menu item. The confirm button is purposely on the left to force users to be mindful of this action.

Users can remove a menu item by clicking on the 'X' on the top left corner of the menu item they wish to remove.

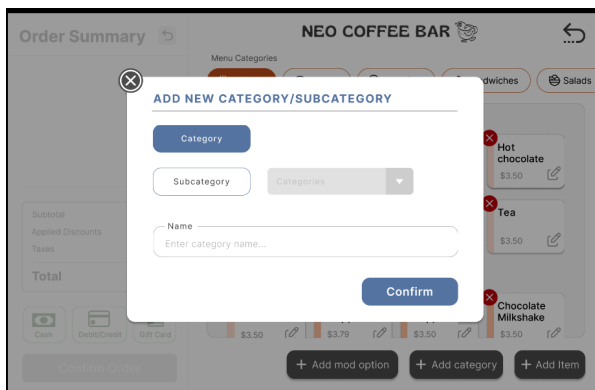


**Name:** Add New Item Pop-up Modal

**Description:**

The modal includes information such as new item name, description, ingredients. It also includes dropdown menus to categorize them into a specific menu category (e.g., Drinks) and sub-category (e.g., Hot Drinks).

Managers will be able to add a new menu item by selecting the 'Add item' button on the bottom right on the 'Menu Modification' page.

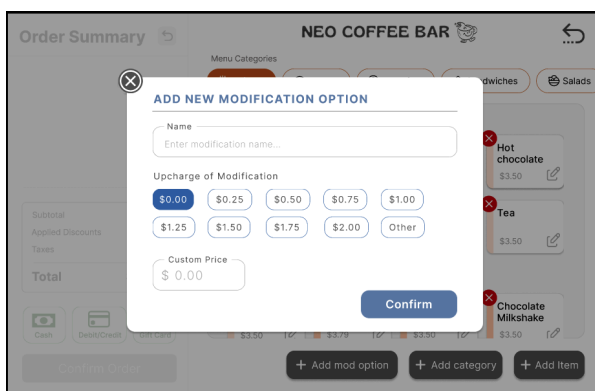


**Name:** Add New Category/Subcategory Pop-up Modal

**Description:**

Managers can add new categories or subcategories to the menu using this modal.

Managers can access this feature by selecting the 'Add category' button on the bottom right on the 'Menu Modification' page.



**Name:** Add New Modification Pop-up Modal

**Description:**

Managers can use this feature to add new modifications with an associated upcharge to the menu.

Managers can access this feature by selecting the 'Add mod option' button on the bottom right of the 'Menu Modification' page.

**Name:** Menu Modification Screen with Toast Notification

**Description:** When a user makes a change to the menu by either removing an item, adding a new item, or adding a category/subcategory or modification, the user will receive a notification in the top right corner notifying them that the changes were saved successfully.

## Medium-Fidelity Vertical Prototype

Link to Vertical Prototype:

<https://www.figma.com/proto/v0P7CpPnHlqtsBV2dR9m7x/MSC1-343?type=design&node-id=209-8605&t=neTrP9Flo8fT70uO-1&scaling=scale-down&page-id=209%3A6524&starting-point-node-id=209%3A8605&mode=design>

The **vertical prototype** has more developed interactions, and the many features take us through the entire process of taking an order. In addition to the aforementioned pages in the horizontal prototype, we can add and remove items from the order, add custom modifications to an ordered item, add a discount to the order, and place an order. The following use case was integrated into the vertical prototype and is based on the 'must-include' features identified in the previous milestones.

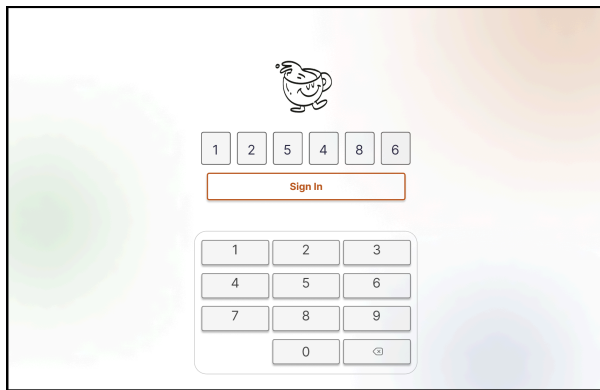
Vertical Prototype Use Case: (see Appendix C for detailed version)

1. Log In
2. Add Items to Order:
  - a. Add: Iced Coffee
  - b. Edit the type of milk
  - c. Remove
3. Add discount
4. Pay with cash

In the table below, the use case for the vertical prototype is described and the necessary actions are outlined:

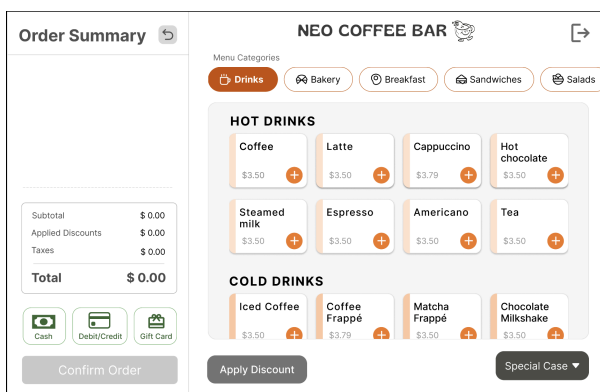
<b>Vertical Prototype</b>	
<b>Screen</b>	<b>Action</b>





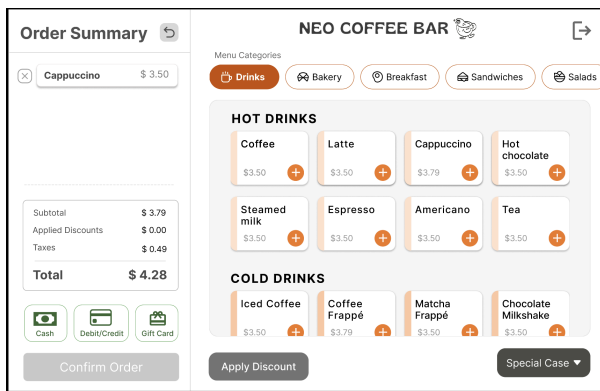
Type in any 6 numbers with the on-screen keyboard on the Log-In screen and then click "Sign In".

This will lead you to the main menu order screen.



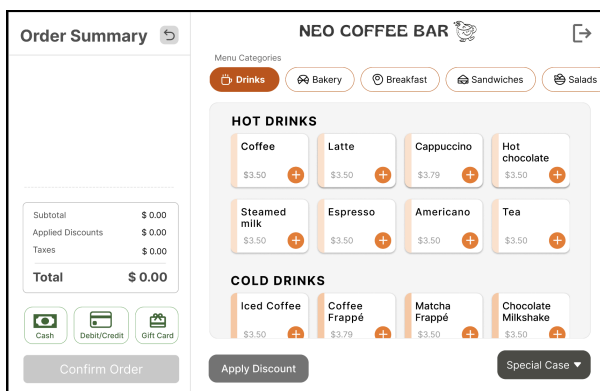
Let's walk through a sample user case. Say a customer orders a cappuccino:

Add "Cappuccino" to the order from the "Hot Drinks" section. The item can be added by clicking the plus sign on the item card.



