Requirements Specification Document

Best SENG Painting Company (BSPC)
Mobile Ordering System

Brainstorm Consulting

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Revision History

Name	Date	Reason for Changes	Version
Requirement Document	02/10/2018	Initial Document	1.0
Requirement Specification Document	30/10/2018	Addition of Modelling, Incorporation of Client Feedback	0.9
Requirement Specification Document	07/11/2018	Client feedback for version 0.9	1.0
Requirement Specification Document	26/11/2018	Client and TA feedback for version 1.0	2.0

1 Introduction

1.1 Purpose

This is the third release of the Requirements Specification Document for the Best SENG Painting Company Mobile Ordering System project (hereafter known as the Mobile Ordering System). It follows the Requirements Document that was previously written for the Mobile Ordering System. The following is a response to the Request for Proposals (RFP) offered by the Best SENG Painting Company (hereby referred to as BSPC). BSPC is searching for a mobile-based software system that offers new ways to order paint that complement the current paint ordering procedures. The following document details the requirements of the overall system, its features, external interface, non-functional features as per the RFP, elicitation from the clients, and feedback from a previously written Requirement Document. The document also contains models of the new system to be developed by Brainstorm Consulting.

1.2 Project Scope

The Mobile Ordering System will complement the existing ordering methods and provide each customer of BSPC with an additional method to purchase paints. Extending the existing system will allow each customer to make more informed decisions on the paint he or she should purchase and reduce the amount of time employees use to process orders.
The Mobile Ordering System will be used primarily by both individual customers with small orders and contractors with large or repetitive orders. The BSPC employees' participation in the Mobile Ordering System will be limited to receive pick slips from the printer.

The Mobile Ordering System must:

- Allow each customer to order paint with ease and speed.
- Reduce the amount of manual input (i.e. inputting received orders) by employees, reducing demand on employee time.
- Allow automation of the order processes, freeing employees to perform another task.
- Allow each customer to access his or her own order history and use past orders to add to new orders.

Glossary of Terms

Account page: The account page offers the user to login or register.

Back end system: The server that receives and processes incoming orders, stores data for the company and generates output including pick slips.

Cart: A list of products the user has selected for purchase.

Contractor: A Customer that can be identified by a unique Contractor ID and may receive discounts.

Customer: Intended user of the Mobile ordering system.

Customer profiles: Information that the system stores about Customers.

Landing page: the first page a user who opens the Mobile Ordering System will see (see Figure 1)

Model: A diagram representation of a process.

Must: Mandatory feature that needs to be incorporated into the Mobile Ordering System.

Pick Slips: A slip containing order information and Customer information. Employees use pick slips to fill orders.

Pick System: The existing system used by employees to track orders; generates pick slips.

Place Order: Functionality allowing Customer to submit the products in the Customer's cart as a finalized order.

Should: Not mandatory behavior, but highly desirable.

Source: The page from which the Customer navigated from to reach the current page. i.e. If a *back* button is pressed the Customer will return to the source page.

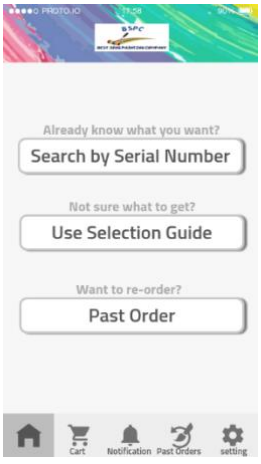

Figure 1: Landing page UI Diagram

1.3 References

IEEE Software Requirements Specification Template: used for guidelines for requirements document.

1.4 Overview

The next sections provide information on:

- The problem domain and features of the Mobile Ordering System, including the major users of the system, design considerations, assumptions, and constraints.
- Major system features and models describing them.
- External interfaces with which the Mobile Ordering System will be required to work.
- Additional non-functional or other requirements.
- Models explaining the design of the Mobile Ordering System.

2 Overall Description

2.1 Product Perspective

The product will be a mobile application-based system. The existing methods of purchasing paint are to place an order via email, phone or text message, or in person. In the existing system each order is inputted to the pick system which generates a pick slip, and an employee uses that pick slip to process the order. The Mobile Ordering System should work seamlessly alongside the existing ordering system.

2.2 Product Features

Primary Features:

- Each Customer must be able to obtain automated paint selection guidance. Paint selection guidance should accommodate a varying degree of Customer knowledge.
- Each Customer creating a mobile order must have the option to add a paint to his or her order using its serial number.
- Each Customer must be able to access his or her previously placed orders and add any items from previous orders to his or her current order.
- Each Customer that places an order must be provided with an approximate time the order will be ready.
- Each Customer must have access to detailed specifications of each paint product offered by BSPC.
- After order confirmation, a pick slip must be generated and printed automatically.
- There must exist a method of alerting employees when each mobile order is placed.

2.3 User Classes and Characteristics

2.3.1 Customer

The Customer user class consists of people who purchase paint. Each Customer may

- Be using the system for the first time, and may require guidance in selecting the correct type of paint for his or her purpose
- Know the exact type of paint he or she wants to purchase by its serial number
- Have used the Mobile Ordering System before and have past orders saved to the Customer's account

2.3.2 Employee

The Employee user class consists any person currently working at BSPC.

2.4 Operating Environment

The Mobile Ordering System must run on any iOS and Android device manufactured from 2010 onwards.

2.5 Design and Implementation Constraints

- To accommodate a variety of phone-user skill sets, the Mobile Ordering System should be descriptive enough that each first time Customer are able to complete an order without contacting BSPC for assistance.
- There must be an interface between the Mobile Ordering System and the existing pick slip system.

- Existing phone and in-person ordering methods must not be disrupted.

2.6 Assumptions and dependencies

- Users can read and write in English or in French.
- Users have internet access on their devices.

3 System Features

3.1 Register / Login Customer Account

3.1.1 Description and Priority

A Customer account is integral to the core functionality of the Mobile Ordering System. This allows each Customer to be linked to his or her order history, and to provide BSPC with his or her contact information. The Customer can be contacted to confirm the order if deemed necessary.

3.1.2 Functional Requirements

3.1.2.1 Verification of Login/Register Parameters

Description: Each Customer must be able to login or register when he or she provides valid data. Valid data for a login is an existing username and the correct password, valid data for a registration is a non-existing username and a sufficiently complex password.

Rationale: Each Customer must be able to access and create an account in order to place an order or use the past order functionality, which are core functionalities requested by the client in the initial elicitation.

Test Case 1.1: Attempting to register a new account with a valid email and password must succeed.

Test Case 1.2: Attempting to register a new account with an existing email must fail.

Test Case 1.3: Attempting to log in to an existing account using a valid password must succeed.

Test Case 1.4: Attempting to log in to an existing account using an invalid password must fail.

Test Case 1.5: Attempting to log in to a non-existent account must fail.

3.1.2.2 Both Options Login and Register Available

Description: The option to create a new account or log in to an existing account should be accessed from the same page.

Rationale: Since both logging in and registering are similar processes, and the fact that the act of registering implies an intent to login, the interface can be simplified by offering both options together. This increases ease of use for each customer.

Test Case 1.6: Verify that both the Login and Register options are available from the Login/Register page.

3.1.2.3 Immediate Access to Login/Register

Description: The login/register feature should be accessible from any stage of the ordering process unless the Customer is already logged in.

Rationale: To allow each Customer to browse products without being logged in or registered, the Mobile Ordering System must allow each Customer to access the Login/Register option from any page, should they choose to place an order.

Test Case 1.7: Verify that Account Settings is accessible from any stage of the ordering process.

3.1.2.4 Return to Source

Description: After a successful login/registration, each Customer is returned to the Source page.

Rationale: For ease of use, the Mobile Ordering System must return each Customer to the Source page after he or she visits the Login/Register page.

Test Case 1.8: Verify that the Mobile Ordering System returns to the Source page after accessing the Account page.

3.1.2.5 Require Login/Registration to Access Past Orders

Description: Successful login/registration will be a required intervening step before the Customer can access Past Order (feature 3.4).

Rationale: To access a specific Customer's past orders, the Mobile Ordering System must know which Customer's data to access.

Test Case 1.9: Attempting to access Past Orders as a logged in Customer must provide his or her order history.

Test Case 1.10: Attempting to access Past Orders as a non-logged in Customer must fail.

3.1.2.6 Require Login/Registration to Place an Order

Description: Successful login/registration will be a required intervening step before the Customer can place an order.

Rationale: To place an order, the Customer must be logged in.

Test Case 1.11: Attempting to place an order as a logged in Customer must succeed.

Test Case 1.12: Attempting to place an order as a non-logged in Customer must redirect him or her to the Account page.

3.1.2.7 Contractor ID Integration

Description: Contractors have the option to input a code into the Contractor ID field in the new Customer form to be associated with an organization (i.e. company, union, association) and receive applicable discounts when logged in. Organization information must also be displayed on the pick slips.

Rationale: By request of the client in the third elicitation meeting, each Contractor should be able to enter codes to associate his or her account with an organization.

Test Case 1.13: Attempting to enter a valid Contractor code should associate the account with an organization.

Test Case 1.14: Verify that organization discounts are applied to each associated contractor account.

Test Case 1.15: Verify that Contractor organization information displays on pick slip if the account is associated with an organization.

3.1.3 Associated Use Case: Register/Login

Allows each Customer to create a Customer account on the Mobile Ordering System or log in to existing account.

Actors

- Customer

Preconditions

- Not logged in to the Mobile Ordering System or not registered under the desired email

Post Condition

- The Customer will have access to his or her list of previously placed orders
- The Customer will be able to complete the order process by including the place order use case

Flow of Events

The Customer selects *Register* button (Alternate Path A)
The Customer is redirected to registration form
The Customer fills out registration form
The Customer returns to the previous page the Customer was on, and now the Customer can include the *View Past Orders* and *Place Order* use cases.

