SENG 471 Assignment 3: Modelling Requirements Specification

For

CADA Software System

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1 Executive Summary

1.1 Overview

The Canadian Automobile Dealers Association (CADA) is the national association for franchised automobile and truck dealerships selling new cars. CADA has over 3000 nation-wide dealers and are a key contributor to Canada's economy. To better serve their clients, CADA would like to launch a software project enabling clients to visualize the interior and exterior colours of the vehicle they will potentially purchase.

1.2 Information Gathering

The current focus is meeting the mentioned short term goal, while enabling the system to be updated to meet long term goals. To identify requirements of the system and understand the features of the system, interviews are conducted. Questions are prepared in advance to maximize the extraction of information from each of the interviews with key stakeholders. Interview questions are tailored to the stakeholder depending on their project involvement.

1.3 Design and Modelling

After sufficient information is gathered, the design process involves modelling system objects and their relationships to one another. Flow of data within the system is modelled to understand what information is necessary with regards to the system and its stakeholders. Diagrams regarding business processes are also used as well as several other models to identify all key features, interactions, and properties of the system.

2 Introduction

CADA is an automobile dealers association that was established in 1941. The organization experienced consistent growth between 1941 and 1990; the scope of the organization grew after the second world war. The goal of the federation is to address issues affecting the well-being of automobile dealers in Canada, including issues regarding public, government, and industry relations, as well as member services, and legal conflicts. Dealers operate under a code of ethics which emphasizes the following qualities: integrity, competence, and accountability.

3 Interview Methodology

3.1 Interview Methodology

Interviews were conducted in an algorithmic manner. Questions were prepared in advance (usually one or two days prior to the interviews), since it is impossible to identify the exact role of the stakeholder, a large pool of interview questions was produced prior to the first interview. The question bank was tailored to fit any possible stakeholder that the team would meet. Questions for managers, clients, developers, salespeople were prepared. Each set of questions for a given stakeholder was within the respective stakeholder's domain of knowledge. After each interview, questions that were answered were removed, and additional questions were added depending on the information needed to model the requirements. If the team was notified that there was no stakeholder that would be interviewed, then the respective set of questions for the stakeholder were adjusted and moved under another relevant stakeholder.

3.2 Interview Strategy

Two types of stakeholders were interviewed, developers, and CADA sales team members. To obtain a significant amount of information regarding the system, each interview was started using the same question: "Please describe a use case involving the system.". Some individuals gaev a use case from the client's point of view, others from a sales representative's point of view. The initial questions allow a significant amount of information to be extracted. After the initial question regarding the use case, tailored questions were asked. Questions regarding design, features, or implementation of the system used during interviews with developers, while questions regarding security, data storage and accessibility were used during interviews with CADA sales team members. If all questions of a given stakeholder set were answered, questions from other stakeholder sets were used, or additional unprepared questions were used. All interview Questions are included in the "**Appendix A: Interview Questions**" section.

3.3 Analysis

Based on the information gathered, a short team meeting was conducted upon interview conclusion to discuss the significance of all information gathered. The type of information heavily influenced the model diagram later produced.

4 Lessons and Difficulties

Throughout the modelling process multiple lessons were learned. After conducting numerous interviews, it became evident that it is very difficult to prepare specific questions. To overcome this difficulty, the team took a more general approach regarding the interview questions. More general questions regarding use cases were used to extract more information. After each interview, questions were tailored to fit any upcoming interviews (questions remained static in the past). During analysis, some key information was missing, in which case the team decided on some assumptions while still including any identified requirements to produce a complete representation of the system.