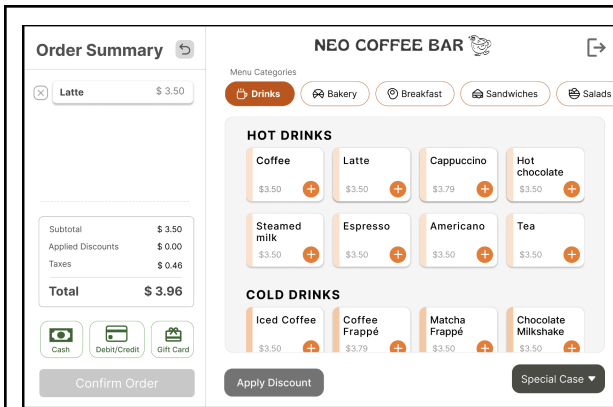
We now have a cappuccino in our order. Let's say that the customer changed their mind and no longer wants to order the cappuccino.

You can remove the item by clicking the [X] icon beside the Cappuccino in the order summary. This is what your screen should look like following deleting the item.

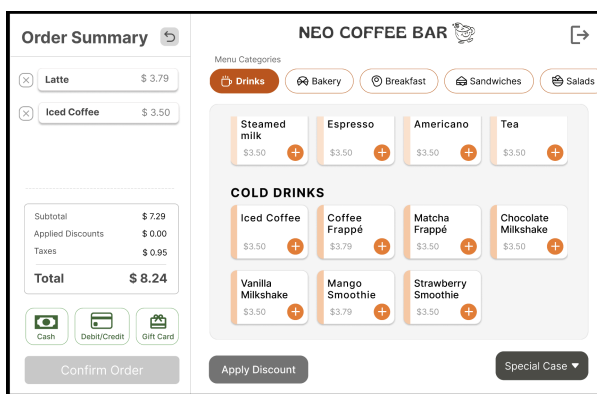


There are now no items in our order. The customer says they want to order a latte and an iced coffee.

Add "Cappuccino" to the order from the "Hot Drinks" section. The item can be added by clicking the plus sign on the item card.

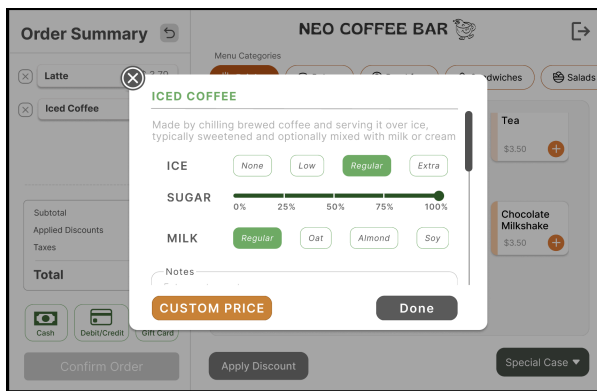


Scroll down slightly to “Cold Drinks”. Add “Iced” to the order from the “Cold Drinks” section. The item can be added by clicking the plus sign on the item card.

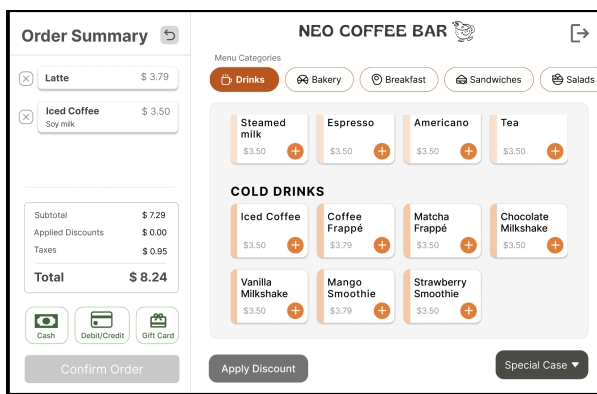


Now you have both drink items in the order correctly. The customer says they want the iced coffee made with soy milk.

Click on the “Iced Coffee” item card from the “Order Summary”. A popup modal should appear where you can edit the order item.

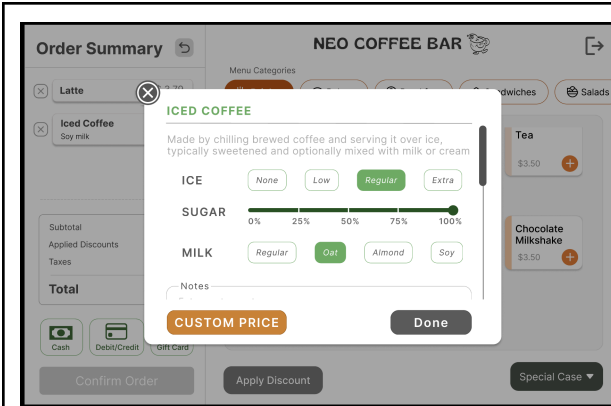


Change milk to “Soy” and then select the “Done” button in the bottom right corner.

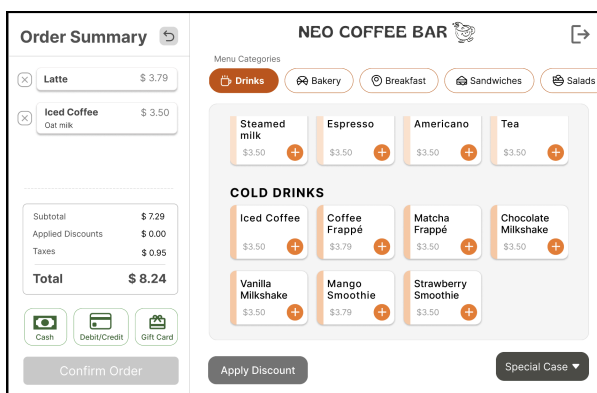
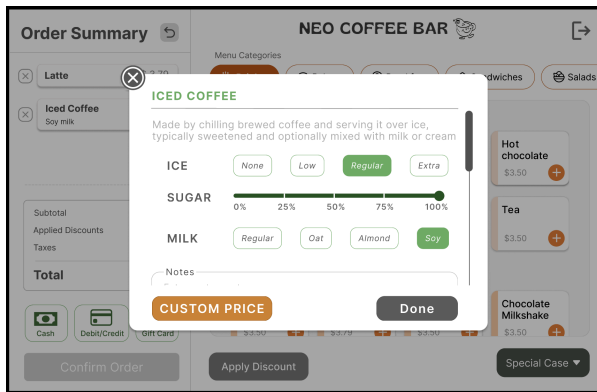


The iced coffee now includes a custom modification. Let’s say the customer actually wants oat milk instead.

Click on the “Iced Coffee” item card from the “Order Summary”.

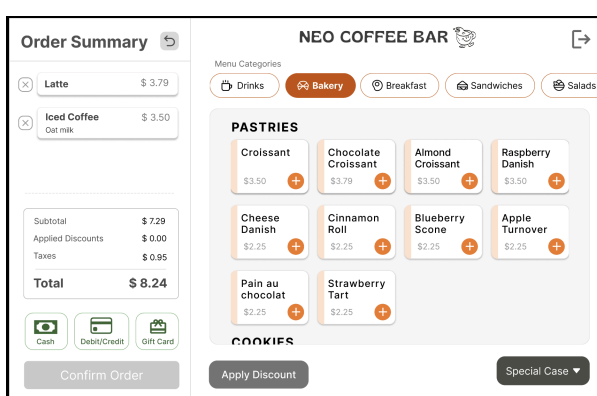


The same popup should appear with soy milk highlighted. Change milk to "Oat" and then select the "Done" button in the bottom right corner.