Alternate Path A

1. The Customer selects Login button
2. The Customer is returned to the previous page he or she were on

Note: during any step, the Customer can exit the process and register later.

3.1.4 Associated Sequence Diagram and UI Model: Register/Login

The Customer begins by requesting the account page from the main page. The Mobile Ordering System then displays the registration form to each Customer. The Customer then inputs his or her information to the page, including her or his name, phone number, email, contractor ID (if applicable) and password. The Customer then submits this information. If the email is valid, the Mobile Ordering System will confirm the registration to the Customer and return him or her to the login/register page. If the email is invalid (for example, the value provided in the email field is already in use by another account, or the email supplied is not formatted as an email address) then the Mobile Ordering System will display an error message explaining the error, and provide the page again with the forms already filled with what each Customer filled in. Assuming the Customer provided a valid email, the Customer can then authenticate with the email and password he or she provided, and the system will confirm the login.

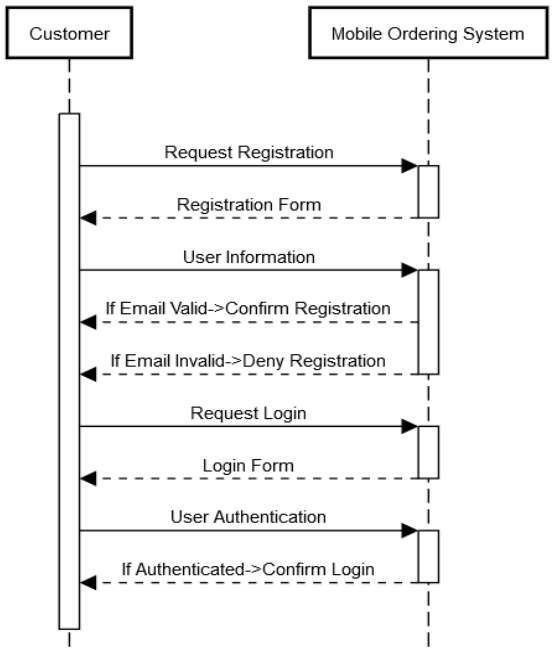

Figure 2:Sequence Diagram for Registration and Sign In

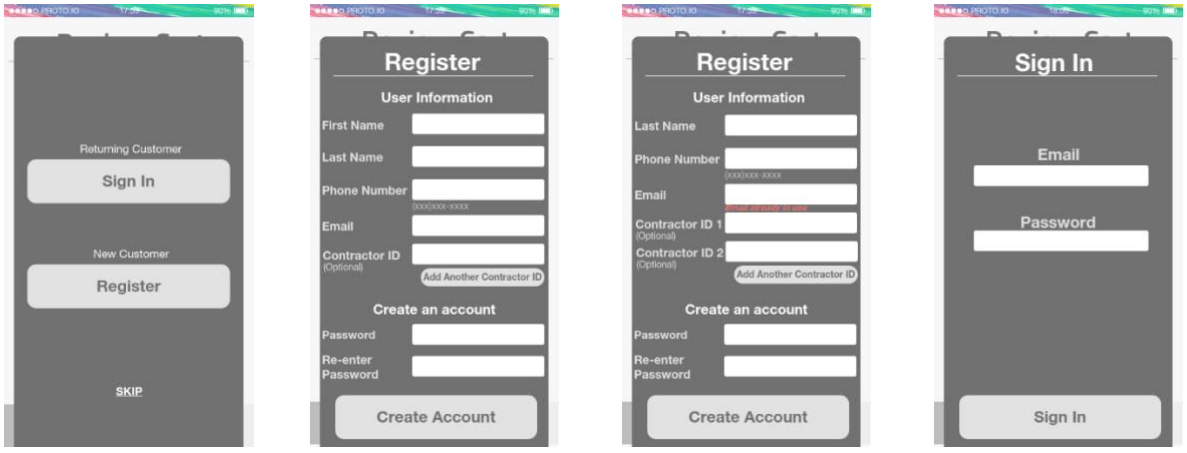

Figure 3:UI Model for Registration and Sign In

3.2 Selection Guide

3.2.1 Description and Priority

The Selection Guide should elicit each Customer's needs, and recommend items based on the information gathered. This is a high priority feature of the system as per BSPC request, and is expected to parallel the elicitation system used by Employees in-store.

3.2.2 Functional Requirements

3.2.2.1 Product Recommendation

Description: The Selection Guide should give each Customer the opportunity to define his or her paint needs with respect to a variety of categories (e.g. indoor/outdoor) and be presented with recommendations upon completion.

Rationale: As per client request in initial elicitation, the Mobile Ordering System must ask a series of question designed to match paint products to each Customer's needs. This process is based on questions asked by Employees in stores and is designed to match products with Customer needs.

Test Case 2.1: Verify the Selection Guide suggests paint products based on answers elicited from the questionnaire.

3.2.2.2 Selection Guide Accessibility

Description: The Selection Guide should be displayed prominently on the landing page of the Mobile Ordering System, with the expectation that first-time Customers will begin by using the Selection Guide. The Selection Guide should also be easily bypassed by returning Customers who choose to use Search by Serial Number (feature 3.3) or use Past Orders (feature 3.4).

Rationale: As per client request, the Selection Guide should be prominently displayed on the Landing page for both returning and first-time Customers. This increases the ease of use for each Customer that wants recommendations.

Test Case 2.2: Verify that the Selection Guide is accessible from the Landing Page as a logged in Customer

Test Case 2.3: Verify that the Selection Guide is accessible from the Landing Page as a non-logged in Customer

3.2.2.3 Minimum Product

Description: Multiple paint products may fit a Customer's needs. Therefore, the recommendation page must present at least three paint products.

Rationale: As suggested by the client in the second elicitation, there are typically several paint products that could fit a Customer's needs, and each Customer should be presented with a selection of paint products.

Test Case 2.4: Verify that upon completion of the Selection Guide, a minimum of 3 relevant products are recommended.

3.2.3 Associated Use Case: Search by Selection Guide

Allows each Customer to use the Selection Guide. The Selection Guide provides a list of at least 3 paint products.

Actors

- Customer

Preconditions

- None

Post Condition

- The Customer's desired items will be added to cart

Flow of Events

1. The Customer selects the *Selection Guide* button from the starting menu.
2. The *Selection Guide* asks the Customer a series of questions before offering suggestions.
3. This question list consists of 5 question; they are as followed:
    a. What environment will the paint be used in?
    b. What type of surface will the paint be applied to?
    c. How will the surface be prepared before paint is applied?
    d. What are the properties of the paint?
    e. What is the specified price range of the paint?
4. The Customer answers a minimum set the questions (questions 'a' and 'b' are the mandatory questions) that the system proposes to the Customer
5. The Mobile Ordering System provides at least 3 suggestions on a paint for the Customer according to the answer(s) given to the *Selection Guide*
6. The Customer selects one or more of the items suggested, views the item description, and adds item to the cart
7. The Mobile Ordering System adds the item(s) to the cart and takes the Customer to the V*iew/Modify Order* page.

Alternate Path

1. During any step the Customer can exit the process and not add an item to cart.
2. If the Customer wants to change an answer he or she provided previously, a Customer can return to the previous question.

3.2.4 Associated Sequence Diagram and UI Model: Search by Selection Guide

Assuming the Customer is logged in and on the Landing page, the Customer will click on the Selection Guide button. The Mobile Ordering System will display the Selection Guide, which provides several questions that the Customer can answer to allow the Selection Guide to make informed recommendations. These questions can be read in section 3.2.3. The Customer must answer at least one of these questions, but can provide answers to some or all the questions. The Customer then submits the questions, and the Mobile Ordering System provides the Customer with a page with paint product suggestions. The Customer can then select one of the suggested paints. The Mobile Ordering System then provides the product page for that paint product. The Customer can then request the more detailed product specification. The Mobile Ordering System will return the product specification page. From this page, the Customer can select a colour and a quantity. The Customer can then choose the *Add to Cart* option. The Mobile Ordering System will add the selected paint product to the cart and take the Customer to the *View/Modify Order* page.