During the research of the SRS IEEE standard there were many teaching opportunities. Relevant lessons came about in many different areas. Firstly in Section 8.5.2 we noticed how many different sections of requirements there were. This led us to branch out our questioning and elicit information which would go on to describe the sections required by the standard. This meant that our questioning would be able to cover those sections completely. Next within the same section is where we really started thinking about different types of users for the system, which as the standard describes, is user classification. Within this construct we were able to develop a UML Use Case Diagram and show how each of the potential users may interact with the system. Similarly in section 9.5.2 the purpose was brought up. For our system we were assigned in this assignment, we were somewhat unsure what all it was required to perform. After investigating the purpose we were able to clarify the softwares intent. This was demonstrated in the UML Activity Diagram which was prepared. By limiting the purpose, it was much easier to formulate an exact specifications list, rather than allowing the software to be able to “do everything”. Next came two very important related sections, sections 9.5.5 and 9.5.6. These sections were the main areas of interest in our elicitation with the CADA and Software Company employees. The information collected in this stage would set the stage to provide a response to both the functional and usability requirements. Again during the further sections 9.6.13 and 9.6.14 there were more particulars about the usability and performance of the system. As such we were able to elicit some specifications for which we could measure results. This led to further more focused questioning, and valuable information.

5 Appendix A: Interview Questions

General Questions

1. Is it prefered to use a touchscreen or keyboard and mouse?
2. What user data will be required?
3. Security concerns over user data (how will security be handled)?
4. Is this meant to be used at home, at the dealership, or both?
5. Which platforms is the software meant for?
6. What do you think is wrong with the standard brochure?
7. Do you know what VR is? *******
8. Would you find VR more interactive? ******
9. Would that make your buying experience better?

For the salesman

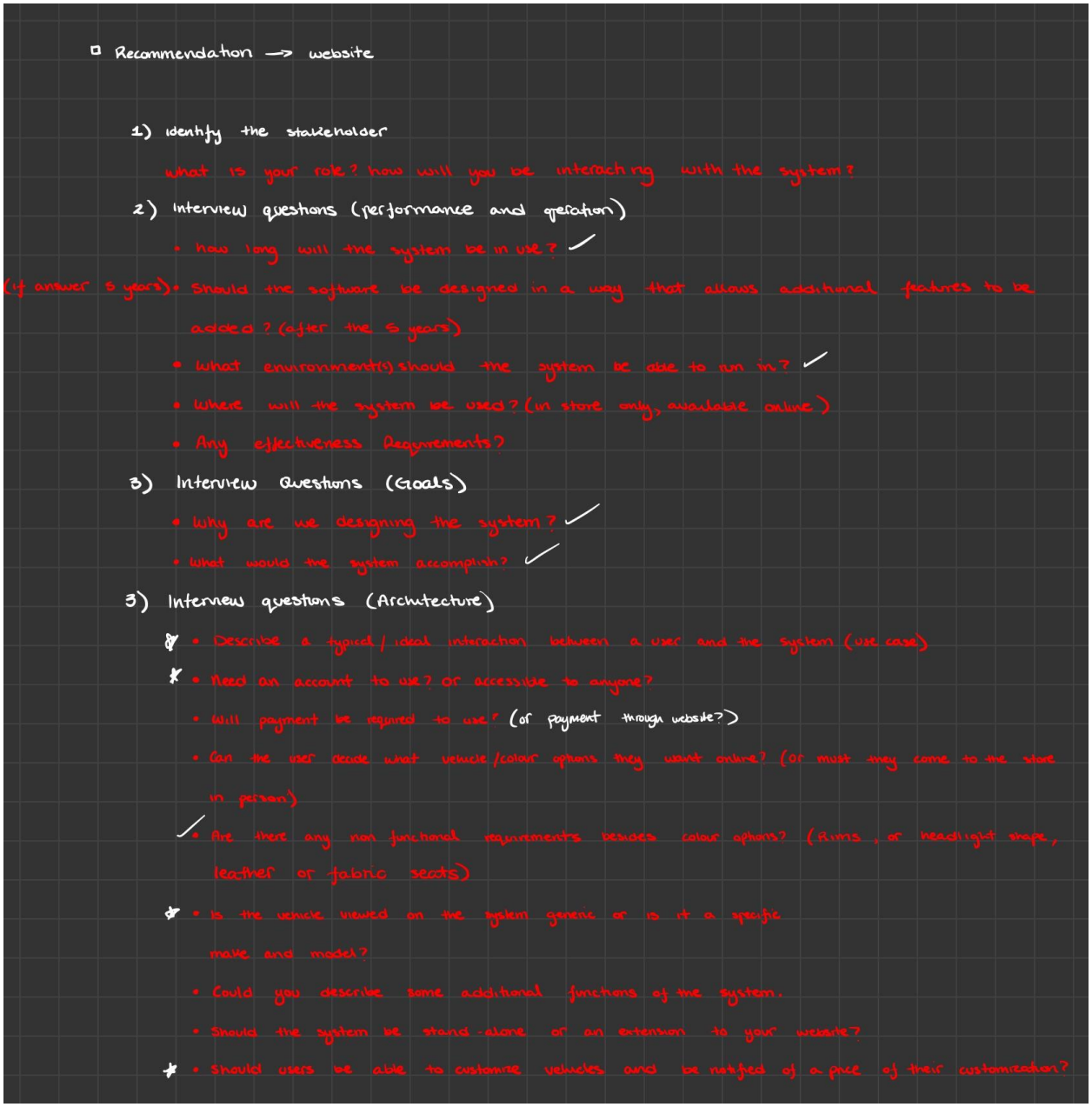
1. What kind of control would you like over the app? (use case)
2. What functions do you wish the app would have?
3. What are your concerns with the original brochure approach?
4. Would you be open to the app being available from home?
5. What type of interaction would you like with the app if so?
6. What are the best views of the car interior/exterior that you want included?
7. Would you be open to learning a little about VR in order to facilitate the buying experience for the customer?
8. Do you feel this would make their choice / your duties easier?
9. Are there any features that you think must be included (i.e. zoom, 360 view, …)?
10. Are there customers who require accessibility options? What are they?
11. What do you feel is appropriate for personal data collection in terms of the customer?
12. Describe a typical use case from the salesman's point of view.
13. What information should be accessible from the system? (mentioned 4 pieces of info at a time from previous interview)
14. Is texture an issue? Is seeing the colors enough?
15. Is there any timing requirements for the payment / login / viewing parts of the app?
16. How should payment be handled in the system (what are they paying for)?
17. Web based/stand alone????