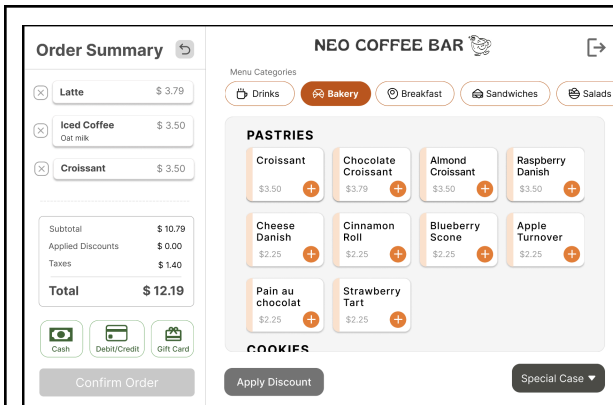


Now the iced coffee is instructed to be made with oat milk. Let's say the customer wants to add a croissant to their order.

Scroll through the horizontal bar displaying menu categories and click "Bakery".

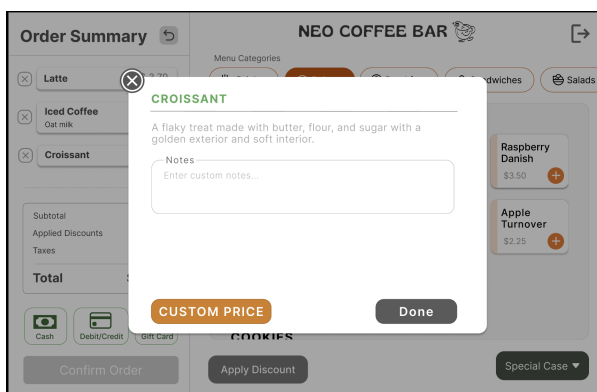


Select "Croissant" from the "Pastries" subcategory section.

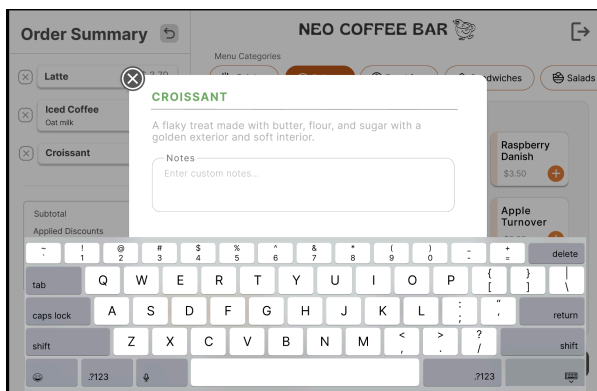


You ask the customer if they would like their croissant warmed up and they say yes. Let's add this instruction to the croissant in the order.

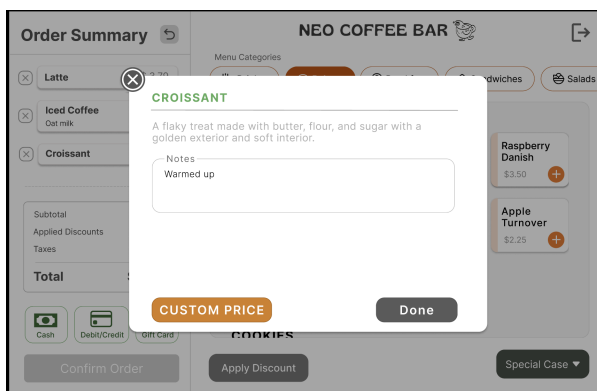
Select the "Croissant" item card from the "Order Summary". A popup modal should appear to add these instructions.



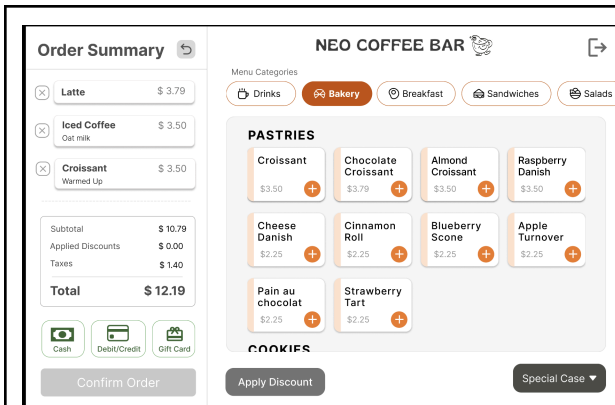
Click the "Notes" textbox to prompt the keyboard to appear. In a high-fidelity prototype, the keyboard is meant to be used to type the modification.



For demonstration purposes, click right underneath the "Notes" text box to make the keyboard go away. Then click on the same place to show the text in the notes section. (This is a workaround due to only being able to implement one interaction at a time).

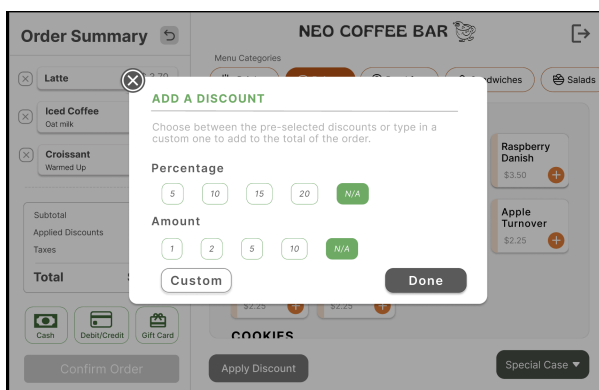


The instruction is now typed into the textbox. Select the "Done" button.



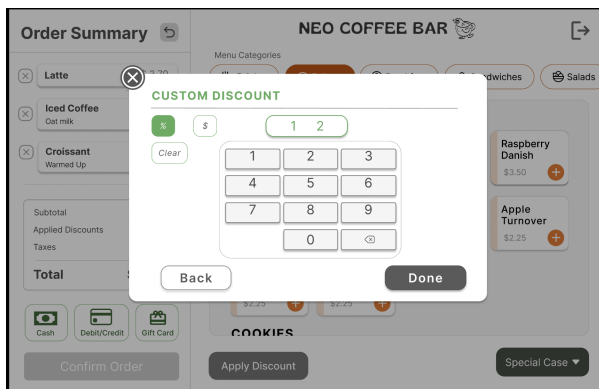
The order is now complete with the two drinks and pastry. Now let's say you want to apply a 12% discount on the total order.

Select "Apply Discount" at the footer of the screen. A popup modal should appear.

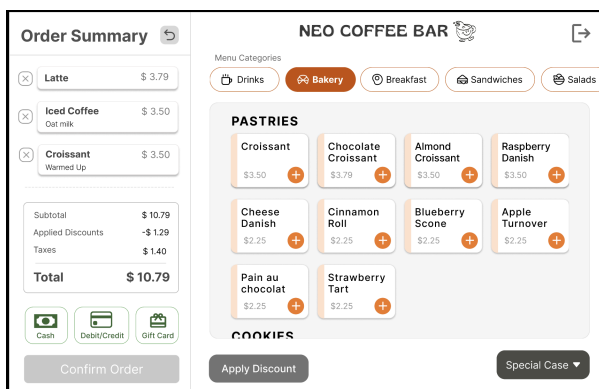


We do not see a predefined discount for 12% so we will need to make it into a custom discount.

Select the "Custom" button in the bottom left corner.

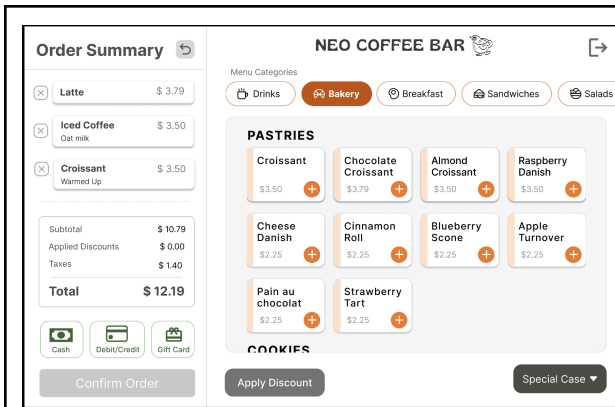


Type a discount of "12" and select the "Done" button.



