Final Report

CARSA Registration System Enhancement

Group 5

November 27th, 2015

Revisions

Name	Date	Reason For Changes	Version
Ian Sutton	27/11/2015	Initial Draft	1.0.0

Table of Contents

Section 1: Introduction

1.1: Project Overview

1.1.1: Executive Summary

The CARSA Registration System Enhancement (CRSE) is focused on improving the ability of CARSA staff and systems to accommodate the influx of new members at the start of the semester. Since CARSA opened this summer it has been clear that the surge of students seeking to register is too much for the current infrastructure to handle during the first two weeks. Group 5 proposes to find a solution that gives CARSA staff the ability to handle these increased numbers without incurring undue expenses the rest of the year.

1.1.2: Context

CARSA is UVic's recreation and sports center for students and community members, it was built to replace the aging Ian Stewart complex and to provide improved facilities for UVic sports organizations. CARSA has only been operational since May of this year, and has licensed CLASS, a COTS system used by several local recreation centers, in order to handle membership data. The CLASS system has limited interaction with existing UVic registration systems, and new members are added manually by employees at the CARSA front desk.

1.1.3 Need

Currently, the CARSA front desk staff are unable to handle the influx of members at the start of semester, leading to slow registration times and long lines. They need a solution that will allow them to handle the increased load during the first two weeks of the new semester without increasing costs during the rest of the year when the numbers are more manageable.

1.1.4 Scope

The problem only occurs the first two weeks of semester, so any solution should focus on that time frame. In addition, the solution is limited to the existing CARSA facilities, no new space can be acquired. UVic systems can be modified as part of the enhancement, but the CLASS system cannot be changed, since it is licensed from an external organization. It is also within the budget to allocate more resources to the front desk temporarily during the busy season.

1.1.5 Stakeholders

- **UVic executives:** Supervise the operation and budget of CARSA.
- **CARSA administrators:** Manage CARSA affairs, including staffing, building maintenance and membership systems.
- **CARSA staff:** Responsible for customer facing services.
- **UVic members:** UVic students and staff who register with their ONECards and use CARSA facilities.
- **Community members:** Customers from the community who are not part of the UVic systems.
- **UVic systems personnel:** Responsible for maintaining UVic's systems.
- **Non-member customers:** Customers who purchase day passes and other short term offerings rather than registering for membership.

1.1.6 Objectives

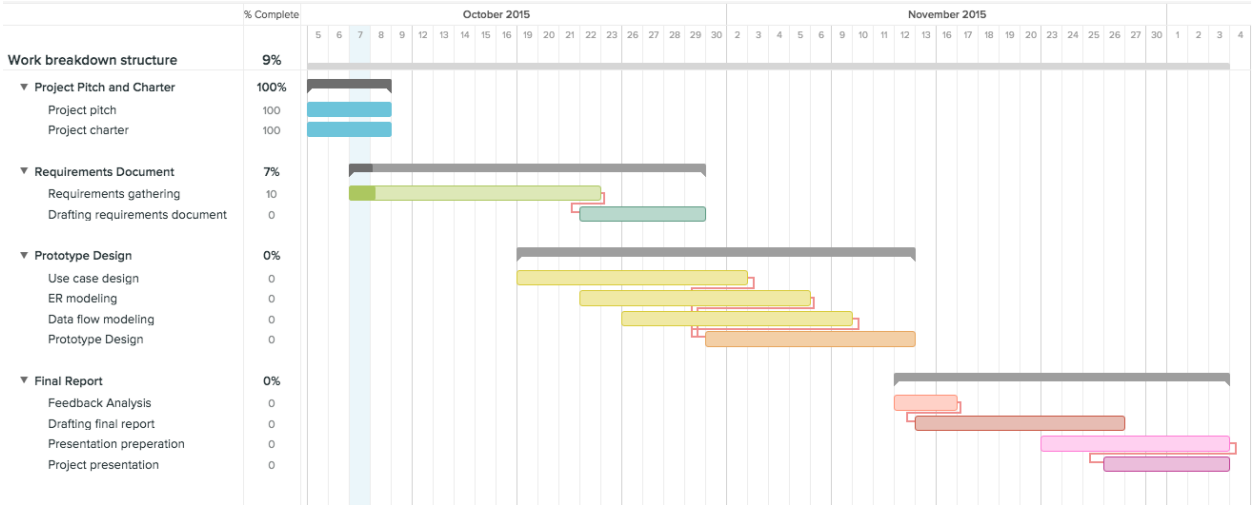
- Decrease registration time
- Prevent long lines from building up at the front desk during the first two weeks of semester
- Reduce the load on CARSA front desk staff
- Avoid raising operating costs outside of the first two weeks of semester
- Make the system easier to use for both customers and staff

1.2: Project Organization

1.2.1: Team Organization and Roles

Name	Role
Steve Chapman	Project Manager
Brian Chen	Senior Software Architect
David Gu	Senior Process Analyst
Lora Liu	Senior Business Consultant
Graeme Nathan	Architecture Director
Jing Qi	Financial Manager
Ian Sutton	Senior Analyst
Bernie Wang	Senior Business Analyst

1.2.2: Work Breakdown Structure



1.2.3: Milestones

Date	Milestone
October 8th	Project Pitch
October 29th	Requirements Delivered
November 16th	Prototype Demonstration
November 26th	Final Report Delivered
December 3rd	Project Presentation

1.2.4: Deliverables

- Project Charter
    - A document detailing the scope and purpose of the CRSE project, as well as background context and other logistical information.
- Requirements
    - A detailed list of functional and nonfunctional requirements created by the analyst team.
- Project Prototype
    - A prototype for the system change to be presented to the client for feedback leading up to the final report.
- Final Report
    - The report compiling the requirements, artifacts and systems design information of the final solution.

1.2.5: Risks

- System changes may lead to decreased performance (medium risk, high impact)
    - This will be mitigated by reliability testing of any new system infrastructure and thorough process review.
- Conflict between project stakeholders (medium risk, medium impact)
    - We will resolve conflicting priorities among stakeholders by prioritizing inexpensive changes to customer experience and staff work processes over deep systemic changes.
- Feature creep inflates costs/causes failure to meet deadlines (low risk, medium impact)
    - This risk will be managed by considering non-technical solutions before any revisions to UVic systems, and by maintaining scope awareness on the analyst team.
- Staff reject the new system (medium risk, medium impact)
    - We will reduce this risk by incorporating staff feedback into the design process.
- Differences between the customer types leads to some customers being overlooked in the new system (medium risk, medium impact)
    - This risk will be addressed by reviewing with the client how different classes of client are handled, and by obtaining any relevant internal documentation on the current customer systems.
- Changes to requirements/project goals cause the project to run past it's deadlines (medium risk, high impact)
    - This risk will be addressed by reviewing requirements with clients during the requirements document drafting process.
- Resource turnover leads to delays and cost overrun (low risk, medium impact)
    - Our team has enough shared skills to handle the loss of some of our resources without severely impacting team function.
- Systems solutions aren't scalable and fail to accommodate real world performance demands (medium risk, high impact)
    - This risk will be mitigated through thorough load testing in a test environment before production rollout of any technical solutions.
- Project disrupts compliance with legal liability measures (medium risk, high impact)
    - We will review the relevant privacy laws and legal liability concerns with the client when designing requirements.
- Requirements are insufficient/incomplete (high risk, high impact)

This risk will be addressed by reviewing requirements with clients during the requirements document drafting process.

Section 2: Requirements

2.1: Use Cases

Use Case 1: Login

Description

This use case describes how a Front Desk actor logs in to the system.

Actors

Front Desk

Pre-Conditions

The Front Desk must have an active account within the system including a username, a password, and access to the front desk computer terminals.

Main Flow

1. The use case begins when the Front Desk turns the front desk computer terminal on.
2. The system prompts for a user-name and password.
3. **<Enter Credentials>** The Front Desk enters their user-name and password.
4. **<Authentication>** The system authenticates the actor.
5. The system displays the administrative menu.
6. The use case ends.

Post-Conditions

The Front Desk has access to the system's main view.

Alternative Flows

A. At **<Enter Credentials>**, if any invalid parameters are entered in the input fields, then
   1. The system colours the background of the input sections red.
   2. The system displays "Inputs are invalid, please try again."