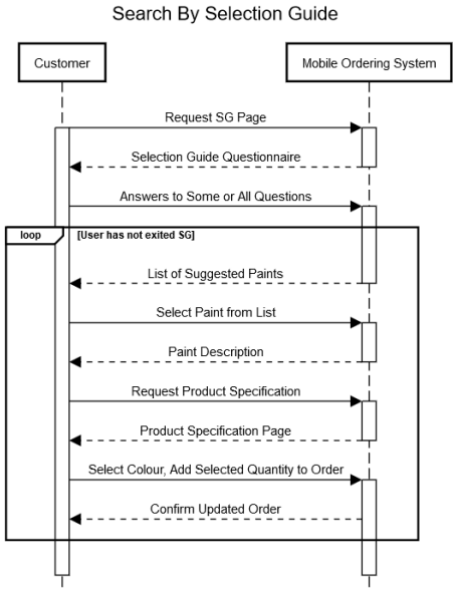

Figure 4: Sequence Diagram for Selection Guide

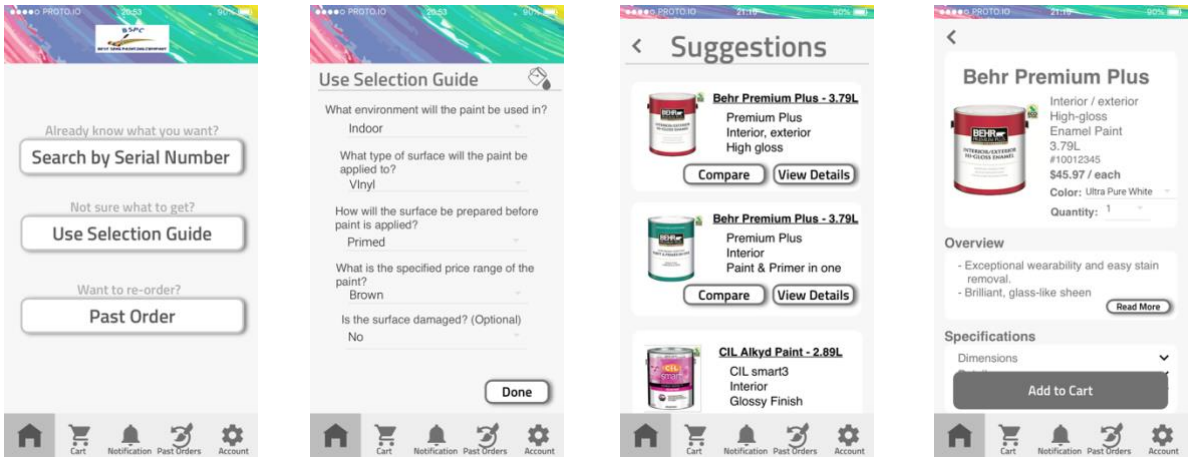

Figure 5:UI Models for Selection Guide

3.3 Serial Number

3.3.1 Description and Priority

The search function should allow each Customer who knows the serial number of a desired paint product to search for that specific product. As a large portion of the userbase is expected to be returning Customers, this is considered an important part of the app and is given high priority.

3.3.2 Functional Requirements

3.3.2.1 Landing Page Contains Search by Serial Number

Description: The search function should be displayed on the landing page.

Rationale: As per client request in initial elicitation, the Mobile Ordering System should have the serial number feature immediately available since many Customers are returning Customers and know serial numbers for some of his or her commonly purchased products. This provides a fast, direct method for experienced Customers to find a product he or she is familiar with.

Test Case 3.1: Verify that the search by serial number feature is accessible from the landing page.

3.3.2.2 Valid Serial Numbers Display the Appropriate Paint

Description: The search function must accept any valid serial number as input.

Rationale: As per client request in the initial elicitation, the Mobile Ordering System must have all paint products searchable by serial number, since it is the fastest method available to returning Customers.

Test Case 3.2: Attempting to search with a valid serial number must produce the product page with the paint product associate with that serial number.

Test Case 3.3: Attempting to search with an invalid serial number must fail.

3.3.3 Associated Use Case: Search by Serial Number

Allows the Customer to add paint to order using the paint product serial number.

Actors

- Customer

Preconditions

- None

Post Condition

- An item will be added to the cart

Flow of Events

1. The Customer selects Search by Serial Number from the Landing page.
2. The Customer enters a valid serial number
3. The Customer views the product page
4. The Customer may view product specification page by selecting *View Details* button
5. The Customer selects the colour and quantity of the item
6. The Customer adds paint product to cart

Alternate Path

During any step the Customer can exit the process and not add an item to cart.

3.3.4 Associated Sequence Diagram and UI Model: Search by Serial Number

Assuming the Customer is logged in and on the Landing page, the Customer will click on the *Search by Serial Number* button. The Mobile Ordering System will provide a page prompting the Customer for the serial number. The Customer will then enter a serial number and submit. If the serial number is invalid, the Mobile Ordering System will display a message asking the Customer to enter a valid serial number and redisplay the *Search by Serial Number* page. If the serial number is valid, the Mobile Ordering System will display the product page for the paint product associated with that serial number. The Customer will then choose to view the detailed product specification for the paint product. The Mobile Ordering System will display the detailed product specification. From this page, the Customer can select a colour and a quantity. The Customer will then choose to *Add to Cart.* The Mobile Ordering System will add the selected paint product to the cart and take the Customer to the *View/Modify Order* page.

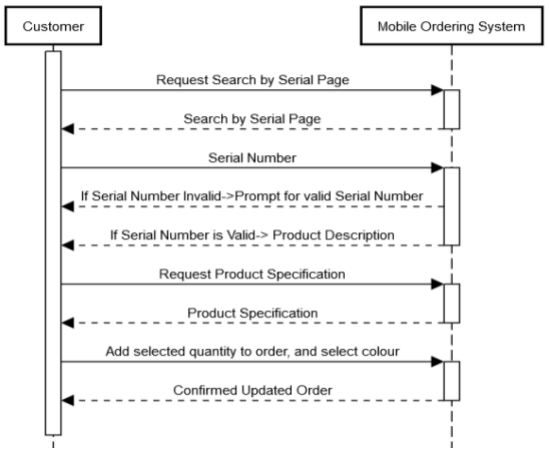

Figure 6:Sequence Diagram for Search by Serial Number

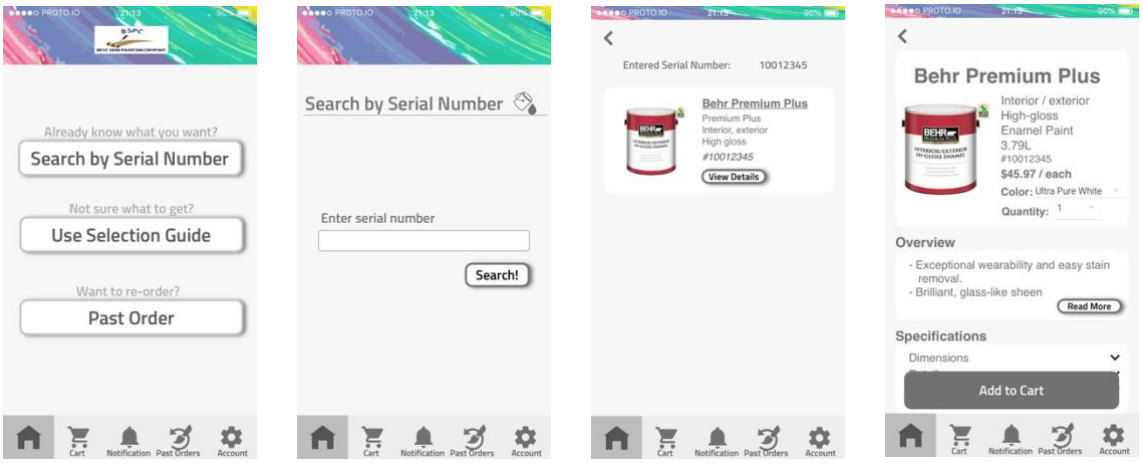

Figure 7:UI Models for Search by Serial Number

3.4 Past Order

3.4.1 Description and Priority

A returning Customer should be able to easily view his or her past orders and use the past orders as a basis for creating new orders. As a large portion of the userbase will be returning Customers, this feature is given high priority.

3.4.2 Functional Requirements

3.4.2.1 Past Orders Availability

Description: A successful login is required for each Customer to access his or her own Past Orders.

Rationale: Each Customer should be able to view his or her own order history.

Test Case 4.1: Attempting to view past orders while logged in must succeed.

Test Case 4.2: Attempting to view past orders while not logged in must fail.

3.4.2.2 Add by Past Orders

Description: Each Customer must be able to add items to the cart from Past Orders.

Rationale: As per client request, the Mobile Ordering System must provide returning Customers with shortcuts to order paints they have previously ordered to save time and provide a better user experience.

Test Case 4.3: Verify that Upon selecting a paint product from a previous order, the product page for that product must be displayed.

3.4.3 Associated Use Case: Add item using past orders

Allows the Customer to add a paint product to his or her cart from past orders.

Actors

- Customer

Preconditions

- The Customer is logged in
- The Customer has placed an order in the past

Post Condition

- The Customer's selected paint product will be added to cart

Flow of Events

1. The Customer selects the Past Order button from the Landing page
2. The Customer's list of past orders is displayed
3. The Customer selects a specific past order
4. List of paint product from the selected order is displayed
5. The Customer selects paint product and is presented with the product page.
6. The Customer selects View Details to view the product specification page
7. The Customer selects quantity and colour of the paint product and adds to cart

Alternate Path

1. During any step the Customer can exit the process and not add a paint product to cart.

3.4.4 Associated Sequence Diagram and UI Model: Add Product to Order by Past Order

Assuming the Customer is logged in and on the Landing page, he or she will click on the *Past Order* button. The Mobile Ordering System will display the previous orders. The Customer will then select a past order from the list. The Mobile Ordering System will provide the details of the specific past order, and each paint product that was ordered in the selected past order. A Customer will then select one of the paints from the last order. The Mobile Ordering System will then provide a description of that paint product. The Customer can then request more detailed information on that paint. The Mobile Ordering System will then provide the more detailed specification of the paint product. The Customer can then select the paint colour and quantity and then add to cart. The Mobile Ordering System will add the selected paint product to the cart and take the Customer to the *View/Modify Order* page.