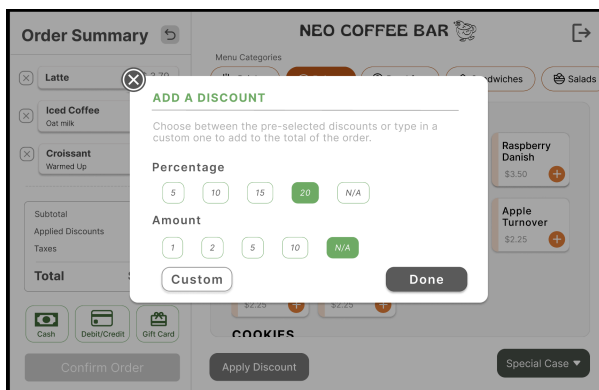
We can now see the 12% discount in the order. Let's say you made a mistake in applying the discount. It should actually be a 20% applied discount!

Select the undo button at the top right of the order summary to remove the discount.

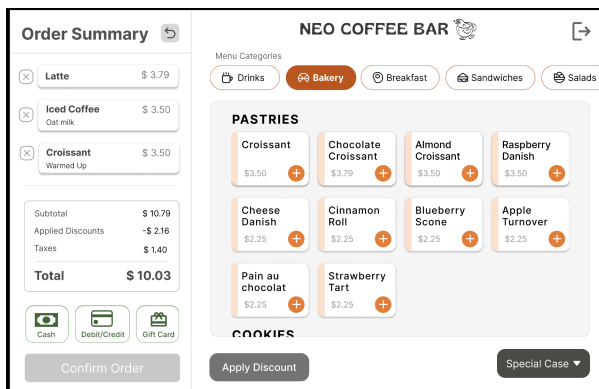


You can now see that the 12% discount has been unapplied.

Select "Apply Discount" at the footer of the screen. A popup should appear.

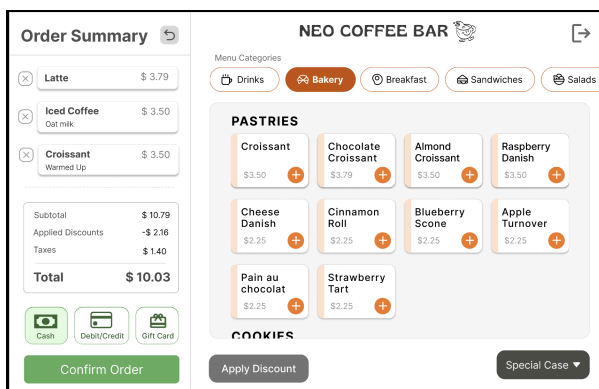


Click on the 20% icon on the pop-up modal and select the "Done" button.



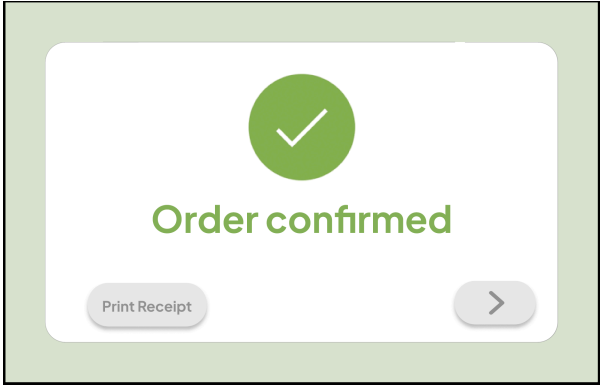
You ask the customer how they would like to pay and they say with cash.

Select the "Cash" button as the payment method at the bottom of the Order Summary. The "Confirm Order" button should turn green.



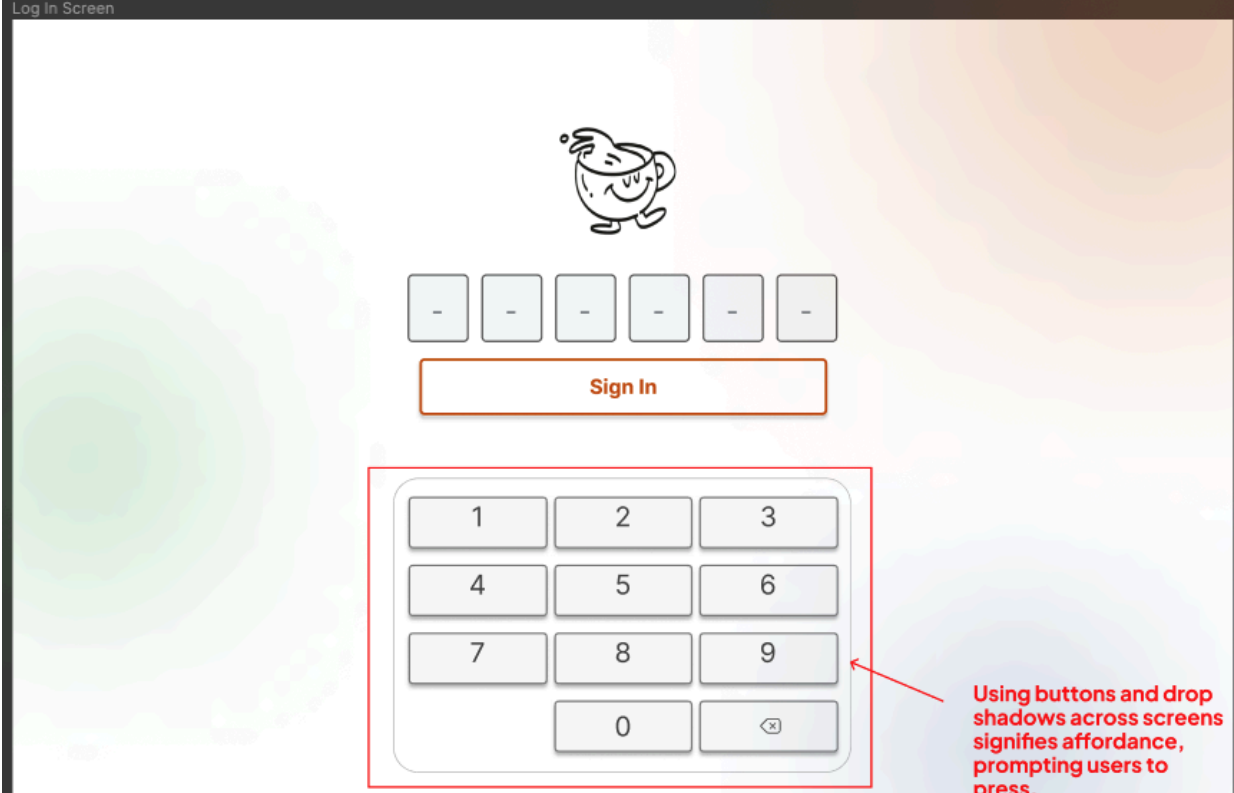
The order is ready to be confirmed!

Select the "Confirm Order" button.