Return to **<Enter Credentials>**.

B. At **<Authentication>**, if the Front Desk entered an incorrect username or password, then
   1. The system displays a message saying "User-name and password do not match, please try again."

Return to **<Enter Credentials>**.

Use Case 2: Search

Description

This use case describes how a Front Desk actor searches for accounts in the system.

Actors

Front Desk

Pre-Conditions

The actor must logged in to the administrative menu of the system.

Main Flow

1. The use case begins when the Front Desk chooses the search menu option.
2. The system displays the search view.
3. **<Enter Query>** The Front Desk enters any of the following information if it is available: first name, last name, UVic ID number, address.
4. **<Submit Query>** The Front Desk submits the query to the search interface provided.
5. The interface returns the search results.
6. The system displays the search results view.
7. The Front Desk selects an account from those displayed.
8. The system displays the account details view of the selected account.
9. The use case ends.

Post-Conditions

The actor has access to the account details view of the account matching the search query.

Alternative Flows

A. At **<Enter Query>**, if any invalid parameters are entered in the input fields, then
   1. The system colours the background of the input sections red.
   2. The system displays “Inputs are invalid, please try again.”

Return to **<Enter Query>**.

B. At **<Submit Query>**, if the Front Desk entered parameters which do not match any account, then
   1. The system displays a message saying “No accounts were found with <parameter name> = <input parameter>.”

Return to **<Submit Query>**.

Use Case 3: Create Community Membership Account

Description

This use case describes how a Front Desk actor creates a new Community account for the Client in the system.

Actors

Front Desk, Client

Pre-Conditions

The Front Desk actor must logged in to the administrative view of the system; all input parameters to an account must be available, including: first and last name of the future account holder, a selected available account type, and a selected available membership level; there must be no accounts associated with the exact parameters list being used; the actor must have seen valid identification confirming both the full name and the selected account type to be created as true.

Main Flow

1. The use case begins when the Front Desk chooses the create account menu option.
2. The system displays the create account screen.
3. **<Enter Data>** The Front Desk enters the information for the account being created, including the Client's full name and address
4. **<Submit Data>** The Front Desk submits the data to the system.
5. **<Generate Account>** The system generates a new account with the corresponding data inserted, along with the current date listed as the creation date.
6. The system displays the account details screen for the new account.
7. A picture is taken of the new community member and a card is printed out for their account.
8. The use case ends.

Post-Conditions

The system has a new inactive account corresponding to the submitted data.

Alternative Flows

A. At **<Enter Data>**, if any invalid parameters are entered in the input fields, then
   1. The system colours the background of the input sections red.
   2. The system displays "Inputs are invalid, please try again."

Return to **<Enter Data>**.

B. At **<Generate Account>**, if the entered parameters do not result in conflicting types, or are themselves invalid, then
   1. The system displays a message saying "Account not created: non-matching or invalid inputs submitted. Please try again."

Return to **<Submit Data>**.

Use Case 4: Create UVic Membership Account

Description

This use case describes how a Front Desk actor creates a new UVic account for the Client.

Actors

Front Desk, Client

Pre-Conditions

The Front Desk actor must logged in to the administrative view of the system; all input parameters to an account must be available, including: first and last name of the future account holder, a selected available account type, a selected available membership level, and a UVic ID number; there must be no accounts associated with the exact parameters list being used; the actor must have seen valid identification confirming both the full name and the selected account type to be created as true.

Main Flow

1. The use case begins when the Front Desk chooses the create account menu option.
2. The system displays the create account screen.
3. **<Enter Data>** The Front Desk enters all parameters for the account being created either manually, or automatically by swiping the Client's OneCard.
4. **<Submit Data>** The Front Desk submits the data to the system.
5. **<Generate Account>** The system generates a new account with the corresponding data inserted, along with the current date listed as the creation date.
6. The system displays the account details screen for the new account.
7. The use case ends.

Post-Conditions

The system has a new inactive account corresponding to the submitted data.

Alternative Flows

A. At **<Enter Data>**, if any invalid parameters are entered in the input fields, then
   1. The system colours the background of the input sections red.
   2. The system displays "Inputs are invalid, please try again."

Return to **<Enter Data>**.

B. At **<Generate Account>**, if the entered parameters do not result in conflicting types, or are themselves invalid, then
   1. The system displays a message saying "Account not created: non-matching or invalid inputs submitted. Please try again."

Return to **<Submit Data>**.

Use Case 5: Delete Account

Description

This use case describes how a Front Desk actor deletes an account from the system.

Actors

Front Desk

Pre-Conditions

The actor must logged in to the administrative view of the system.

Main Flow

1. The use case begins when the Front Desk chooses the delete account menu option.
2. The system displays the delete account screen.
3. **<Search>** The Front Desk searches for the account to be deleted.
4. **<Delete>** The actor chooses the delete-account option.
5. **<Confirm>** The system displays a message saying “Delete this account?” with cancel and confirm options.
6. The Front Desk chooses the confirm option.
7. The system deletes the account from the database.
8. **<Completion>** The system confirms the account has been removed from the database.
9. The system displays a message saying “Account successfully deleted.”
10. The use case ends.

Post-Conditions

The system has removed all data corresponding to the account in question.

Alternative Flows

A. At **<Confirm>**, if the actor chooses the cancel option, then
   1. The system displays “Operation canceled. Account not deleted.”

Return to **<Delete>**.

B. At **<Completion>**, if the account was not removed from the database, then
   1. The system displays “Error: account was not deleted.”

Return to **<Delete>**.

C. At <Search>, if no account is found, then end the use case.

Use Case 6: Modify Account

Description

This use case describes how a Front Desk actor modifies an account in the system.

Actors

Front Desk

Pre-Conditions

The actor must logged in to the administrative view of the system.

Main Flow

1. **<Search>** The use case begins when the Front Desk searches for the account to be deleted.
2. The Front Desk selects the account from the search results.
3. The system displays the account details screen.
4. The actor chooses the modify account option.
5. The system displays the modify account screen.
6. **<Modifying>** The actor modifies any fields in the account, replacing them with different valid inputs.
7. The Front Desk chooses the finish option.
8. The system saves the new account information into the database.
9. **<Success>** The system confirms the new information has been successfully saved.
10. The system displays a message saying “Account successfully updated.”
11. The system returns to the account details screen.
12. The use case ends.

Post-Conditions

The system has updated all data corresponding to the account in question.

Alternative Flows

A. At **<Modifying>**, if the actor inputs invalid parameters, then
   1. The system colours the background of the input section red.
   2. The system displays “Invalid input, please correct.”

Return to **<Modifying>**.

B. At **<Success>**, if the new account information was not saved in the database, then
   1. The system displays “Error: account update not saved.”

Return to **<Modifying>**.

C. At **<Search>**, if no account is returned, end the use case.

Use Case 7: Pay Fees

Description

This use case describes how a Front Desk actor takes payments from the Client for a membership.

Actors

Front Desk, Client, Bank

Pre-Conditions

The Front Desk must logged in to the administrative view of the system, and must be in the account details view of the account to be paid.

Main Flow

1. The use case begins when the Front Desk chooses the pay option from the account details screen.
2. **<Select>** The Front Desk selects either the debit, credit, or cash payment option.
3. The system calculates the corresponding fee for the account.
4. The system charges the fee to the payment hardware.
5. **<Charge>** The payment hardware submits data to the Bank.
6. **<Confirm>** The Bank confirms payment received.
7. The system marks fees as paid.
8. The system updates the account status to activated.
9. The system updates the account deactivation date to match the membership type.
10. The system displays a message “Print receipt?”
11. **<Receipt>** The actor selects yes.
12. The system prints a receipt.
13. The new member signs the waiver in order to gain access to the gym facilities.
14. The use case ends.

Post-Conditions

The Bank has received payment for the membership fee, the account status has been updated to active, and the account deactivation date has been updated to match the membership type.

Alternative Flows

A. At **<Confirm>**, if the Bank does not confirm, then
    1. The system displays “Payment failed: <Bank error>.”

Return to **<Charge>**.