For the management

1. What are metrics which you would like the software to meet in order to be deemed successful?
2. How much training time are you willing to alot to the integration of the new software?
3. What are your concerns with the collection of client information during use of the program?
4. Performance requirements?

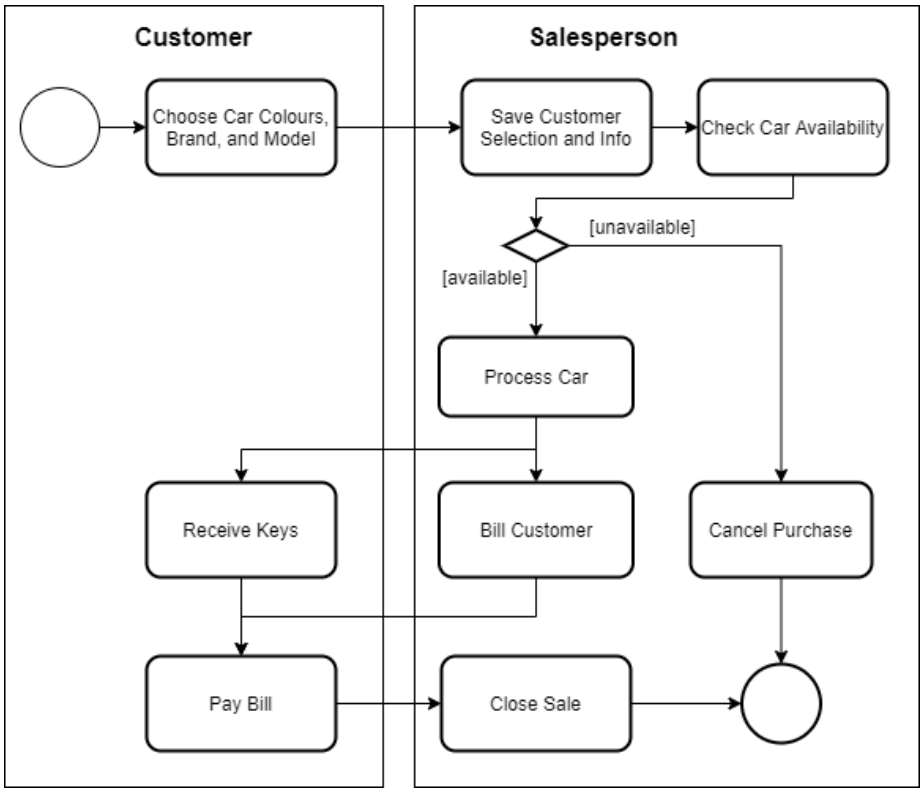
Software Dev Questions

1. What platforms will the software be designed for?
2. Will the software be exclusively for viewing or can the user purchase through it?
3. Will the user have an account for saving colours or viewing their history?
4. Do you think that an account needs to be attached to the app?
5. Could you talk about the architecture that will be used for this app?
6. What existing systems do you have in place and how will the systems be incorporated in the new application?



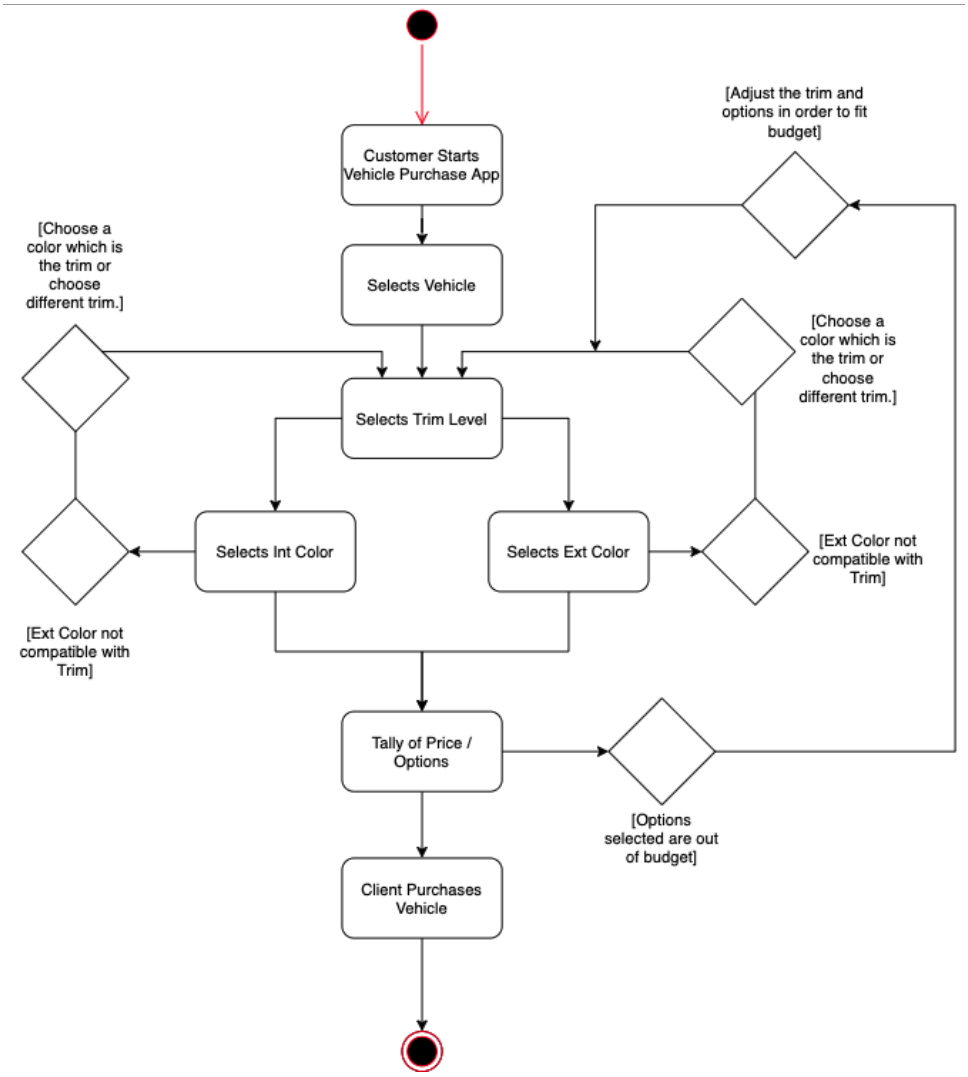
(Figure 1a)