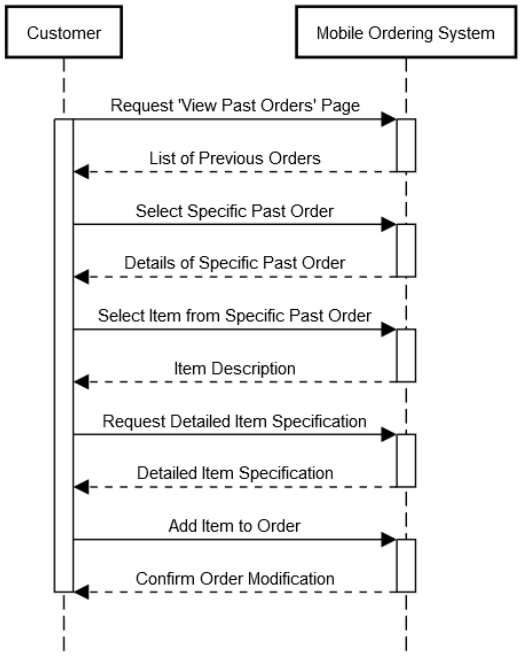

Figure 8: Sequence Diagram for Past Order

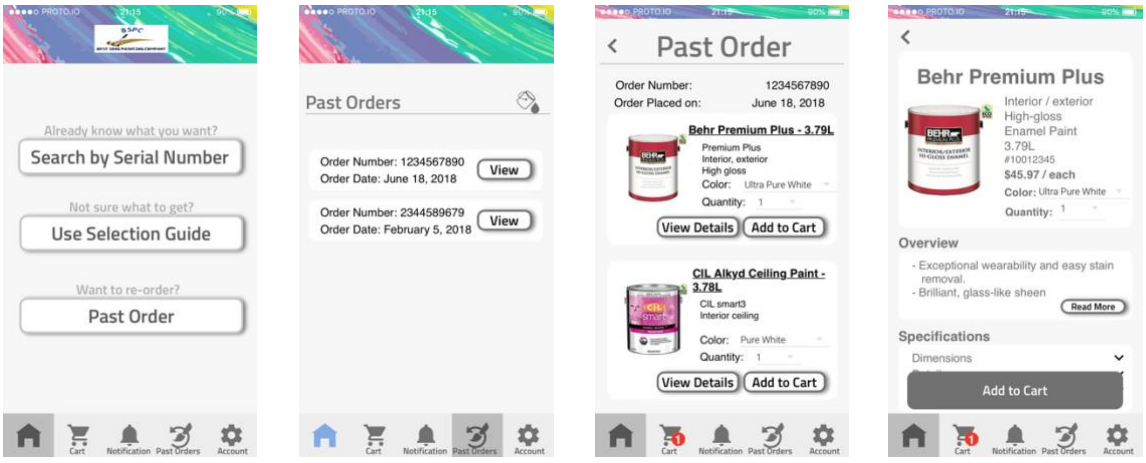

Figure 9: UI Model for Past Order

3.5 Virtual Shopping Cart

3.5.1 Description and Priority

Each Customer should have the ability to pick out products, and view/edit a list of these products before finalizing the placement of an order. As the virtual shopping cart is used for each order, this feature is assigned high priority.

3.5.2 Functional Requirements

3.5.2.1 View Cart

Description: Each Customer must be able to view a list of the products they have selected to purchase

Rationale: Each Customer may wish to modify or view his or her selections before proceeding to place an order.

Test Case 5.1: Verify that upon selecting *View Cart* with no paint products added to cart, the Customer must be presented with their currently empty cart and no option to place an order.

Test Case 5.2: Verify that upon selecting *View Cart* with at least one paint product added to cart, the Customer must be presented with their current cart and have the option to place order.

3.5.2.2 View Item

Description: Each Customer must be able to view each specific paint product they have added to his or her cart.

Rationale: Each Customer may want to remind him or herself of the specific details of the products they have selected.

Test Case 5.3: Verify that upon selecting a product while viewing cart, the Customer should be presented with the product page for the product they have selected.

3.5.2.3 Modify Quantity and Colour

Description: Each Customer must be able to change the quantity and colour of a paint product that has been added to their cart.

Rationale: Each Customer may change his or her mind or may not have noticed the option to select quantity and colour before adding a product to his or her cart.

Test Case 5.4: Verify that while viewing cart, each paint product listed must have a colour/quantity displayed with a drop-down attribute to change the quantity or colour.

Test Case 5.5: Verify that after changing the colour/quantity of a product in the cart, the new colour/quantity must replace the old one.

3.5.2.4 Delete Item from Cart

Description: Each Customer must be able to directly remove any paint product from his or her cart.

Rationale: Customers may have added an item by accident or changed his or her mind after adding an item. This requires the item to be deleted from the order.

Test Case 5.6: Attempting to delete an item from the cart must result in the item being removed from the cart.

3.5.3 Associated Use Case: View/Modify Order

Allows each Customer to view and modify her or his order prior to completion.

Actors

- Customer

Preconditions

- At least one paint product has been added to cart

Post Conditions

- None

Flow of Events

1. The Customer is presented with a list of the paint product(s) that have been added to his or her cart.
   a. The Customer can adjust colour/quantity for each paint product in his or her cart
   b. The Customer can remove any paint product from his or her cart
2. When the Customer is satisfied, and there is still at least one paint product in his or her cart, he or she selects the *Place Order* option.
3. Since the Customer is logged in, the Mobile Ordering System proceeds to *Place Order* (Associated Use Case 3.6.3).

Alternate Path

1. If the Customer has removed all paint products from cart before step 2, or the Customer has chosen to view her or his cart before adding any paint products to the cart, the cart will be displayed as empty and the Place Order option will not be available. The Customer must return to browsing and add at least one paint product before this action is possible.
2. The Customer resumes at step 1 in above Flow of Events.

3.5.4 Associated Sequence Diagram and UI Model: View/Modify Order

The Customer begins by selecting the *View/Modify Order* option. The Customer is then presented with cart. From here the Customer can select a paint product from the list to view that paint product detailed specifications. The Customer will then be presented with that product's specification page. From here the Customer can click the *back* button to return to his or her cart. From here the Customer can click the *back* button to return to the cart. When viewing the cart, the Customer can choose to modify the colour/quantity of any existing item in the cart. The Customer will then be presented with an updated cart. When viewing the cart, the Customer can choose to remove a paint product from the cart. The Customer will then be presented with an updated cart.

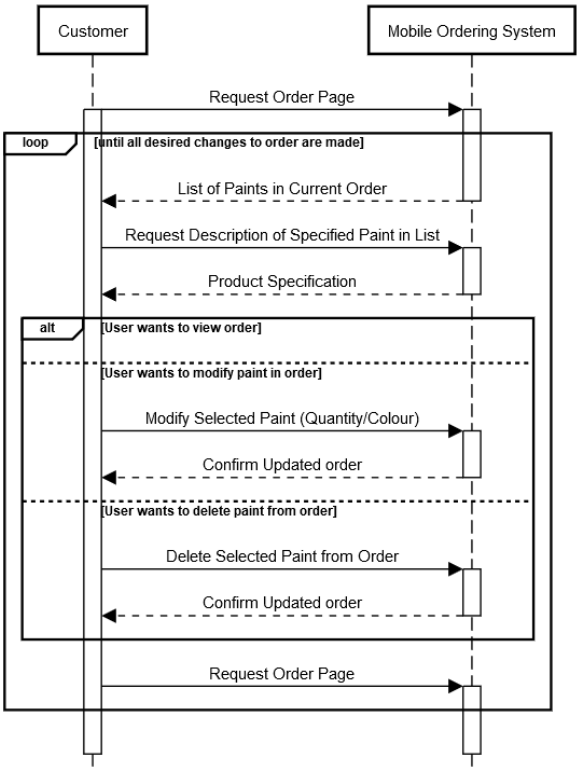

Figure 10: Sequence Diagram for View/Modify Order

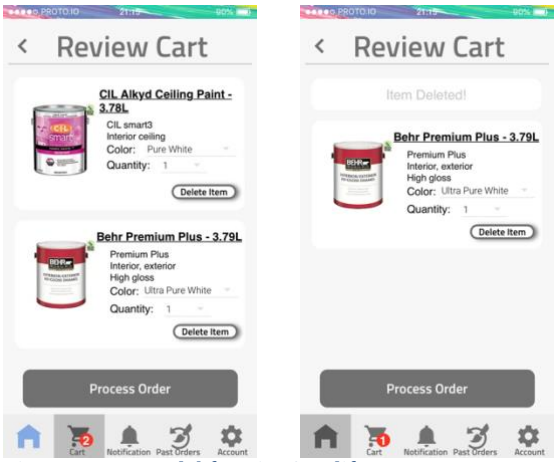

Figure 11: UI model for View/Modify Order

3.6 Select Pick-up Location

3.6.1 Description and Priority

As part of the order placement process each Customer must select a store from which to collect his or her order. This feature is given high priority.

3.6.2 Functional Requirements

3.6.2.1 Select Location

Description: The Select Location feature must present each Customer with a list of stores as a final step in the ordering process.

Rationale: As per client request in the third elicitation, the purpose of Select Location is to allow the Customer to choose the most convenient store from which to collect his or her order.

Test Case 6.1: Verify that placing an order requires the Customer to select a pick-up location.

Test Case 6.2: Verify that only the selected store receives the order when it is placed.

3.6.2.2 Stores Near Customer

Description: Stores near each Customer's location, which can be assumed based on the area code of the phone number she or he used to register with, should appear at the top of the list.

Rationale: Each Customer is most likely to want to pick up from local stores, so these stores should appear at the top of the list for ease of use.

Test Case 6.3: Verify that the customer is presented a list of locations ordered by proximity based on phone number area code.

3.6.3 Associated Use Case: Place Order

Allows each Customer to order the contents of the cart.

Actors

- Customer

Preconditions

- The Customer is registered and logged in.
- The Customer has a minimum of one product in the cart.

Post Condition

- Paint product(s) in the cart are ordered.
- The Customer's cart is emptied.
- Printer at selected location prints the pick slip.
- Order is added to the Customer's past order history.

Flow of Events

The Customer selects *Process Order*.
List of stores is shown with addresses and contact information.
The Customer selects specific store.
The Customer selects Place Order.
Order number, order date, order pick up date and time and store contact information are provided in case of follow up query or order cancelation.
Printer at selected store prints the pick slip.