B. At **<Receipt>**, if the Front Desk selects no, then
    1. Skip to step 13.

C. At **<Select>**, if cash is selected, then
    1. The system displays the cash-in-cash-out view.
    2. The Front Desk submits the total cash provided.
    3. The system displays the change to be provided.
    4. The Front Desk inserts the received cash into the till and retrieves the displayed change amount.
    5. The Front Desk returns the change to the Client.
    6. The system displays the print receipt view.
    7. Return to **<Receipt>**.

Use Case 8: Refund Fees

Description

This use case describes how a Front Desk actor refunds payments to the client.

Actors

Front Desk, Client, Bank

Pre-Conditions

The Front Desk actor must logged in to the administrative menu of the CLASS system, and must be in the account details view of the account to be paid. If the card reader is used, it must have a connection to the internet in order to function.

Main Flow

1. The use case begins when the Client requests a refund from the Front Desk.
2. The Front Desk chooses the refund option from the account details screen.
3. The Client selects either the debit or credit refund option.
4. The system selects the value of the fee already paid.
5. The system sends the fee and refund code to the payment hardware.
6. **<Refund>** The payment hardware submits data to the Bank.
7. **<Confirm>** The Bank confirms refund received.
8. The system marks fees as refunded.
9. The system updates the account status to deactivated.
10. The system updates the account deactivation date to undetermined.
11. The system displays a message “Print receipt?”
12. **<Receipt>** The user selects yes.
13. The system prints a receipt.
14. The use case ends.

Post-Conditions

The Bank has received refunded the previously received fee for membership, the account status has been updated to deactivated, and the account deactivation date has been updated to undetermined.

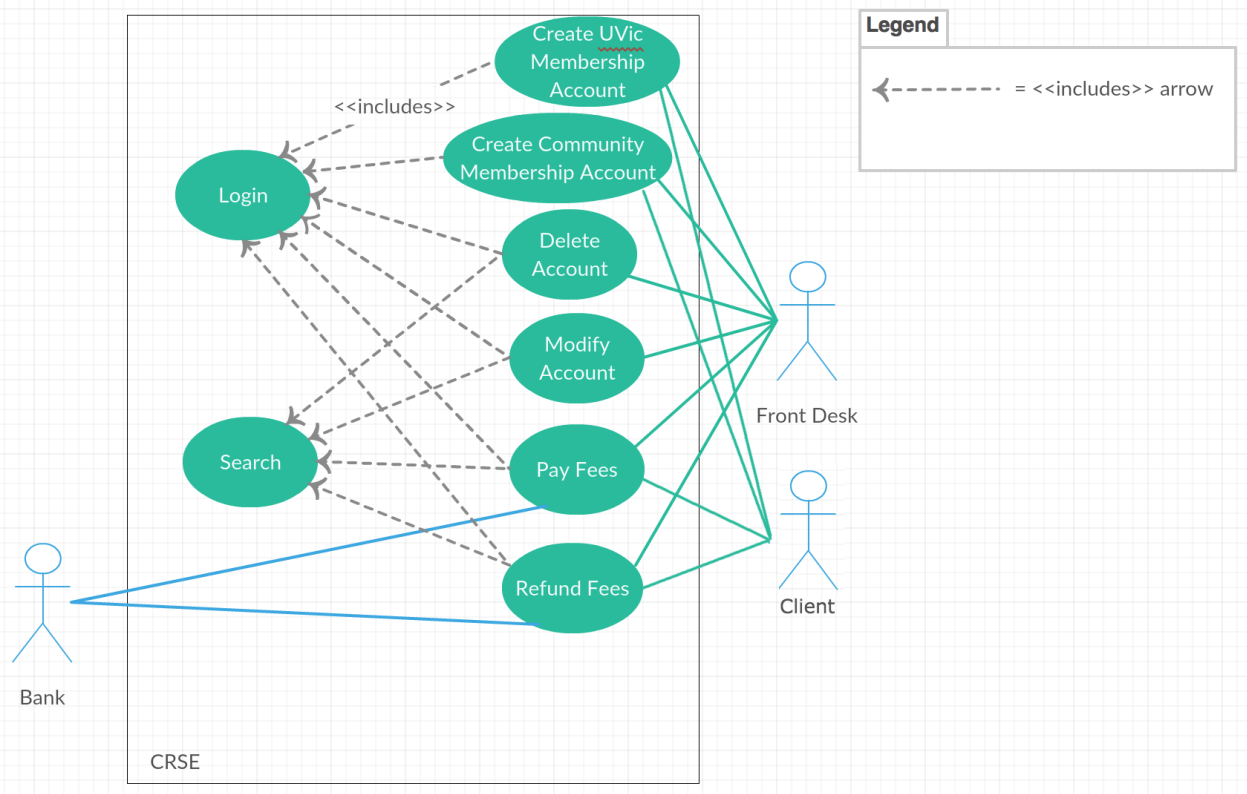
Alternative Flows

A. At **<Confirm>**, if the Bank does not confirm, then
   1. The system displays “Payment failed: <Bank error>.”

Return to **<Refund>**.

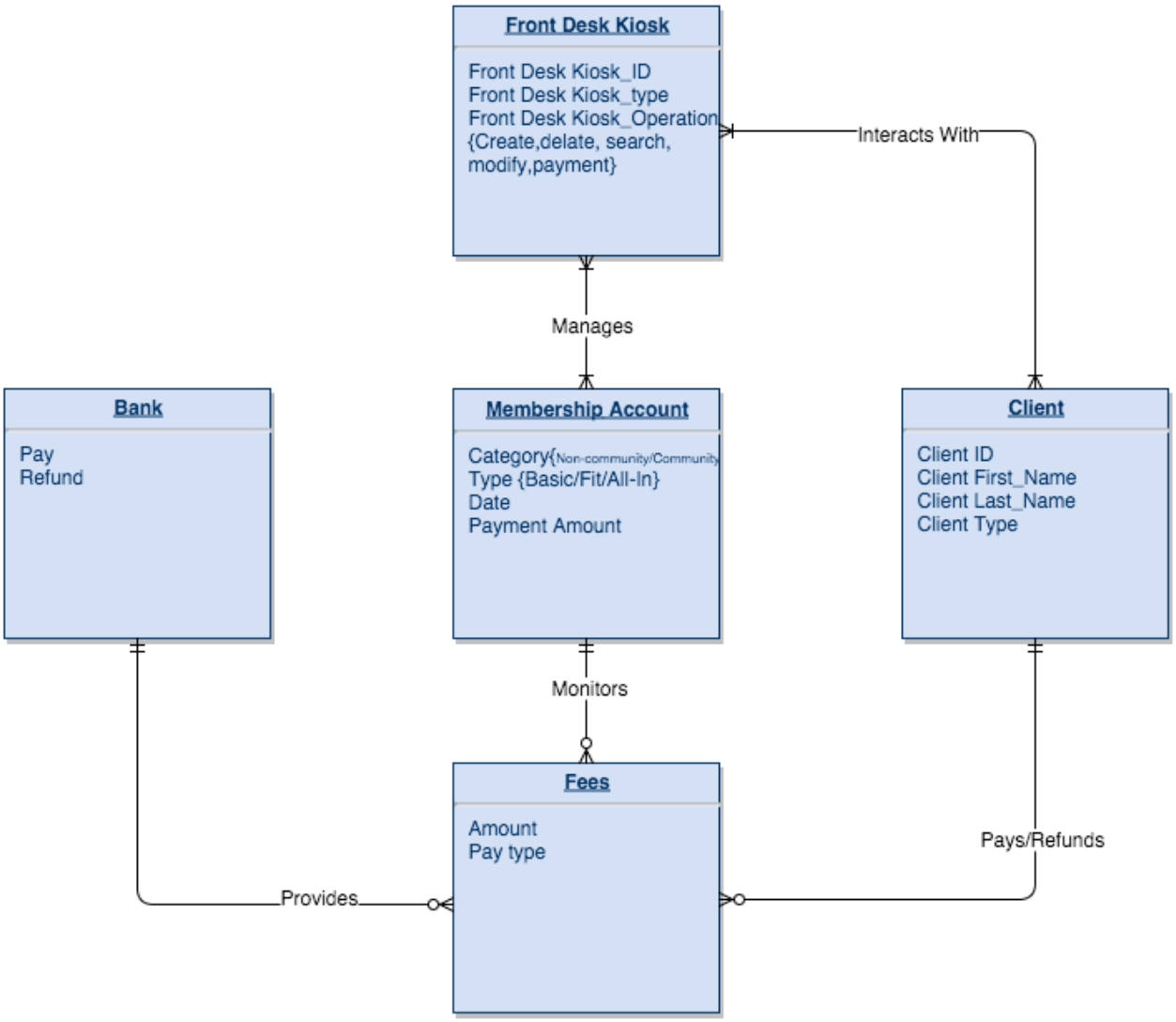
B. At **<Receipt>**, if the Client selects no, then
   1. End the use case.