 A screenshot of a mobile application screen showing a green checkmark icon at the top center. Below the icon, the text "Order confirmed" is displayed in green. At the bottom left, there is a button labeled "Print Receipt". At the bottom right, there is a button with a right-pointing arrow.	<p><i>Order is complete!</i></p> <p><b>Optional:</b> You can click on the right arrow icon to reset the screen (and start working on a new order).</p>
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## Justification of Prototype Design using Design Principles

While designing the medium-fidelity prototype, the team implemented the final changes while factoring in design concepts like affordance, Gestalt psychology and Fitts Law. Below are the design principles applied made while creating the medium-fidelity prototype :

A screenshot of a "Log In Screen" prototype. At the top center is a cartoon coffee cup icon. Below it is a password field consisting of six grey boxes, each containing a hyphen. Underneath the password field is a "Sign In" button with a red border. Below the "Sign In" button is a numeric keypad with buttons for digits 1-9, 0, and a backspace icon. A red box highlights the numeric keypad, and a red arrow points from a text box to the right side of the keypad.

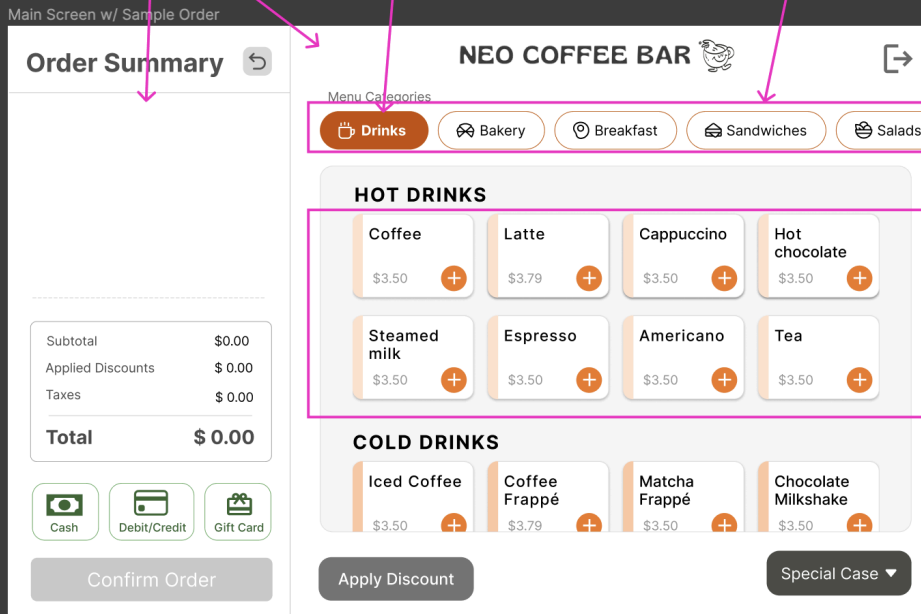
Log In Screen

Using buttons and drop shadows across screens signifies affordance, prompting users to press.

A split-screen layout is employed to separate different pieces of information that complement each other, such as the ordering screen and the order summary

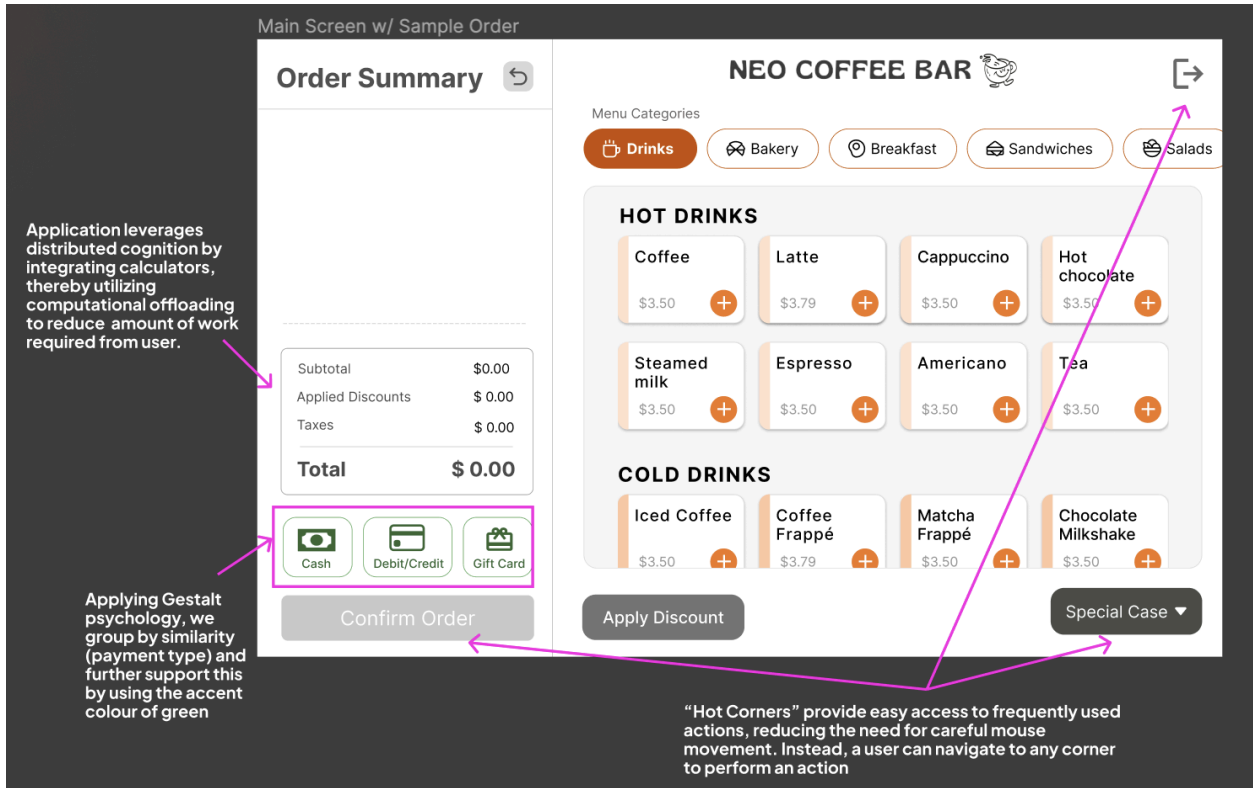
With visual variables, we leverage preattentive processing through increasing the degree of difference using colour - the selected label has full colour

Applying Gestalt psychology, we group by similarity (menu categories) with continuity (in a line) with close proximity



Applying Gestalt psychology, we group by similarity (menu items) with proximity (clusters) of items in the same sub-category





Croissant Modal

Applying Fitt's Law, we aim to enhance user interactions by using large icons, making them easier to locate and reach. For instance, the time required to close pop-ups is minimized because the frequently used close button is larger and more easily accessible.

**CROISSANT**

A flaky treat made with butter, flour, and sugar with a golden exterior and soft interior.

Notes  
Enter custom notes...

CUSTOM PRICE Done

Toast Notification

**Saved Successfully**  
Your changes have been saved successfully

Applying Distributed Cognition, the toast notification serves as an example of externalizing to reduce memory load

Iced Coffee Modification Modal

**ICED COFFEE**

Made by chilling brewed coffee and serving it over ice, typically sweetened and optionally mixed with milk or cream

ICE: None, Low, Regular, Extra

SUGAR: 0%, 25%, 50%, 75%, 100%

MILK: Regular, Oat, Almond, Soy

Notes

CUSTOM PRICE Done

Utilizing scroll bars signifies affordance, prompting users to scroll to view other components of the screen

### Heuristic Evaluation

To evaluate our prototype, we conducted 4 heuristic evaluations for each team member in the group who are familiar with the concepts of Neilson's Heuristics and have not previously seen

our designs. This allowed us to gather different perspectives, especially from participants outside of our project group who offered a fresh and unbiased viewpoint. Although these users are not familiar with using POS systems, their interactions were predicted to simulate those of new cashier hires who are learning how to use the POS system. Each participant/volunteer evaluator was presented with the prototype and briefed on the project background. The task assigned is a simplified version of our vertical prototype; processing a straightforward coffee order. Team members accompanied participants to help take notes and make observations on the overall experience.