Alternate Paths

1. At any point before step 5, the Customer can decide to go back and modify order.
2. After step 5 the Customer may call the store to make changes or cancel the order.

3.6.4 Associated Sequence Diagram and UI Model: Place Order

Assuming the Customer is logged in and on the landing page, the Customer will begin by selecting View/Modify cart. The Mobile Ordering System then displays the current cart contents. The Customer then selects the *Place Order* button. The Mobile Ordering System then presents the details of the Customer's order, including paint products with their colours and quantities. The Customer must then select a *Pick-Up Location*. Once this is done, the Customer may select *Confirm Order*. The Mobile Ordering System sends order details to the selected store where a pick slip will be printed. The Mobile Ordering System then presents a page confirming that the order has been placed and provides the Customer with an approximate date and time the order will be ready for pickup along with order number and order date.

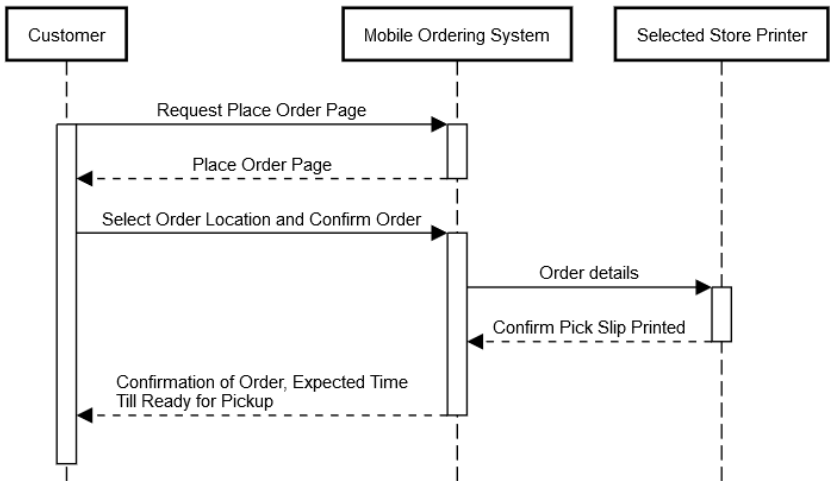

Figure 12: Sequence Diagram for Place Order

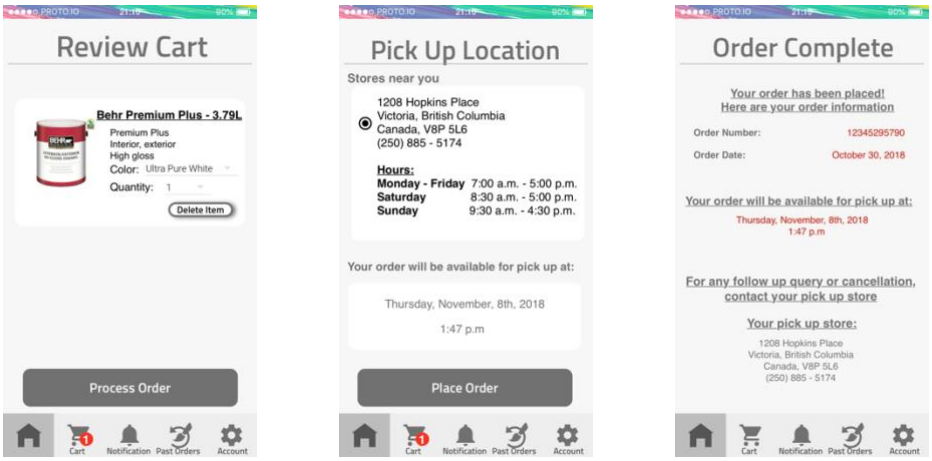

Figure 13:UI Model for Place Order

3.7 Wait Time Estimator

3.7.1 Description and Priority

After placing an order, each Customer should be presented with an estimate on when his or her order will be ready for pickup. This is a medium priority.

3.7.2 Functional Requirements

3.7.2.1 Wait Time Estimator

Description: After an order is placed, the Mobile Ordering System must produce an estimate as to when the order will be ready for pickup.

Rationale: To reduce Customer wait time in store and manage Customer expectations a time estimate is given.

Test Case 7.1: Verify that when an order is placed, the Mobile Ordering System must produce an appropriate wait time estimate.

3.7.2.2 Correctness of Wait Time Provided

Description: The wait time is based on order size, time of day relative to store hours, and the existence of other orders currently being handled by the selected store.

Rationale: If the wait time is accurate the Customer can receive his or her order as soon as possible while not waiting for the order in store.

Test Case 7.2: Verify that when an order is placed the wait time provided is similar to the time required by the store to fill the order.

3.7.3 Associated Use Case: Place Order (See Section 3.6.3)

3.7.4 Associated Sequence Diagram and UI Model: Place Order (See Section 3.6.4)

3.8 Product Comparison

3.8.1 Description and Priority

Each Customer should be presented with the choice of selecting two products and comparing product specifications. This is a medium priority.

3.8.2 Functional requirements

3.8.2.1 Side-by-side Comparison

Description: The product comparison feature should allow each Customer to select two products at a time and produce a comparison table with the description and specification of each product side by side.

Rationale: As per client request during the third elicitation, each Customer may want to compare similar product features directly to determine which product best fits his or her needs.

Test Case 8.1: Attempting to compare two paint products must result in a comparison table being displayed.

3.8.2.2 Order from Comparison Table

Description: The Customer should be able to add paint products to cart based on a comparison table.

Rationale: As per client request, while two paint products are being compared, the option to include either or both paint to the cart should be available on the same page for convenience.

Test Case 8.2: Verify that there is an *Add to Cart* option for each paint product in the comparison table.

3.8.3 Associated Use Case: Compare Product

Allows each Customer to compare two products at a time.

Actors

- Customer

Preconditions

- The Customer has completed one of the selection processes (features 3.2, 3.3, 3.4), and has identified one product against which the Customer wish to make comparisons.

Post Condition

- The Customer is given a list of specifications and descriptions of two selected paint product.

Flow of Events

3. The Customer selects the *Compare* button from the product page of the first paint product.
1. The Customer selects a second product to compare using a selection process (features 3.2, 3.3, 3.4).
2. The Customer selects *Compare* button from the product page of the second product.
3. Comparison table of both products including the product description and detailed specifications are displayed.

3.8.4 Associated Sequence Diagram and UI Model: Compare Paints

Once the Customer has been presented with various recommended paint products from the Selection Guide he or she begins by clicking one of the *Compare* buttons located next to each item listed. The Mobile Ordering System will then return a Product Comparison Page. The Customer must then select a second item. The Mobile Ordering System will then return a page showing specifications for both items selected. The Customer can specify a colour/quantity and add one of the items to his or her cart. The Mobile Ordering System will then return a page to the Customer confirming that the paint product has been added to the cart. From the Product Comparison Page the Customer can click the *back* button. The Mobile Ordering System will return the Customer to the Source page.

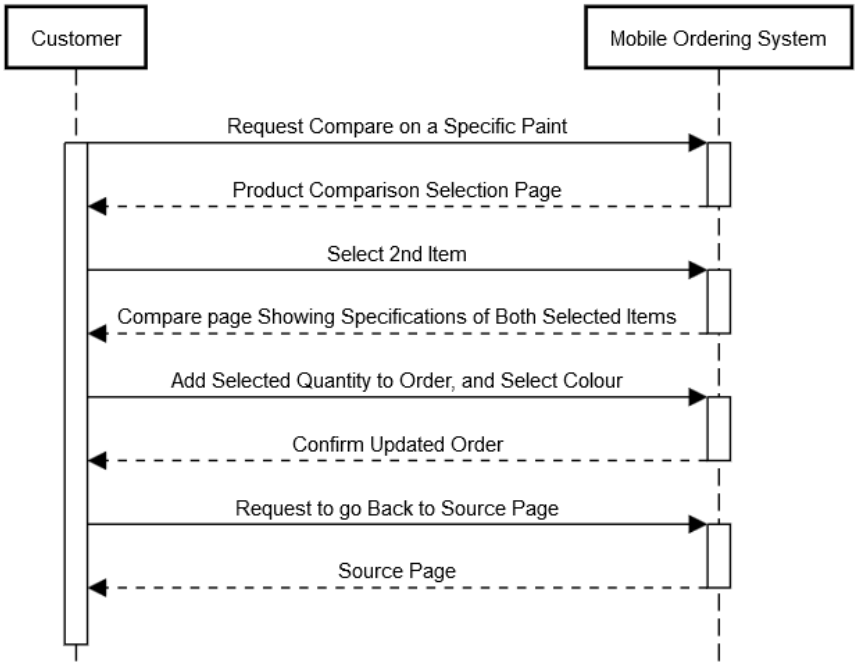

Figure 14:Sequence Diagram for Compare Product

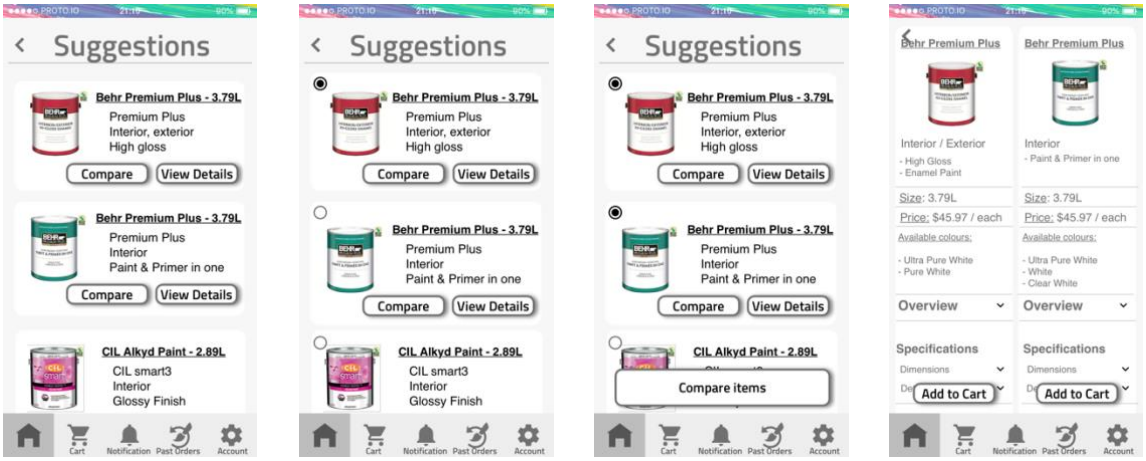

Figure 15: UI Model for Product Comparison

4 External Interface Requirements

4.1 User Interfaces

The Mobile Ordering System must have the following user interface characteristics to satisfy overall user experience:

- **Simplicity:** There must be no unnecessary elements to confuse the Customer.
- **Clarity:** Buttons and functions must have clear meaning to avoid confusion and prevent the Customer from pressing wrong buttons. The interface must be written using simple language to facilitate easy navigation.
- **Familiarity:** The design must have an intuitive interface that uses the design language of the target device (i.e. Android design must use Material Design; iOS design must use iOS's Human Interface Guidelines).
- **Consistency:** The design must have similar options available from any screen in the Mobile ordering System.
- **Efficiency:** The design must allow each Customer to perform tasks with speed and ease. 80% of first-time Customers must be able to place an order unassisted within 10 minutes of launching the Mobile Ordering System for the first time.
- **Responsiveness:** The Mobile Ordering System must respond to Customer actions within 0.1 seconds (the response may be a loading indicator if network coverage does not allow a fast response).

The buttons and functions that will be used most frequently must be on every screen in the Mobile Ordering System for easy access.

4.2 Hardware Interfaces

The Mobile Ordering System will run on smartphones (Apple and Android) from 2010 onwards. The back end of the Mobile Ordering System will integrate with the pick slip system already being used by BSPC's paint stores.

4.3 Software Interfaces

The system will communicate with a database that stores all registered Customer information (e.g. name, phone number, and email) as well as all paints carried by BSPC (along with their attributes). The Customer information and the data regarding his or her current and past orders must be available.
The Mobile Ordering System must be available on both the iOS and Android operating systems. The application must be available for iPhone 4 and newer devices and Samsung Galaxy S3 devices (or equivalent) and newer devices.
The Mobile Ordering System should automatically submit an order to the printer at the selected store when a Customer submits an order. This pick slip will then be used by an Employee to prepare the order for the Customer who submitted the order.

4.4 Communications Interfaces

When an order is submitted by a Customer, the Mobile Ordering System must send a command to print the pick slip to the printer at the selected store containing the associated order information.

5 Other Non-Functional Requirements

5.1 Performance Requirements

- Paint order placements must be made in real time to ensure that employees are able to receive the order as soon as possible.

5.2 Security Requirements

- The Mobile Ordering System must keep all user data private according to user data legislation by the Government of Canada.
- In order to make an account with the Mobile Ordering System, each Customer must provide a unique email and a password in order to ensure that Customer's personal information can be secured and is only accessible to that Customer. In order to access or change personal information, each Customer must provide his or her credentials again.
- To log in, each Customer must provide the email and password submitted during account creation.
- Each Customer must be logged in to have access to his or her previous order data and place orders.

5.3 Software Quality Attributes

5.3.1 Availability

- Each Customer should be able to place a paint order to any BSPC paint store across Canada.
- Each Customer must be able to place paint orders 24 hours a day.

5.3.2 Robustness

- The Mobile Ordering system must be able to process up to 5000 orders an hour.
- The Mobile Ordering System must be integrable with BSPC's API that is currently in use by BSPC's software system.

5.3.3 Interpretability

- The Mobile Ordering System should be descriptive enough that each first-time user is able to complete an order without contacting BSPC for assistance.

5.3.4 Usability

- Each Customer must be able to use the Mobile Ordering System in an effective and efficient manner.
- Each step in the ordering process must not be redundant.
- An experienced Customer must be able to place an order within 2 minutes.

6 Analysis Models

6.1 Use Case Model

The following use case model (See Figure 16) demonstrates the flow between the use cases belonging to the Mobile Ordering System. As described in Section 3, after opening and loading the Mobile Ordering System, the Customer is given the option to *Login or Register*; or to choose one of three product selection actions: *Search by Serial Number*, *Use Selection Guide* or *View Past Orders*. In order to *View Past Orders* the Customer must be logged in; therefore, *View Past Orders* includes the *Register/Login* use case. Following the use of one of the product selection actions the Customer can return to use another action, *Compare Products* or proceed to the *View/Modify Order* use case. Following the *View/Modify Order* use case, the Customer can proceed to *Place Order* or to *Register/Login* if he or she hasn't already. As in View *Past Orders*, *Place Order* also requires the Customer to be logged in; therefore, it also includes *Register/Login*.

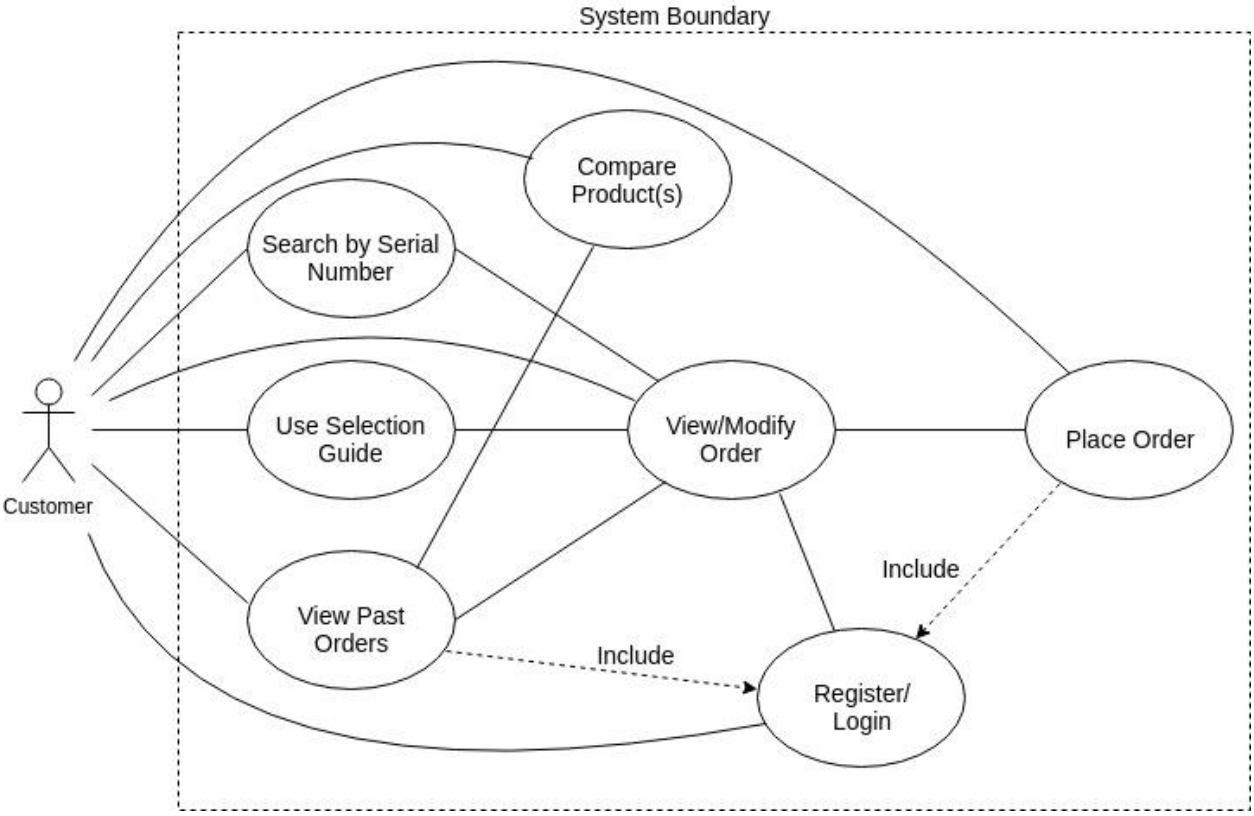

Figure 16:Use Case Model

6.2 Entity Relationship Diagram

This Entity Relationship Diagram for the Mobile Ordering System (See Figure 17) illustrates the relationship between four entities: The *Customer*, his or her *Order,* his or her *organization(s)*, and the *Paint* they are ordering through the Mobile Ordering System. The four entities are linked via their relationships, the *Customer* is linked to order by *places*, and the paint is related to the order by *contains*, the *Customer* is a part of *organizations*. All attributes related to the Mobile Ordering System are denoted by the ellipses. Primary key attributes are *Email Address, Order Number, Serial Number*, and *Color*; and are denoted by the underlined titles.