2.2: Use Case Diagram



2.3: Domain Models

2.3.1: ER Diagram



2.3.2: Data Flow Diagram

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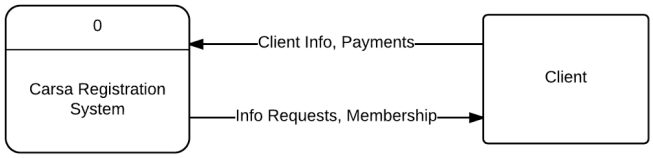

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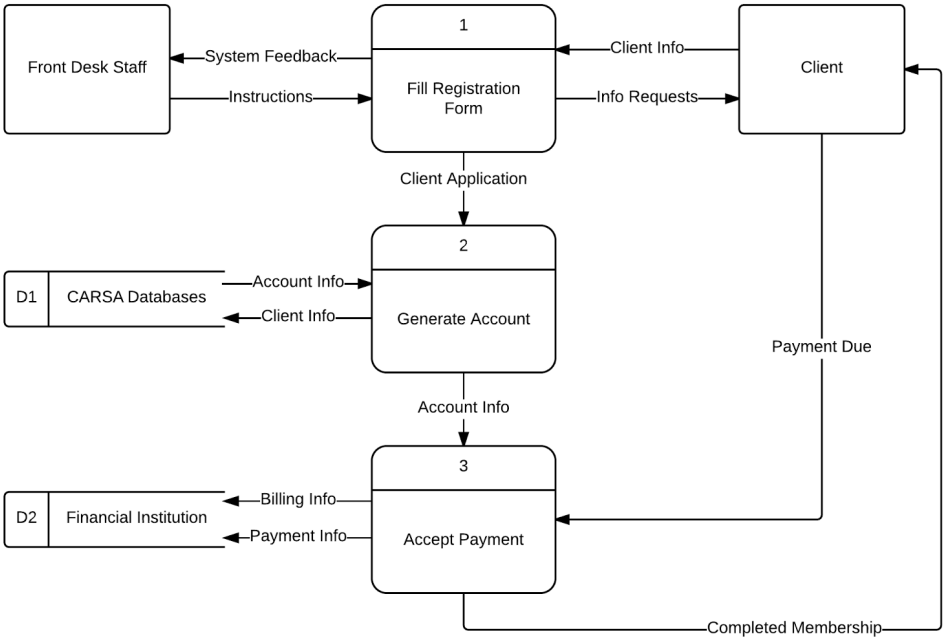
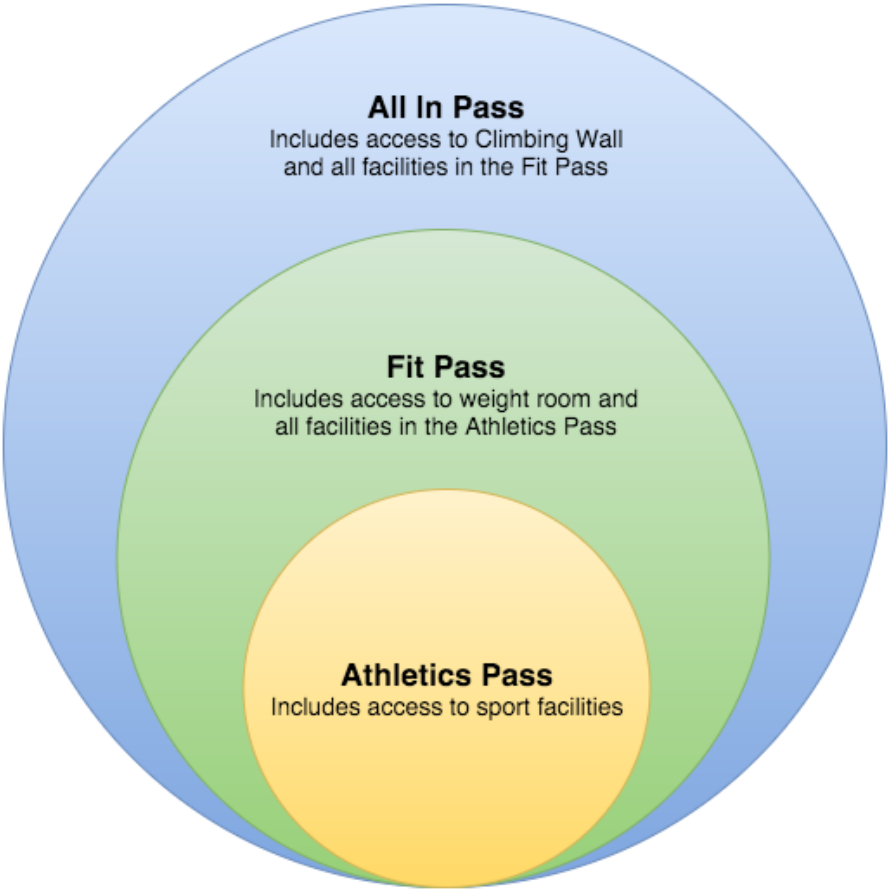


2.3.3: Membership Hierarchy Diagram



2.4: Overall Description

2.4.1 Product Perspective

The planned system would be a modification of CARSA's existing registration and membership process. This system will either extend or enhance the ability of the existing CARSA registration system to handle increased user traffic during peak intervals in the school year.

2.4.2 Product Features

Improved Customer Experience: The layout and design of the current registration process will be revamped to provide a more intuitive, fast and friendly customer experience.

Easy Implementation: The new solution will not require significant software changes or new hardware, it will reorganize existing methods in order to improve efficiency while limiting overhead. Existing employees should have no trouble learning the new system.

2.4.3 User Classes and Characteristics

The primary users of the system can be divided into two groups. CARSA staff are the primary operators and the intermediary between clients and the backend software system. CARSA customers primarily interact with the system through front desk staff in the building lobby.

2.4.3.1 CARSA Staff

In the context of the registration system, CARSA staff includes all the employees who work at the front desk. These staff are the first point of interaction for users looking to register at CARSA, and spend the most time out of any user group interacting with the backend system. All front desk staff are trained in operating the registration and membership system, and thus are presumed to have technical expertise with the system. CARSA staff are also responsible for providing membership information to customers.

2.4.3.2 CARSA Customers

Customers are divided into members and non-members. Members include UVic students, staff and faculty, as well as community members who have applied for a membership at CARSA. Non-members encompass all other users of the CARSA facilities. Even within the three sub-categories, customer usage of the system varies greatly from daily to intermittent, so it is not possible to describe a general usage pattern.

Following is a breakdown of the three main customer groups: UVic members, community members and non-member customers.

- **UVic members:** UVic students and staff who register with their ONECards and use CARSA facilities. All of these members have ONECards for identification, and many are automatically eligible for memberships through mandatory recreation fees.

- **Community members:** Customers from the community who are not part of the UVic systems. These clients are issued dedicated member cards upon registration.

- **Non-member customers:** Customers who have not applied for any form of membership fall into this category. To enter the facilities requires either a secondary pass or some otherwise specified reason such as supervising a minor. These customers generally have very limited interaction with the system.

2.4.4 Design and Implementation Constraints

2.4.4.1 Security

The new system must adhere to UVic's accessibility standards as detailed by [1]. Any modifications that interact with user information must abide by both the BC [2] and UVic [3] information privacy guidelines.

2.4.4.2 Modification of Existing System

The current CARSA registration system makes heavy use of a proprietary recreation management system called CLASS. Since CLASS is a COTS system, there will be no modification of existing software within the scope of this project.