**Script:**

*You will be presented with our platform prototype, a Point of Sales system designed for coffee shop cashiers as the target users. We ask you to interact with the system and explore all the functionalities. In addition, please complete the following task: Add an iced coffee to an order and checkout. As you navigate the system, please actively note any issues or usability violations you come across. Identify violations of heuristic principles or areas for design improvement, while referring to the attached list of heuristics and drawing from your personal knowledge of UI design concepts. To facilitate a thorough analysis, please document your valuable feedback and suggestions in the table, linking each issue to a specific heuristic principle.*

**Results**

Each participant’s heuristic evaluation can be found in **Appendix C**. Relevant and recurring evaluation remarks were combined into the table below (sorted by highest to lowest severity):

#	Task/Action/Page	Heuristic	Issues/Violations	Severity Rating	Fix Rating	Suggestions
1	Removing an applied discount	[H2-3] User control and freedom  [H2-5] Error Prevention	Once a discount is applied and you perform other actions in the order, you can’t undo the discount without undoing all of the other actions made to the order.	4	3	Add an applied discount item box to the order summary so that you can easily remove an applied discount
2	Adding items to order	[H2-8] Aesthetic and Minimalist Design	There should be a scroll bar on the order summary for orders that get very big so that we know there’s more to an order and need to scroll to see the whole thing.	4	1	Add a scroll bar to the side of the order where the items are listed.
3	Order checkout	[H2-5] Error Prevention	The payment methods are used to enable/disable the	3	2	Keep the confirm order button

			confirm button but it should not be enabled when a cart is empty.			disabled until both a payment method is selected and there is at least one item in the order
4	Apply Discount	[H2-1] Visibility of system status	Discount button may get overlooked because it's not on the payment panel, makes more sense to group with the financial processing side, and it's coloured gray so it may be easy to miss	2	2	Add to the payment panel, under the payment type, as that would be right before checkout
5	Editing an order	[H2-1] Visibility of system status	Not clear that order item is editable on the order summary, does not suggest action, does not appear clickable	2	3	Add edit icon on the items in the order summary
6	Adding a discount	[H2-1] Visibility of system status	It was not very explicit that a discount was applied besides the calculation being updated. But there was nothing showing me or explicit feedback saying the discount was applied.	2	2	Add an item card for the specific discount, the same way you have items in your order.
7	Apply Order customization	[H2-1] Visibility of system status	Not clear that order item is editable on the order summary, does not suggest action, does not appear clickable	2	3	Add edit icon on the items in the order summary
8	Adding an item to the order	[H2-7] Flexibility and efficiency of use	When I try to add an item, I have to specifically click on the add plus icon. If I were an experienced user with the system, I would want to be able to just click the item card to make the process quicker.	2	1	Make each item card clickable to add to the order
9	Using the special	[H2-4]	It is not really clear what a	1	1	Change the

	case drop-down menu	Consistency and standards	special case is so I wouldn't really know what would be wrapped in this functionality.			name of the drop-down button to "Additional Functionality" or "Manager functions" if they are only restricted to managers.
10	Adding a custom discount	[H2-7] Flexibility and efficiency of use	It is tedious to apply a discount and then have to click "custom" to determine a custom discount. It is not that efficient needing to go through multiple steps to do so.	1	2	Make the custom discount calculator option on the same pop-up screen as the standard discounts.

**Evaluation Discussion:**

From our heuristic evaluation, we have identified several suggested improvements, with the highest priority fixes primarily centred around applying discounts to orders. It is clear that there is not enough visibility, flexibility and error prevention integrated into the discount functionality as this was a prevalent issue. There were also many occurrences of users not knowing how to edit an item which highlighted issues with consistency (e.g., there is an icon for remove but no icon for edit). Many of the suggested improvements would significantly enhance usability and are fortunately feasible to implement. For instance, changing the "Special Case" drop down menu to a different named button such as "Manager Functions" would make it more explicit that the functionality within that dropdown are for managers. Similarly, there were many offered changes to make discounts more visible and easy to adjust (recommendations #1 4, 6) which are all feasible to implement.

It is crucial to recognize that the diverse feedback we received may sometimes present conflicting suggestions, introducing trade-offs with our design rationale. For example, Recommendation #5 suggests adding an edit icon to items in the menu summary, conflicting with our intention to maintain a clean and uncluttered interface. Given that our future users will undergo training on the system and learn that the item itself is editable during the training period, we aim to strike a balance between visibility and minimalism. This consideration reflects our interests in learnability and avoiding cluttering the order with additional icons.

Lastly, we aspire to offer more user flexibility while minimizing error proneness. In the future, if we were to consult an expert, we would seek advice on maximizing user flow design to enable cashiers to move seamlessly across the interface and recover from errors.

## **Conclusion**

Throughout the design process, our team gained valuable insights and experience, enhancing our understanding of what an effective application design entails. The use of individual and collaborative brainstorming sessions enabled the team to explore diverse perspectives and creative solutions. The iterative nature of our design approach, including defining requirements, user testing, and feedback loops were vital to ensure the application meets the specific needs of the users. Challenges encountered during the design process served as valuable learning opportunities, emphasizing the importance of user-centric design principles and the need for continuous refinement. As a team, we developed an understanding of the balance between functionality and user-friendliness, recognizing that a well-designed POS system should not only meet technical requirements but should also be able to integrate seamlessly into the daily workflow of the users.

Our team has successfully designed an application that addresses the inherent challenges associated with traditional POS systems, particularly in the context of coffee shops. Our application aims to enhance the overall user experience by offering a more intuitive and customizable interface. By recognizing the frustrations stemming from unintuitive designs and limited customizability, we have crafted a POS system that empowers businesses to tailor their workflows effectively.

However, we acknowledge the need for ongoing improvements to further enhance our solution. As revealed in our heuristic evaluation, certain areas require attention, such as improving the visibility of specific application features. Our evaluation highlighted instances where users struggled to identify actions like modifying menu items or utilizing discount buttons due to issues with placement, colour, and clear identification. Another notable area for refinement involves incorporating error prevention features, such as ensuring users cannot complete a checkout without items in the cart or providing helpful tooltips when users are uncertain about the next steps.