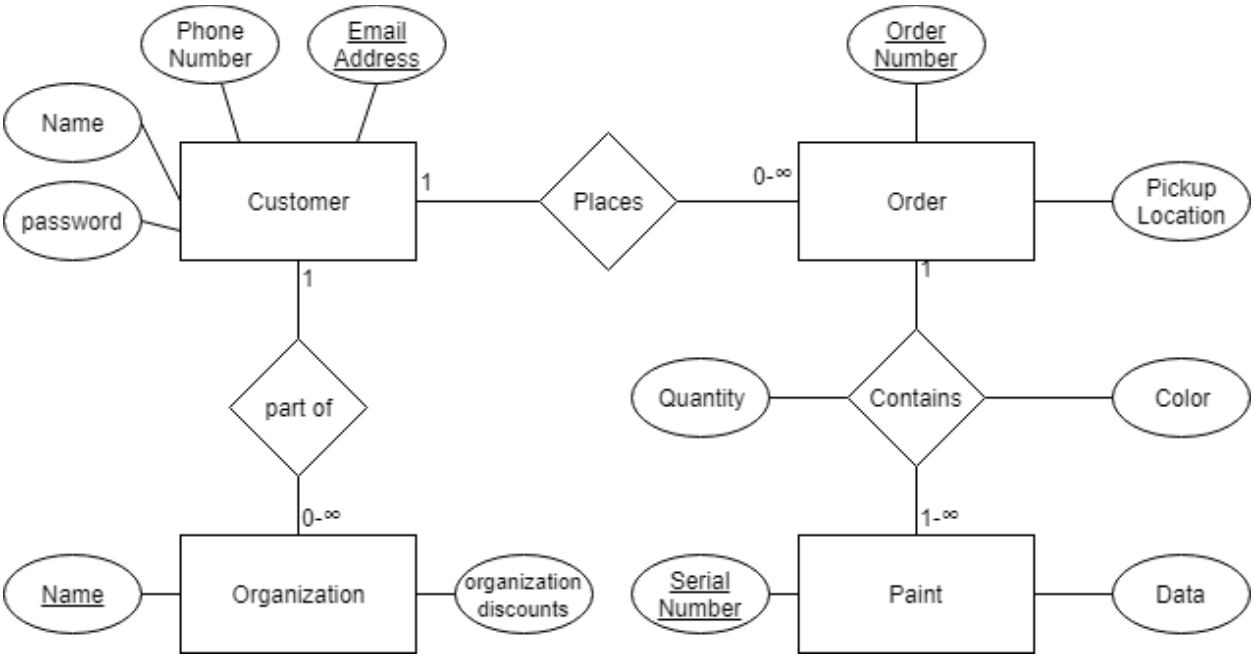

Figure 17: Entity Relationship Model

6.3 Data Flow Diagrams

6.3.1 Level 0 Data Flow Diagram

The following diagram is a Level 0 Data Flow Diagram (DFD) depicting the Mobile Ordering System (see Figure 18). It describes the data moving in and out of the Mobile Ordering System to each of the terminators of the system: The *Customer* and the *Printer*. The Customer will provide input such as his or her authentication credentials to log in, and order information to place orders. The *Printer* corresponds to the printers inside BSPC stores that print Pick Slips so that employees can fill. It will only provide confirmation that a pick slip was printed at a store to the Mobile Ordering System, which is then provided to the Customer that has made the order.

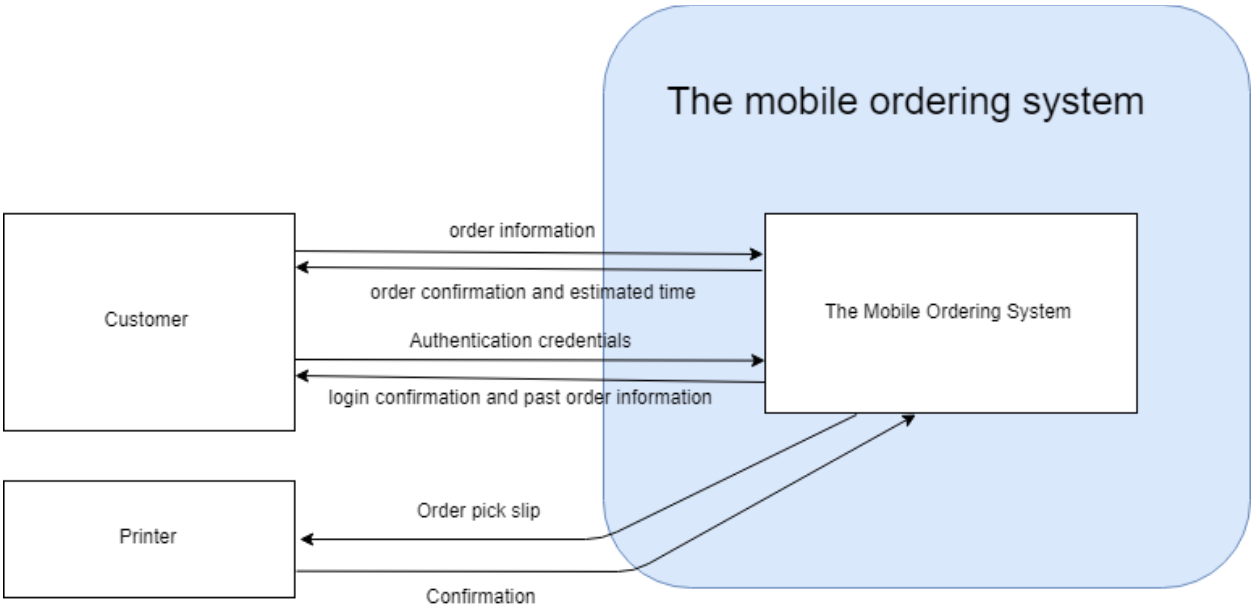

Figure 18: Data Flow Diagram Level 0

6.3.2 Level 1 Data Flow Diagram

The following diagram is a Level 1 Data Flow Diagram depicting the Mobile Ordering System (See Figure 19). This DFD expands on the previous DFD 0 by expanding the functionality into four logical parts: *Login/Register*, *Search for Products*, *Compare Products* and *Manage Order*. *Login/Register* describes data flowing in and out of the system while a Customer attempts to login to the Mobile Ordering System, or when a Customer attempts to create a new account for himself or herself. *Search for Products* describes data flows while a Customer attempts to search for a product using the Mobile Ordering System. *Compare Products* describes data flows while a Customer compares two products available in the Mobile Ordering System. *Manage Order* describes data flows while a Customer completes an order and submits it to a store for completion.

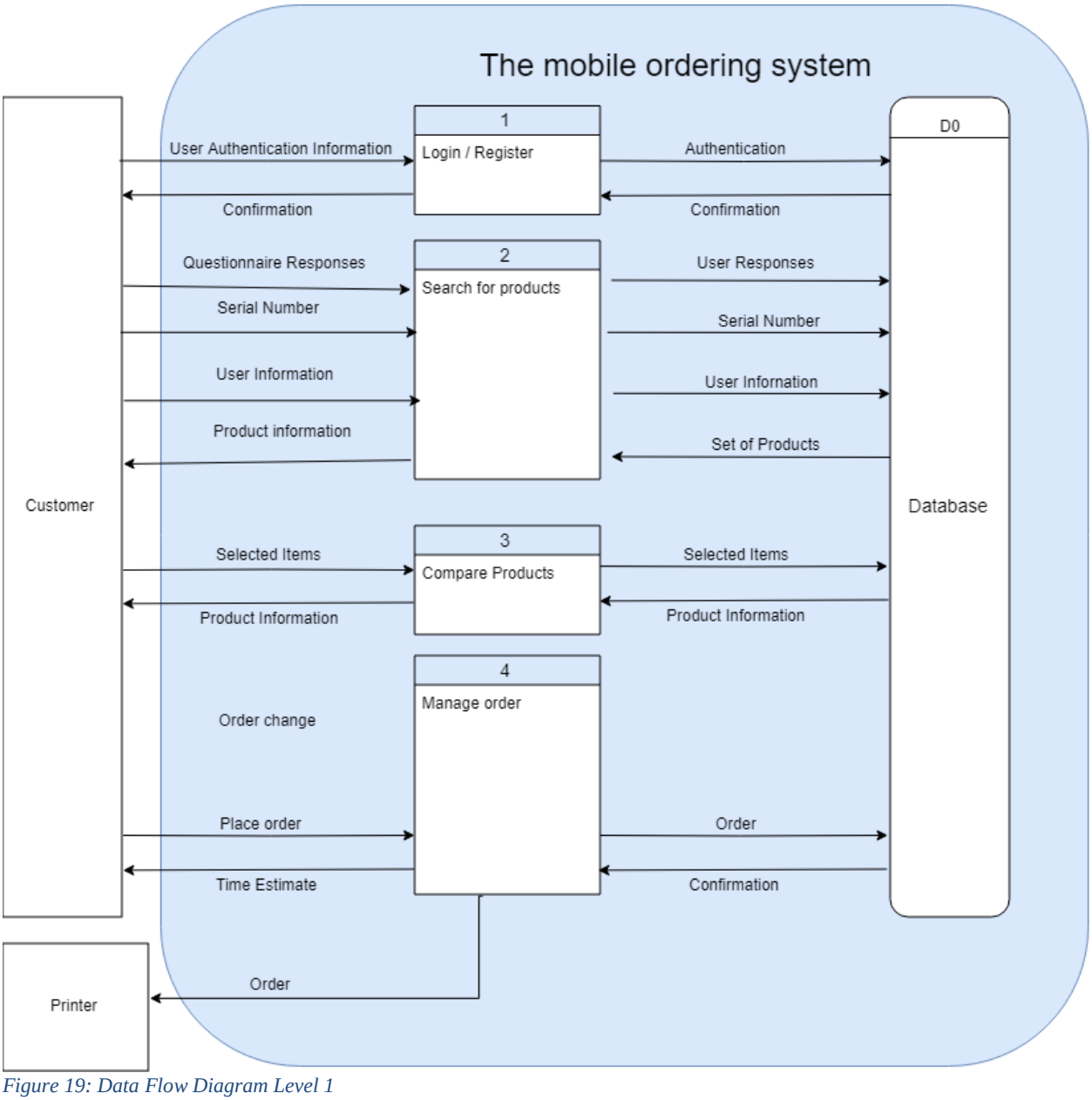

Figure 19: Data Flow Diagram Level 1

6.3.3 Level 2 Data Flow Diagram

The following diagram is a Level 2 Data Flow Diagram depicting the Mobile Ordering System (See Figure 20). It describes the data moving between each process in the Mobile Ordering System to a more detailed extent than was provided in DFD 1. The *Login/Register* flows are decomposed into *Login* and *Register*, the product search flows are decomposed into *Search by Selection Guide*, *Search by Serial Number* and *View Past Order*. Each of these flows correspond to different ways that a Customer can add products to his or her cart. The *Compare Products* remains unchanged from DFD 1. *Manage Order* is decomposed into *View/Modify Cart* and *Place Order*.