2.4.5 Assumptions and dependencies

2.4.5.1 Assumptions

Our project assumes that UVic will not be replacing the underlying technical systems used by CARSA. Software changes would be likely to alter the workflow of front desk staff and may invalidate any proposed enhancements.

2.4.5.2 Dependencies

As this project builds off of the existing system, it is necessary to maintain the existing external dependencies:

- The UVIC account system
- The OneCard system
- CLASS and its associated functions
- Physical infrastructure provided for registration by CARSA (i.e. the front desk kiosks and terminals)

2.5: Existing Functional Requirements

2.5.1 Description and Priority

These are functional requirements of the existing system that will be preserved in the new system's implementation. **Priority: High**

2.5.2 Requirements

REQ-01: Front desk kiosks must connect to UVic systems to retrieve UVic staff and student account information when creating their CARSA membership.

Backward Traceability: The existing kiosks have access to UVic systems for registration, making the registration process must faster for UVic members.

Forward Traceability: This requirement can be verified by checking whether a kiosk can retrieve account information from the UVic systems/ONECard when creating an account.

REQ-02: Front desk kiosks must not be able to modify/delete UVic accounts

Backward Traceability: The existing kiosks are limited to reading UVic account information to prevent interference in UVic's systems.

Forward Traceability: This requirement can be verified by attempting to delete or modify a UVic account from within the CARSA software system.

REQ-03: UVic members must have their UVic ID in their CARSA account, while community members have no UVic ID in their account.

Backward Traceability: The current system stores UVic member's UVic ID in their CARSA account, which allows customers identified as UVic members to qualify for lower membership fees than members of the general community.

Forward Traceability: This requirement can be verified by checking the account of a UVic member to verify that the UVic ID is present and by checking the account of a community member to verify that the UVic ID is absent.

REQ-04: The system must be able to register for a 4-month, 8-month or a full year pass at CARSA.

> **Backward Traceability:** The current system supports 4-month increments for the duration of purchased memberships, which allows members to make less of a commitment when purchasing their membership.
>
> **Forward Traceability:** This requirement can be verified by checking the possible membership options in the interface and through verification testing of the expiration date functionality.

REQ-05: The system must enable customers to register for any of the three membership tiers.

> **Backward Traceability:** The current system supports a three tier membership system that allows customers to opt out of paying for facilities they do not intend to use.
>
> **Forward Traceability:** This requirement can be verified by creating a new membership with each of the three membership tiers and testing the card on the card readers for each of the facilities.

REQ-06: The system must support the purchase of secondary passes.

> **Backward Traceability:** The current system allows customers to buy short term passes that do not require membership, which gives people a way to use gym facilities without committing to a longer membership.
>
> **Forward Traceability:** This requirement can be verified by checking the availability of non member passes at kiosks.

REQ-07: Front desk kiosks must be able to accept credit cards, debit cards, and cash payments.

> **Backward Traceability:** The current system allows customers to use cash, credit or debit. These methods of payment are all standard for most institutions.
>
> **Forward Traceability:** This requirement can be verified by ensuring that kiosks have a secure register for cash and a card reader for debit and credit cards.

REQ-10: Front desk kiosks need to be able to connect to the CLASS system in order to register new members and search for existing members.

> **Backward Traceability:** The current system uses the CLASS system to handle member accounts.
>
> **Forward Traceability:** This requirement can be verified by ensuring that kiosks have an active internet connection.

REQ-11: Users must sign a waiver against personal injury while using the facilities as part of the registration process.

> **Backward Traceability:** The waiver protects CARSA from liability if a member is injured while using the facilities.
>
> **Forward Traceability:** This requirement can be verified by ensuring that the account is not activated until the waiver has been signed.

REQ-12: Users must log on to gain access to CARSA systems.

> **Backward Traceability:** The current system has a login screen and requires an employee username and password. This prevents malicious use of CARSA systems and protects member privacy.
>
> **Forward Traceability:** This requirement can be verified by ensuring that there are no exploits by which a user could gain access to CARSA systems without valid login credentials.

REQ-13: The system must be able to search for members using any of the following parameters: first name, last name, student number or address.

> **Backward Traceability:** The current CARSA system includes support for searching with several different kinds of customer information. This is essential for retrieving membership information with limited data.
>
> **Forward Traceability:** This requirement can be verified by ensuring that the search field in the CLASS application accepts a first name, last name, address or UVic ID as search parameters.

2.6: Features

2.6.1 Improved Customer Experience

2.6.1.1 Description and Priority

The new system will be easy for customers to use and understand, but also considerably faster than the existing solution, resulting in shorter lineups. **Priority: High**

2.6.1.2 Requirements

REQ-CX-01: Information about CARSA memberships and passes should be available online.

Backward Traceability: Providing information about the available passes and memberships online helps customers decide what they will purchase before they come to CARSA, leading to a faster registration process.

Forward Traceability: This requirement can be verified by finding the information on the CARSA webpage.

REQ-CX-02: The system must meet UVic's accessibility standards[1].

Backward Traceability: As a UVic facility, CARSA must adhere to the university's accessibility guidelines.

Forward Traceability: This requirement can be verified by reviewing UVic's accessibility standards.

REQ-CX-03: The system must be active during CARSA's daily operational hours: 6:30AM - 11PM every day.

Backward Traceability: Any new system must not interfere with the regularly scheduled hours for CARSA

Forward Traceability: This requirement can be verified by checking staff numbers and availability against the work schedule.

REQ-CX-04: The system must be capable of handling customer inquiries at the front desk.

> **Backward Traceability:** The front desk is the only avenue for customers to get help from a human about CARSA facilities and services.
>
> **Forward Traceability:** This requirement can be verified by ensuring that there is a protocol in place for handling customer inquiries.

REQ-CX-05: The system must allow users to immediately (in less than one second) identify open kiosks.

> **Backward Traceability:** Making open kiosks obvious to customers reduces the time spent in line.
>
> **Forward Traceability:** This requirement can be verified by observing the visibility of the kiosks and clerks from the head of the line.

REQ-CX-06: The system needs to provide users with enough resources to assist them in choosing memberships. Resources are provided before and after the users reach the front desk.

> **Backward Traceability:** The current system provides users with some information of CARSA registration options. However, the users are not finding these information to be sufficient.
>
> **Forward Traceability:** This requirement can be verified by providing the users with registration information while they are at the front desk, and also allow the users to receive information before they reach the front desk.

REQ-CX-07: No customer should have to wait in line for more than 15 minutes.

> **Backward Traceability:** Long waits in line lead to a negative customer experience.
>
> **Forward Traceability:** This requirement can be verified by timing the progress of customers through the line.

REQ-CX-08: The system must be able to register a new customer within five minutes of their arrival at the front desk

Backward Traceability: Quick service is essential to customer satisfaction.

Forward Traceability: This requirement can be verified by recording registration times.

REQ-CX-09: The line for registration should never exceed 20 people

Backward Traceability: Large numbers of customers in line can have a deterring effect on new customers trying to sign up for membership.

Forward Traceability: This requirement can be verified by observing and recording line sizes

REQ-CX-10: There must be some form of line management.

Backward Traceability: Currently during rush times there are crowd control stanchions that are placed leading up to the front desk. These are necessary to manage the large influx of customers.

Forward Traceability: This requirement can be verified by checking if stanchions are placed in the lobby.

2.6.2 Easy Implementation

2.6.2.1 Description and Priority

Training existing staff to use the new system will be quick and any increases in operational cost will be small and largely limited to the first two weeks of semester. **Priority: Medium**

2.6.1.2 Requirements

REQ-IMP-01: The system needs to be implemented within the confines of the CARSA lobby.

Backward Traceability: There is no other feasible space in which to conduct registration.

Forward Traceability: This requirement can be verified by checking the CARSA lobby.

REQ-IMP-02: It must be possible to train existing employees to use the new system within 10 minutes.

> **Backward Traceability:** The system must not too complicated to easily explain to CARSA staff. Ideally a staff member could learn the new arrangement during their shift.
>
> **Forward Traceability:** This requirement can be verified when training CARSA staff in the new system.

REQ-IMP-03: Front desk staff must have an immediately available means of contacting support in the event of technical problems.