## Appendix A - Cognitive Walkthrough

### Task #1 : Placing an Order

Steps	Evaluation
<p><b>1. Login : Enter Username and Password</b></p>	<p><b>A :</b> Yes, there are text fields for the user to input username and password and a 'Done' button for when they are done  <b>F :</b> Yes, once the user enters correct username and password and they select 'Done', the screen changes to the main menu  <b>V :</b> Yes, there are labelled text fields and there is a 'Done' button after the 'Password' text box so the user knows to click the button to complete the action</p>
<p><b>2. Select Iced Coffee from menu</b></p>	<p><b>A :</b> Yes, there is an 'Iced Coffee' button on the side listed under the subcategory 'Cold Drinks'  <b>F :</b> Yes, once users select Iced Coffee, a modification pop-up will show with the title 'Iced Coffee'  <b>V :</b> Yes, users may need to scroll down on the menu items to see the 'Iced Coffee' button, however there is a scroll bar that shows users that they can scroll</p>
<p><b>3. Add oat milk to coffee</b></p>	<p><b>A :</b> Yes, The modification pop-up has buttons to allow for users to add oat milk to coffee.  <b>F :</b> Yes, once the user makes the modifications on the pop-up, it will be highlighted on the modification pop-up  <b>V :</b> There is a clear button for "Oat Milk" under "Milk"</p>
<p><b>4. Confirm changes</b></p>	<p><b>A :</b> Yes, users can select 'Done' to confirm changes  <b>F :</b> Yes, changes will be shown in summary along with the changed total for the order.  <b>V :</b> Yes, the button is located on the bottom right of the pop-up which is standard for 'Done' buttons</p>
<p><b>5. Add a Tea to the order</b></p>	<p><b>A :</b> Yes, the user needs to select 'Tea' from under subcategory 'Hot Drinks' and it will be added to the order. There is no modification option for teas, hence there is no modification pop-up.  <b>F :</b> Yes, once the user selects Tea, it will be added to the summary and the total will change as well.  <b>V :</b> There is a button labelled 'Tea' under 'Hot Drinks'. Users may need to scroll to find the 'Tea' button but there is a scroll bar for users to know that they can scroll.</p>
<p><b>6. Select 'Pastries' category</b></p>	<p><b>A :</b> Yes, there's a button called 'Pastries' listed beside 'Drinks'  <b>F :</b> Yes, the button will be highlighted once you select it and</p>

	<p>the menu items listed on the side will be pastry items</p> <p><b>V</b> : Yes, the button is listed right beside the highlighted 'Drink' button on the centre of the screen.</p>
<p><b>7. Select croissant from menu</b></p>	<p><b>A</b> : Yes, there is an 'Croissant' button under the subcategory 'Other'</p> <p><b>F</b> : Yes, once users select Croissant, a modification pop-up will show with the title 'Croissant'</p> <p><b>V</b> : Yes, the user may have to scroll to see the 'Croissant' button, however there is a scroll bar to indicate to the user that they can scroll on that page.</p>
<p><b>8. Add "warmed up" in notes</b></p>	<p><b>A</b> : Yes, there is an editable input text box that prompts a user to enter modification information through a popup keyboard.</p> <p><b>F</b> : Yes, The user will interpret the response correctly because typed input will display in the text box.</p> <p><b>V</b> : Yes, The user will know the action is available through selecting the text box and the keyboard popup.</p>
<p><b>9. Confirm changes</b></p>	<p><b>A</b> : Yes, there is a "Done" button that allows the user to save their changes or notes.</p> <p><b>F</b> : Yes, after the "Done" at the bottom right button, submitted modifications will be reflected in the summary.</p> <p><b>V</b> : Yes, The user knows the action is available through the labelled button at the bottom right of the screen.</p>
<p><b>10. Edit Iced Coffee item</b></p>	<p><b>A</b> : Yes, users need to select item first and then users have to select "Modify" button to edit item</p> <p><b>F</b> : Yes, once the user selects the item, the item will be highlighted and once the user selects 'Modify' a pop-up shows for the user to make the modification necessary.</p> <p><b>V</b> : No, the user needs to select an item first before the 'Modify' button can be used so users will have to know to select the item first. This may not be intuitive since the button is not hidden when they don't have an item selected, so they may think that they don't need to select an item to click the 'Modify' button.</p>
<p><b>11. Change oat milk to almond milk on Iced Coffee</b></p>	<p><b>A</b> : Yes, the modification pop-up has buttons to allow for users to add almond milk to coffee. Once the user selects the almond milk, the oat milk button will be automatically deselected since only one type of milk can be added to an Iced Coffee.</p> <p><b>F</b> : Yes, once the user makes the change on the pop-up, the 'Almond Milk' button will be highlighted and the 'Oat Milk' button will be unhighlighted</p>



	<p><b>V</b> : Yes, there is a clear button for “Almond Milk” under “Milk”</p>
<p><b>12. Confirm changes</b></p>	<p><b>A</b> : Yes, users can select ‘Done’ to confirm changes  <b>F</b> : Yes, changes will be shown in summary  <b>V</b> : Yes, the button is located on the bottom right of the pop-up which is consistent for standard ‘Done’ buttons</p>
<p><b>13. Confirm order</b></p>	<p><b>A</b> : Yes, there is a button that says ‘Confirm Order’ on the bottom right for the user to click to get the order confirmation screen. All the order items are displayed in a cohesive list at the top of the page with their modifications. At the bottom of the list, the user can then select the payment type.  <b>F</b> : Yes, once the user clicks the ‘Confirm order’ button, they will be redirected to a page that says ‘Order Confirmation’  <b>V</b> : Yes, the button is listed on the bottom right of the screen and isolated from the other buttons on the bottom task bar where it is visible for the user to see.</p>
<p><b>14. Select Discount</b></p>	<p><b>A</b> : Yes, there is a button that says ‘Discount’ on the bottom of the page for users to add a ‘Discount’ to the order  <b>F</b> : Yes, once the button is selected, a pop-up with the title ‘Discount’ will show.  <b>V</b> : Yes, The user will know the action is available since there is a ‘Discount’ button clearly labelled on the bottom of the page</p>
<p><b>15. Cancel Discount</b></p>	<p><b>A</b> : Yes, there is a ‘x’ button on the top right corner of the ‘Discount’ pop-up to cancel the discount  <b>F</b> : Yes, once the button is clicked, the pop-up will close  <b>V</b> : Yes, The user will know the action is available since there is a red ‘x’ button on the top right corner which is standard for a lot of websites/apps.</p>
<p><b>16. Select Credit for payment method</b></p>	<p><b>A</b> : Yes, there are buttons at the bottom of the confirmation screen that indicate payment types such as credit.  <b>F</b> : Yes, once the user selects the ‘Credit’ method, a screen with the total will show.  <b>V</b> : Yes, The user will know the action is available due to the colour-coded buttons at the bottom of the screen indicating payment type.</p>
<p><b>17. Select Done</b></p>	<p><b>A</b> : Yes, there is a button at the bottom of the screen that allows a user to finish the transaction.  <b>F</b> : Yes, once the user selects ‘Done’, the screen will renavigate to the main checkout page for the user to check out the next customer. This was not shown in the paper</p>

	<p>prototype video since the task ended with the user being checked out.</p> <p><b>V</b> : The user will know the action is available given the colour-specific and labelled button.</p>
--	--

#### **Task #4 : Modifying Menu Item**

Steps	Evaluator #1
<b>1. Enter Username and Password</b>	<p><b>A</b> : Yes there are text fields for the user to input username and password</p> <p><b>F</b> : Yes, once the user enters correct username and password, the screen changes</p> <p><b>V</b> : Yes, there are labelled text fields</p>
<b>2. Select Edit Menu</b>	<p><b>A</b> : Yes, there is a button that allows users to edit the menu</p> <p><b>F</b> : Yes, once the user selects the edit menu button, it redirects the user to the menu page</p> <p><b>V</b> : Yes, there is a clear button that says "Edit Menu"</p>
<b>3. Select add button under the subcategory Juices</b>	<p><b>A</b> : Yes, there is a + button at the end of the subcategory Juices to allow users to add an item under Juives</p> <p><b>F</b> : Yes, once the user selects the button, a pop-up shows for the user to add item</p> <p><b>V</b> : Yes, the + sign is visible at the end of each category and the + sign is widely known as add.</p>
<b>4. Add details for the new item</b>	<p><b>A</b> : Yes, there's a pop-up for the user to add the details for the item</p> <p><b>F</b> : Yes, once the users add information, the information will stay in the text boxes</p> <p><b>V</b> : Yes, the buttons for each detail to be added are labelled so the user knows what information to include and where</p>
<b>5. Save item</b>	<p><b>A</b> : Yes, there's a button that allows the user to save the item</p> <p><b>F</b> : Yes, the item will be shown on the menu items once you click save, however, you can't confirm whether the details of the items are correct.</p> <p><b>V</b> : Yes, there's a button that says 'Save'</p>
<b>6. Save changes</b>	<p><b>A</b> : Yes, there's a button that allows the user to save the menu</p> <p><b>F</b> : No feedback for the button</p> <p><b>V</b> : Yes, there's a button that says 'Save' on the bottom right corner</p>