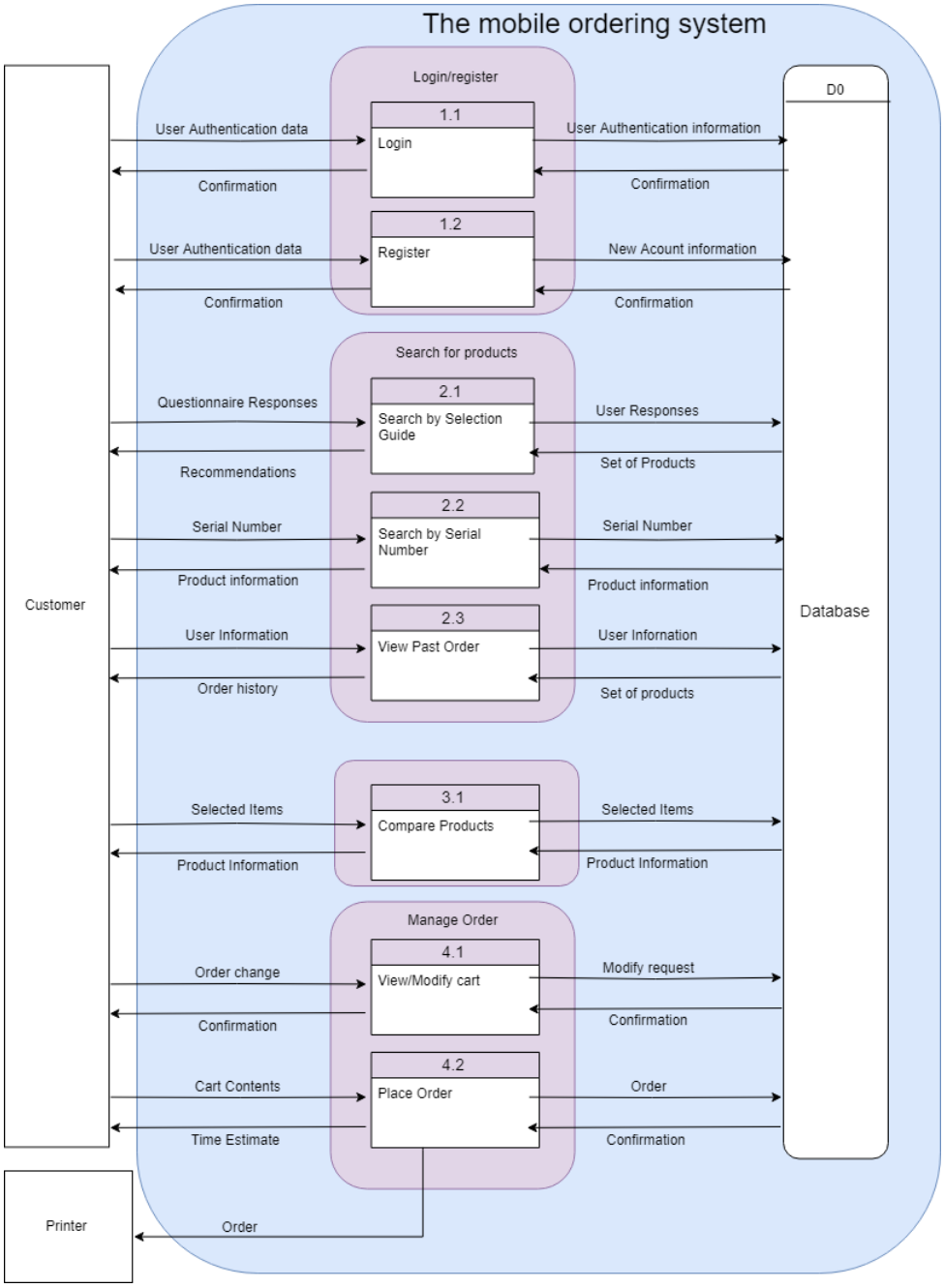

Figure 20: Data Flow Diagram Level 2

6.4 Traceability Matrices

Table 1: 3.1 Traceability matrix for register/login customer account

3.1 Register/Login Customer Account																	
Feature Number	Requirement Number	Requirement Name	TC 1.1	TC 1.2	TC 1.3	TC 1.4	TC 1.5	TC 1.6	TC 1.7	TC 1.8	TC 1.9	TC 1.10	TC 1.11	TC 1.12	TC 1.13	TC 1.14	TC 1.15
3.1	3.1.1	Verification of Login/Register Parameters	x	x	x	x	x										
	3.1.2	Both Options Login and Register Available						x									
	3.1.3	Immediate Access to Login/Register							x								
	3.1.4	Return to Source								x							
	3.1.5	Require Login/Registration to Access Past Orders									x	x					
	3.1.6	Require Login/Registration to Place an Order											x	x			
	3.1.7	Contractor ID Integration													x	x	x

Table 2: Traceability matrix for search by Selection guide.

3.2 Selection guide						
Feature Number	Requirement Number	Requirement Name	TC 2.1	TC 2.2	TC 2.3	TC 2.4
3.2	3.2.1	Product Recommendation	x			
	3.2.2	Selection Guide Accessibility		x	x	
	3.2.3	Minimum Product				x

Table 3: Traceability matrix for serial number

3.3 Serial Number					
Feature Number	Requirement Number	Requirement Name	TC 3.1	TC 3.2	TC 3.3
3.3	3.3.1	Landing Page Contains Search by Serial Number	x		
	3.3.2	Valid Serial Numbers Display the Appropriate Paint		x	X

Table 4: Traceability matrix for Past Orders

3.4 Past Order					
Feature Number	Requirement Number	Requirement Name	TC 4.1	TC 4.2	TC 4.3
3.4	3.4.1	Past Orders Availability	x	x	
	3.4.2	Add by Past Orders			x

Table 5: Traceability matrix for Virtual Shopping Cart

3.5 Virtual Shopping Cart								
Feature Number	Requirement Number	Requirement Name	TC 5.1	TC 5.2	TC 5.3	TC 5.4	TC 5.5	TC 5.6
3.5	3.5.1	View Cart	x	x				
	3.5.2	View Item			x			
	3.5.3	Modify Quantity and Colour				x	x	
	3.5.4	Delete Item						x

Table 6: Traceability matrix for Select Pick-up Location

3.6 Select Pick-up Location					
Feature Number	Requirement Number	Requirement Name	TC 6.1	TC 6.2	TC 6.3
3.6	3.6.1	Select Location	x	x	
	3.6.2	Stores Near Customer			x

Table 7: Traceability matrix for Wait Time Estimator

3.7 wait time estimator				
Feature Number	Requirement Number	Requirement Name	TC 7.1	TC 7.2
3.7	3.7.1	Wait time estimator	x	
	3.7.2	Correctness of wait time provided		x

Table 8: Traceability matrix for Product Comparison

3.8 Product Comparison				
Feature Number	Requirement Number	Requirement Name	TC 8.1	TC 8.2
3.8	3.8.1	Side-by-side Comparison	x	
	3.8.2	Order from Comparison		x

6.5 Data Dictionary

The following diagram is a data dictionary diagram of the mobile ordering system. It is a collection of metadata of data objects or items in the data model for the database users.

Table 9: Data Dictionary for the Mobile Ordering System

Name	Metadata
alphanumeric	::= “a” … “z” | “A” … “Z” | “0” … “9” | “-” | “‘“‘“ | “.”;
city	::= ^{1}{alphanumeric};
colour	::= ^{1}{alphanumeric}^{25};
customer	:::= phone-number, name, email;password
date	::= month, “/”, day, “/”, year;
day	::= “01” .. “31”;
email	::= ^{1}{alphanumeric},”@”,^{1}{alphanumeric};
month	::= “01” .. “31”;
name	::= ^{1}{alphanumeric}^{25};
Order-number	::= ^{16}{digit}^{16};
Order- total	::= ^{1}{digit};
paint - Image	::= {image};
paint-name	::= ^{1}{alphanumeric};
paint-quantity	::= ^{1}{digit};
password	::= ^{8}{alphanumeric}^{25};
phone-number	::= digit, “-(”, ^{3}{digit}^{3}, “)-”, ^{3}{digit}, “-”, ^{4}{digit}^{4};
postal-code	::= ^{6}{alphanumeric}^{6};
price-of-product	::= {digit};
product-description	::=paint-name,“/”, paint-image,“/”, colour, “/”, ^{1}{alphanumeric};
province	::= ^{1}{alphanumeric};
questionnaire	:::= ^{1}{alphanumeric};
questionnaire- response	:::= ^{1}{alphanumeric};
serial-number	::= ^{1}{digit}^{10};
store-location	::= street-address, city, province, postal-code;
street-address	::= ^{1}{alphanumeric};
Time-estimate	::= date
year	::= {digit}^{4};