> **Backward Traceability:** The front desk is currently equipped with a phone that can be used to call UVic technical support services. This is essential for handling unexpected technical problems.
>
> **Forward Traceability:** This requirement can be verified by ensuring that there is a phone at the front desk and that front desk staff know the appropriate support number and procedures.

2.7: Other Requirements

REQ-MISC-01: The system must adhere to the BC Provincial Government's privacy laws[2]

Backward Traceability: In order to avoid legal and ethical risks, CARSA must strictly adhere to the BC Government's privacy laws.

Forward Traceability: This requirement must be verified by a BC provincial law expert.

REQ-MISC-02: The system must adhere to UVic's privacy guidelines[3]

Backward Traceability: As a UVic service, CARSA must adhere to UVic policy in matters of information privacy.

Forward Traceability: This requirement can be verified by referencing the UVic privacy guidelines.

REQ-MISC-03: Card payment options must be secured.

Backward Traceability: Secure card payments are essential to prevent any instances of identity theft or wire fraud from occurring at CARSA facilities.

Forward Traceability: This requirement can be verified by using only secured card readers and payment services.

REQ-MISC-04: There must be a contingency plan for technical failures in the computer system.

Backward Traceability: In the event of technical failure of computers at the CARSA facility, there should be a plan in place to handle registration requests and other inquiries.

Forward Traceability: This requirement can be verified by reviewing procedure documentation.

REQ-MISC-05: Front desk kiosks must be equipped with a UVic OneCard reader.

Backward Traceability: The existing kiosks are all equipped with OneCard readers to accelerate registration for UVic members.

Forward Traceability: This requirement can be verified by checking whether kiosks are equipped with OneCard readers.

REQ-MISC-06: Front desk kiosks must be able to print membership cards with photos for community members.

> **Backward Traceability:** Currently the front desk is equipped with a card printer and photo equipment for producing membership cards. This is essential for members who do not have a OneCard.
>
> **Forward Traceability:** This requirement can be verified by ensuring that the appropriate printing and photographic equipment is available at the front desk.

REQ-MISC-07: There must be a way for new members to sign the waiver on site.

> **Backward Traceability:** There is currently a special self service kiosk for UVic members at the front desk that allows them to sign the digital waiver. Physical waivers for community members are provided on site.
>
> **Forward Traceability:** This requirement can be verified by ensuring that there is a way for both UVic and community members to sign the waiver available in the lobby.

REQ-MISC-08: Front desk kiosks must have an internet connection.

> **Backward Traceability:** The kiosks rely on an internet connection to function, as it allows the use of card readers and is necessary for use of the CLASS system.
>
> **Forward Traceability:** This requirement can be verified by ensuring that kiosks have internet access.

Section 3: Solution

3.1 Design

3.1.1 Overview

In our analysis, we found that there were several inefficiencies in the existing registration process that could be remedied without relying on an expensive technical solution. This, combined with the fact that peak customer traffic is confined to the first two weeks of term, leading us to believe that a process based solution combined with increased staffing would be sufficient to solve the problem without an expensive technical solution.

3.1.2 Line Management

We decided to use airport crowd management systems as an inspiration in our design: when you enter an airport, everyone knows where they need to go, or where to find help. Currently, CARSA has no signage to provide essential information to prospective customers, and the line management is generally inadequate to handle the traffic in the first two weeks. There is only a single line of crowd control stanchions leading up to the front desk during the first two weeks of semester, this line quickly overflows since it is only long enough for approximately 5 people. With our new design, a maze of crowd control stanchions will be installed in the lobby in order to facilitate effective line management and reduce lobby overflow.

3.1.3 Reorganization and Staffing

Currently, there are 4 identical front desk kiosks in the lobby that handle all customer service functions, including registration, membership management, payments, refunds, information, and any other customer requests. This arrangement is sufficient during normal customer traffic, and can easily handle the number of incoming requests. Unfortunately, it leads to inefficiencies during peak traffic at the beginning of semester, where the line to purchase memberships is held up by customers who only want to ask questions about the memberships or view their account status. In addition, non-UVic members have a much longer registration process since they don't have a OneCard. As a result, they must provide their personal information to staff during registration and wait to have a membership card made. Finally, there is a waiver that is required to enter the gym, and the only place for UVic members to sign it is at a single dedicated kiosk next to the registration line, introducing a confusing backeddy to the process. These factors exacerbate the main problem, which is that four desks aren't able to handle the traffic. Our solution is to double the number of front desk kiosks during peak hours, and to assign specific desks to specific tasks. Six desks will be dedicated to processing customers who have a OneCard (UVic students, staff and faculty). Of these six, two will be placed across from the front desk, where there is currently a small waiting area. Another kiosk dedicated to processing customers who do not have a OneCard will be placed where the waiver signing station is currently located. Since the majority of traffic

during the first week of class is a result of new students, one desk should be enough to process community members and keep them from holding up the much longer UVic line with their longer registration process. The last new desk will be an information desk to the left of the lobby entrance. Currently there is a small eating area here, but during the first two weeks it will be dedicated to the information desk, which will field all customer inquiries and non-registration tasks. Waivers will primarily be signed at the front desk kiosks. For students who only want to use the facilities without purchasing a pass, waivers will also be available to sign at the information desk.

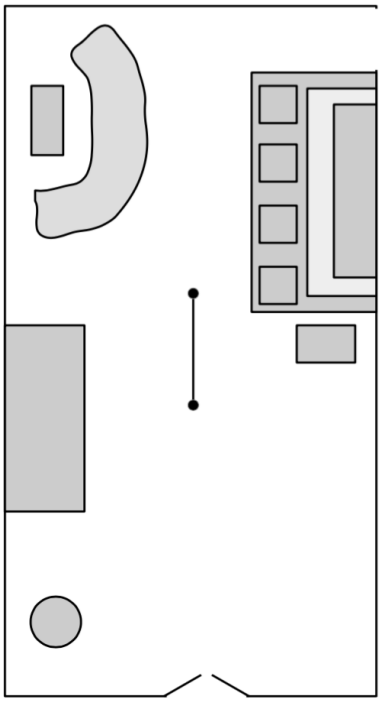


Fig. 1: The current lobby layout

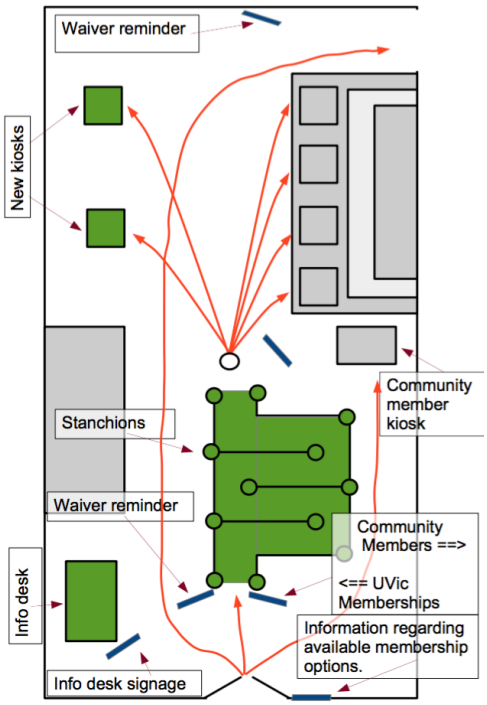


Fig. 2: The redesigned lobby layout

3.1.4 Signage

During our analysis it became apparent that many customers reach the front desk without any idea of the membership structure or which membership they want to purchase, tying up the front desk employees with requests for clarification. In the ideal scenario, all customers who reach the front desk should already know what they want, and we have attempted to make this ideal reality through improved signage. Currently, there are two places that customers can go to find information on the available memberships at CARSA: on the Vikes Rec website and on leaflets distributed by the front desk on request. There is no clearly visible information in the lobby for customers to reference when deciding which pass they want to buy. Worse yet, the current pricing chart is difficult to read, with no clear descriptions of the facilities included in each pass.