## Appendix B - Feedback from Design Charette

Feedback
<ul style="list-style-type: none"> <li>• The Categories Section is unclear as to what it is since there are no labels to what it is</li> <li>• Differentiate between buttons more like maybe add colours</li> <li>• The 'Modify/Delete' functionality is confusing since it's located away from the summary section, you have to click on the item from the summary and then go to the other corner of the app to select 'Modify' or 'Delete'. The action is not that intuitive</li> <li>• Some of the locations of the buttons are not intuitive, the logout button is located in the middle of the other buttons on the bottom bar, which may be hard to find</li> <li>• Buttons are a bit clustered at the bottom, can increase chances of clicking the wrong button</li> <li>• Inconsistent with the modification screen - pops-up when you select some items but not all. What happens when a customer wants to add a special request for a tea? (When a cashier selects 'Tea', the modification pop-up never shows automatically as it does for 'Iced Coffee' or 'Croissant')</li> <li>• There is some whitespace in the design that can be utilized to space things out more since it's a bit clustered</li> </ul>

## Appendix C - Heuristic Evaluations

### Heuristic Evaluation of User 1 - (Aspiring Product Designer, Systems Design Eng. Student)

#	Task/Action/Page	Heuristic	Issues/Violations	Severity Rating	Fix Rating	Suggestions
1	Removing an applied discount	[H2-3] User control and freedom	Once a discount is applied and you perform other actions in the order, you can't undo the discount without undoing all of the other actions made to the order.	4	3	Add an applied discount item box to the order summary so that you can easily remove an applied discount
2	Order checkout	[H2-5] Error Prevention	The payment methods are used to enable/disable the confirm button but it should not be enabled when a cart is empty.	3	2	Keep the confirm order button disabled until both a payment method is selected and there is at least one item in the order

3	Adding an item to the order	[H2-7] Flexibility and efficiency of use	When I try to add an item, I have to specifically click on the add plus icon. If I were an experienced user with the system, I would want to be able to just click the item card to make the process quicker.	2	1	Make each item card clickable to add to the order
4	Using the special case drop-down menu	[H2-4] Consistency and standards	It is not really clear what a special case is so I wouldn't really know what would be wrapped in this functionality.	1	1	Change the name of the drop-down button to "Additional Functionality" or "Manager functions" if they are only restricted to managers.
5	Modifying a menu item	[H2-8] Aesthetic and Minimalist Design	It is not clear what the colour scheme is for the application. The order screen has shades of green while the main menu has shades of orange. When you modify an item, there are shades of green which are a bit inconsistent with the colour scheme outside of it.	0	1	Either use orange or a different colour for the modification modal so there is a more distinct colour coding across the application.
6	Modifying a menu item	[H2-6] Recognition rather than recall	I didn't immediately know how to edit an item in the order summary. It is something I'd have to actively remember.	1	2	The same way each item has a remove icon, you can add an edit icon to each menu so the user knows they can edit it that way.

### Heuristic Evaluation of User 2 - (MSCI 343 Student)

#	Task/Action/Page	Heuristic	Issues/Violations	Severity	Fix	Suggestions
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				Rating	Rating	
1	Apply Discount Modal	[H2-7] Flexibility and efficiency of use	The discount amounts are hard coded and I totally overlooked the Custom button. The N/A is also unclear as no discount should be standard procedure anyway.	2	2	Turn the N/A button into a + sign instead to add a new or custom amount
2	Apply Discount Modal	[H2-4] Consistency and standards	When I was applying a discount to the order, the options on the modal are a little too spaced out and aren't perfectly aligned.	1	1	Ensure that the options are aligned and have the same size. You can also reduce the white space between each one so they look more related.
3	Apply Discount Button	[H2-6] Recognition rather than recall	The discount just shows the numeric value and lacks symbols that could more clearly identify discount type	4	1	Add % and \$ symbols as they are very recognizable
4	Undoing an action	[H2-4] Consistency and standards	The undo icon looks greyed out so it didn't strike me as a button that I could use to remove my last action.  It also allows for users to undo an action even if an action hasn't been done.	2	1	Make the icon not greyed out so it doesn't look disabled. For example, make the background white with a coloured outline. If there is no action to be undone, you can keep it as it is.

### Heuristic Evaluation of User 3 - (MSCI 343 Student)

#	Task/Action/Page	Heuristic	Issues/Violations	Severity Rating	Fix Rating	Suggestions
1	Apply Discount	[H2-6]	There is only the numeric	4	1	Add % and \$

	Button	Recognition rather than recall	value and lacking symbols that could more clearly identify discount type			symbols, very recognizable
2	Navigating to the Menu Customization Screen	[H2-6] Recognition rather than recall	It was not straightforward where to go to customize the menu as I did not think of this function as a "Special Case".	3	1	It would be better to have a distinct button for manager options that only appears when a manager user is logged in instead of clustering it into a dropdown menu button.
3	Adding/removing a discount	[H2-5] Error Prevention	There is no direct way where I can remove a discount the same way that I can remove an item from the order summary. My next step would be to completely restart the order in order to remove the discount.	3	2	It would make more sense to have a remove discount button in case you added the wrong discount instead of having an undo button.
4	Overall Menu Page	[9/10] Error recovery and Help	Overall, not enough help indications in case users gets stuck	2	3	For unknown terms, can add information button with hover/tooltips - helpful for terms specific to a company
5	Menu item	[4] Consistency and standards	Sometimes the menu says Iced coffee and sometimes cold brew. Items appear inconsistently on the order summary	3	2	Ensure menu items are the same across screens

#### Heuristic Evaluation of User 4 - (CS Student, Part-time Barista)

#	Task/Action/Page	Heuristic	Issues/Violations	Severity Rating	Fix Rating	Suggestions
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1	Apply Discount	[H2-4] Consistency and standards	Discount button may get overlooked because it's not on the payment panel, makes more sense to group with the financial processing side, and it's coloured gray so it may be easy to miss	2	2	Add to the payment panel, under the payment type, as that would be right before checkout
2	Add New Menu Subcategory	[H2-4] Consistency and standards	Contrast between text and background is too low, compromises the legibility (may not meet accessibility standards)	4	1	Increase contrast with background colour, make font black instead of grey on grey
3	Apply Order customization	[H2-1] Visibility of system status	Not clear that order item is editable on the order summary, does not suggest action, does not appear clickable	2	3	Add edit icon on the items in the order summary
4	Adding a discount	[H2-7] Flexibility and efficiency of use	It is tedious to apply a discount and then have to click "custom" to determine a custom discount. It is not that efficient needing to go through multiple steps to do so.	1	2	Make the custom discount calculator option on the same pop-up screen as the standard discounts.
5	Adding items to order	[H2-8] Aesthetic and Minimalist Design	There should be a scroll bar on the order summary for orders that get very big so that we know there's more to an order and need to scroll to see the whole thing.	4	1	Add a scroll bar to the side of the order where the items are listed.
6	Adding a discount	[H2-1] Visibility of system status	It was not very explicit that a discount was applied besides the calculation being updated. But there was nothing showing me or explicit feedback saying the discount was applied.	2	2	Add an item card for the specific discount, the same way you have items in your order.