VIKES ALL IN PASS	4 Month	8 Month	12 Month	Works out to**
STUDENTS & ALUMNI				
Students (Ath & Rec Fee paid with tuition)	$175	$300	$320.15	$26.68
Students (Ath & Rec Fee *not* paid with tuition)	$255.50	$461	$481.15	$40.10
Alumni Association Members	$375	$750	$770.15	$64.18
STAFF & FACULTY				
Regular Continuing	$210	$420	$440.15	$36.68
Non Continuing	$375	$750	$770.15	$64.18
UVic Retirees	$210	$420	$440.15	$36.68
COMMUNITY				
Adult	$420	$840	$860.15	$71.68
Youth (Age 14-18)	$280	$560	$580.15	$48.35
Child (Age 6-13) *Does not include FWC*	$280	$560	$580.15	$48.35

VIKES FIT PASS*	4 Month	8 Month	12 Month	Works out to**
STUDENTS & ALUMNI				
Students (Ath & Rec Fee paid with tuition)	$100	$200	$220.15	$18.35
Students (Ath & Rec Fee *not* paid with tuition)	$180.50	$361	$381.15	$31.76
Alumni Association Members	$225	$450	$480.15	$39.18
STAFF & FACULTY				
Regular Continuing	$60	$120	$140.15	$11.68
Non Continuing	$225	$450	$470.15	$39.18
UVic Retirees	$100	$200	$220.15	$18.35
COMMUNITY				
Adult	$270	$540	$560.15	$46.68
Youth (Age 14-18)	$140	$280	$300.15	$25.01
Child (Age 6-13) *Does not include FWC*	$140	$280	$300.15	$25.01

*Peninsula Co-op Climbing Center NOT included
** The Vikes All In and Vikes Fit Pass cannot be purchased on a monthly basis. The Full 12 month fee is due upon purchase.

Please Note: In an effort to prevent unnecessary wear and tear on equipment and machines, all participants are asked to wear clean, athletic clothing while working out or participating in activities. Shirts must be worn in all activity areas

Fig. 3: the original pricing chart

We revised this chart to be more readable and informative for customers. Each pass now has a short description in the chart. We also changed the wording to clarify the athletics fee discount, and removed the confusing “works out to” column.

VIKES ATHLETICS PASS
Provides access to the athletics facilities (UVic Students only)

Free for UVic students who have paid their Athletics Fee with Tuition. Sign the waiver at the Info desk or online to gain access.

VIKES FIT PASS Provides access to the weight room and athletics facilities	4 Months	8 Months	12 Months
STUDENTS AND ALUMNI			
Students (Athletics Fee paid with tuition)	$100.00	$200.00	$220.15
Students (Athletics Fee not paid with tuition)	$180.50	$361.00	$381.15
Alumni Association Members	$225.00	$450.00	$480.15
STAFF & FACULTY			
Regular Continuing	$60.00	$120.00	$140.15
Non Continuing	$225.00	$450.00	$470.15
UVic Retirees	$100.00	$200.00	$220.15
COMMUNITY			
Adult	$270.00	$540.00	$560.15
Students (Age 14-18)	$140.00	$280.00	$300.15
Child (Age 6-13) *Does Not Include Weight Room*	$140.00	$280.00	$300.15

VIKES ALL IN PASS Provides access to the climbing wall, weight room and athletics facilities	4 Months	8 Months	12 Months
STUDENTS AND ALUMNI			
Students (Athletics Fee paid with tuition)	$175.00	$300.00	$320.15
Students (Athletics Fee not paid with tuition)	$255.50	$461.00	$481.15
Alumni Association Members	$375.00	$750.00	$770.15
STAFF & FACULTY			
Regular Continuing	$210.00	$420.00	$440.15
Non Continuing	$375.00	$750.00	$770.15
UVic Retirees	$210.00	$420.00	$440.15
COMMUNITY			
Adult	$420.00	$840.00	$860.15
Students (Age 14-18)	$280.00	$560.00	$580.15
Child (Age 6-13) *Does Not Include Weight Room*	$280.00	$560.00	$580.15

Fig. 4: the redesigned pricing chart

The intention is that this new chart will be on the front window of the lobby so that customers can decide on a membership before they enter the building. Another sign will be put up near the end of the line, allowing customers to read the pricing chart while they wait to reach the front desk.

There are three other signs that will be used to support the reorganization of the new, more complex lobby layout. One sign will direct customers to either the dedicated “UVic” line or the “Community” line based on whether or not they have a OneCard. Another sign near the front of the lines will direct any questions to the information desk, while a third sign placed near the front of the lobby and at the entrance to the facilities will ensure that customers have signed the waiver before they attempt to enter.

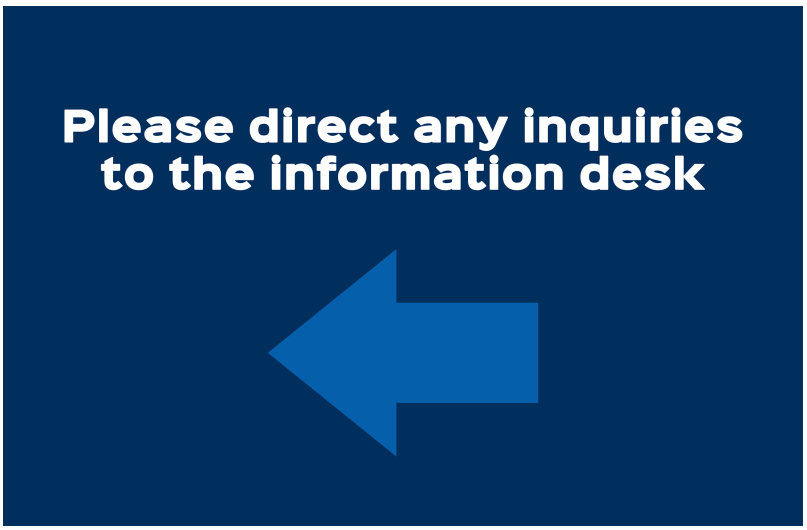


Fig. 5: The info desk sign

Fig. 6: The waiver sign

Fig. 7: The line direction sign

These changes to the structure and scale of the registration process should increase efficiency and keep registration lines short even in high traffic periods at the start of term while remaining inexpensive and easy to implement. Additionally, these measures will only be put in place at the start of semester. During the rest of the year, four kiosks will suffice to handle customers, and all the signs and stanchions can be put into storage (except for the pricing chart, which should be left out year round).

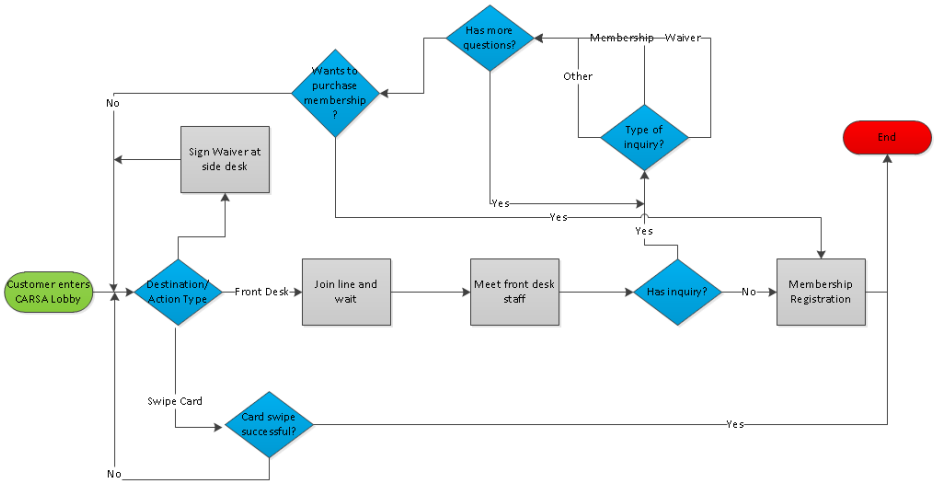


Fig 8: The original workflow

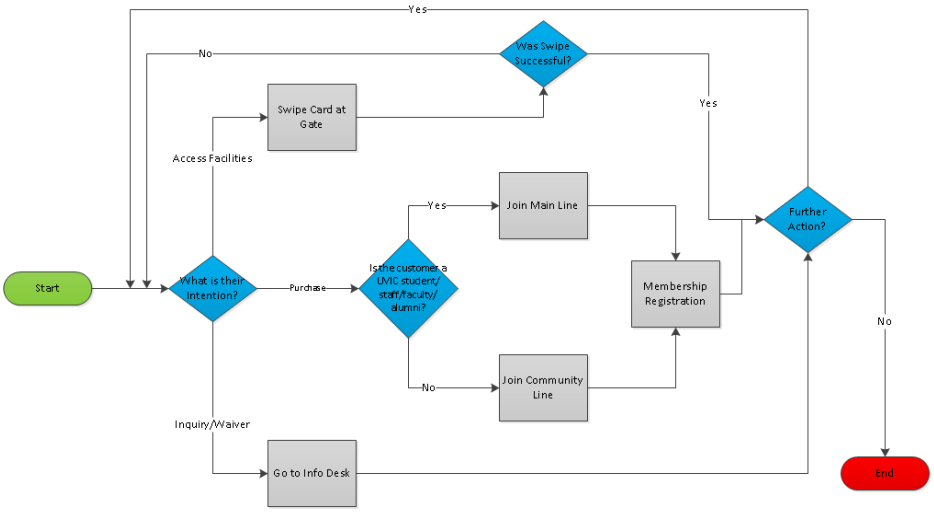


Fig 9: The redesigned workflow

Section 4: Conclusion and Recommendations

The biggest difficulty we encountered during this project stemmed from the dual nature of the project itself: these problems are complicated, and often require clarification from the client. Since teams are primarily marked on their work as analysts it can be challenging to get their time as clients. Additionally, since students only have a finite amount of time to investigate their problem, they may not have in-depth knowledge of the problem situation they are representing. It would have been preferable to either work on a solution our own client problem, or to have been assigned a problem with the professor or a TA as the clients, where they have explored the problem in-depth. This would allow the analyst team to elicit subtle requirements from clients rather than trying to work with requirements being made up on the spot by the client team. Another problem we faced was the pseudo-roleplay elements of the assignments. In the reports it was occasionally difficult to tell when we were supposed to be writing as students versus when we were supposed to be acting like our hypothetical analyst team. This confusion could be alleviated by simplifying the structure of the project or by providing more examples and criteria for each deliverable.

4.1 Recommendations for Future Students

- Make sure to establish a regular communication channel and expect all group members to be active on it. Our group used Slack, but a Facebook group could serve the same purpose.
- Create a shared calendar that reminds everyone on the team of impending due dates.
- Divide the work on each deliverable so that multiple sub-teams can work concurrently.
- Create a shared Google Drive folder to facilitate group creation and revision of deliverables.
- Establish a regular weekly meeting time for your group and make sure that everyone attends.
- At least one person in the group should take charge in the project and act as manager, but if you have multiple leadership oriented members, then don’t be afraid to share management responsibilities: this makes organizing sub-teams much easier.
- Everyone should take part in the editing process for deliverables.

Section 5: Member Contributions

5.1 Overview

Our group has maintained an active slack channel throughout the project for communication purposes, and a shared google drive folder for collaboration on project deliverables. We also established a regular weekly meeting in order to facilitate teamwork and ensure that deadlines were being met. All members regularly attended these meetings, where the direction of the project was decided and each deliverable was split into sub-tasks and divided among the group. As a result of our close co-operation and regular communication, we met every course deadline and achieved our objectives for the project: everyone did an outstanding job of completing their assigned tasks, and the workload was spread fairly among the group members.

Each group member's specific contributions are set out below in section 5.2.

5.2 Specific Contributions

Group Member	**Contribution**
Steve Chapman	Group presentation, domain modeling, document editing
Brian Chen	Document editing, process modeling, requirements gathering
David Gu	Document editing, process modeling, client management
Lora Liu	Requirement gathering, document editing, domain modeling
Graeme Nathan	Group presentation, use case modeling and specifications, graphical design
Jing Qi	Report writing, requirements gathering
Ian Sutton	Graphical design, project management, document editing, client management
Bernie Wang	Group presentation preparation, domain modeling, document editing

Appendix

A1: Glossary

CARSA: Center for Athletics, Recreation, and Special Abilities

CRSE: CARSA Registration System Enhancement

COTS: Commercial Off-the-Shelf

UVic Member: A CARSA member who also has a UVic account/OneCard.

Community Member: A CARSA member who has no UVic account/OneCard.

Membership: The information stored by the CARSA systems about a member. This information includes the member's name, address, current pass, and expiry information.

Basic Pass: A membership type that provides access to the sports facilities of the gym, but not the weight room or the climbing wall.

Fit Pass: A membership type that provides all the benefits of the Basic Pass, as well as access to the weight room.

All-In Pass: A membership type that provides all the benefits of the Basic and Fit Pass as well as access to the climbing wall.

Secondary Pass: Any short term (less than a month) pass that is not covered by the Basic, Fit, or All-In pass categories. This category includes day passes, month long passes, guest passes and McKinnon Gym passes.

Front Desk Kiosk: a desk with an internet connected computer and all the associated equipment required for registering new customers.

A2: Requirements Elicitation Notes

These are brief notes taken from our first requirements elicitation on October 1st, 2015. The topics discussed are as follows:

Front End Management

- **When is the front desk encountering problems with the number of new customers?**
    - *The problem is localized to the first 2 weeks of the semester*
- **Do you have enough people working the front desk?**
    - *There are not enough tills for the amount of people trying to register during peak hours*
- **How many tills do you have?**
    - *There are three registration tills with computers and card readers, and one kiosk for use by customers when signing the waiver to use the weight room*
- **Can people from outside UVic use the facilities?**
    - *There are 2 classes of customer: UVic members and Community members*
        - *UVic members includes staff and students, whose personal information is gathered by swiping their OneCard*
        - *Community members are people from the area, and have to provide information and have their photo taken as part of registration process*
            - *Community members take longer to register and receive a different type of card*
- **How would you characterize the staff?**
    - *The staff this season were new hires, and that is likely to be a recurring problem since the CARSA staff are hired from among UVic students.*
    - *The manager's office is in the back of the complex, only accessible from a side entrance and completely separate from employee operations.*
- **Do the front desk staff perform any functions other than registration of new members?**
    - *All customer facing tasks are done by the front desk staff, including new member registration, replacement of lost or destroyed cards, informational services, payments for short term passes and other miscellaneous activities.*
- **What is the most common request for the front desk**
    - *Registration for the weight room or climbing wall*

Systems

- **What system does CARSA use to track memberships?**
    - *CARSA uses the CLASS system, a COTS software system that is used by local recreation centers*
    - *Though CARSA uses the same CLASS system as other Victoria recreation centers, there is no cross-membership between CARSA and others*
- **What technical modifications will you accept as part of the scope?**
    - *The CLASS system can't be modified since it isn't owned by UVic*
    - *UVic systems such as MyPage or the CARSA site can be modified*
    - *A non-technical solution is preferred*
- **Are there any problems with the CLASS system?**
    - *The employees have no complaints about the performance of the CLASS system*
- **Is there any way to pay for access to the weight room online?**
    - *No, but there are online payment options for certain courses at CARSA, like yoga.*
- **Is there any interaction between UVic's systems and the CLASS system?**
    - Yes, the CLASS system will not allow a member access to the gym until they have signed a waiver on the UVic site

Process

- **Do new members usually know what membership they want to purchase when they arrive at CARSA?**
    - *New customers usually need to ask the front desk workers for information before registering for a membership*
        - *website fails to inform prospective members of the details of services that are offered*
- **What are the steps involved in registering for a membership?**
    - *First the new member comes up to the front desk and provides their information*
        - *UVic students and faculty provide their OneCard*
        - *Community members must fill out detailed information and have their picture taken*
    - *The new member will select a membership*
        - *The default Recreation membership includes access to Athletics and Recreation facilities, and is usually covered by the Athletics and Recreation tuition fee payment*
        - *The 'Vikes Fit Pass' includes all the features of the Recreation membership, as well as access to the weight room*
        - *The 'Vikes All In Pass' includes all the features of the Vikes Fit Pass, as well as access to the Peninsula Co-op Climbing Center.*
    - *Next, if applicable, the new member pays at the till with cash, credit or debit card*
    - *Finally, the newly registered member must sign a waiver before they can gain access to any part of the gym.*
        - *This waiver can be signed online or at a kiosk at the front desk*