6 Appendix B: Business Process Models



(Figure 2a: BPMN Diagram)

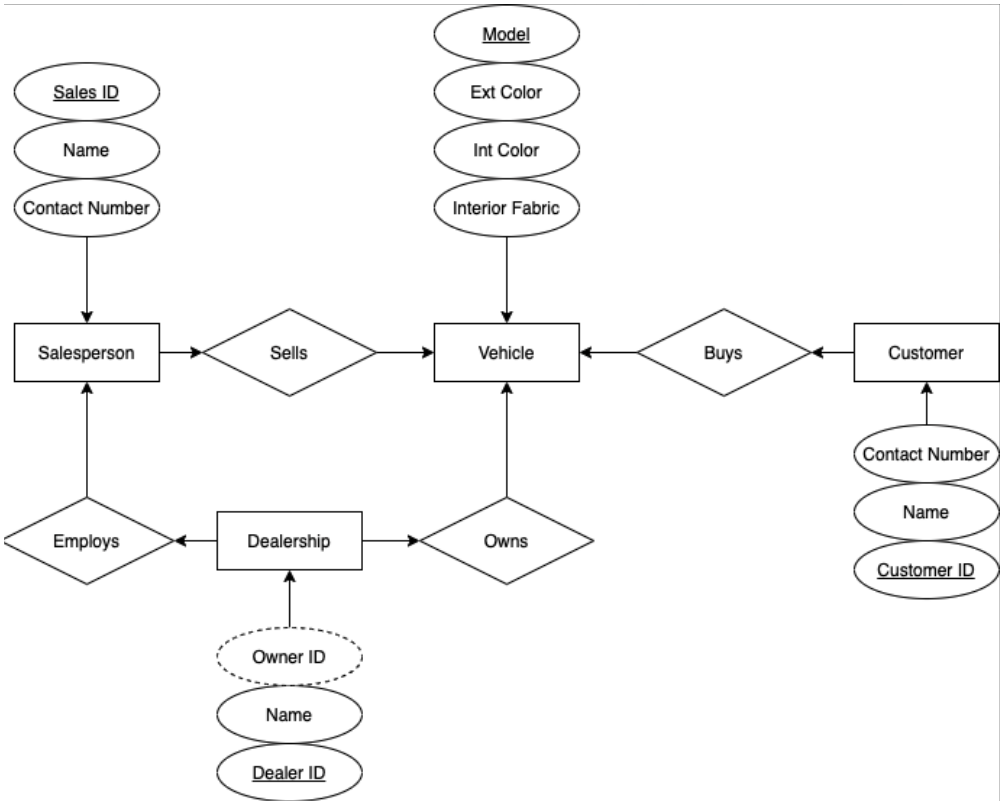
Figure 2a shows an overview of the sales process with a customer. Most of the diagram shows the process outside of the designed application to get familiarity of how it will be used. The customer will be using the application to do the first step of customizing the car they would like to purchase which will provide the salesperson with a lesser workload.



(Figure 2b: UML Activity Diagram)

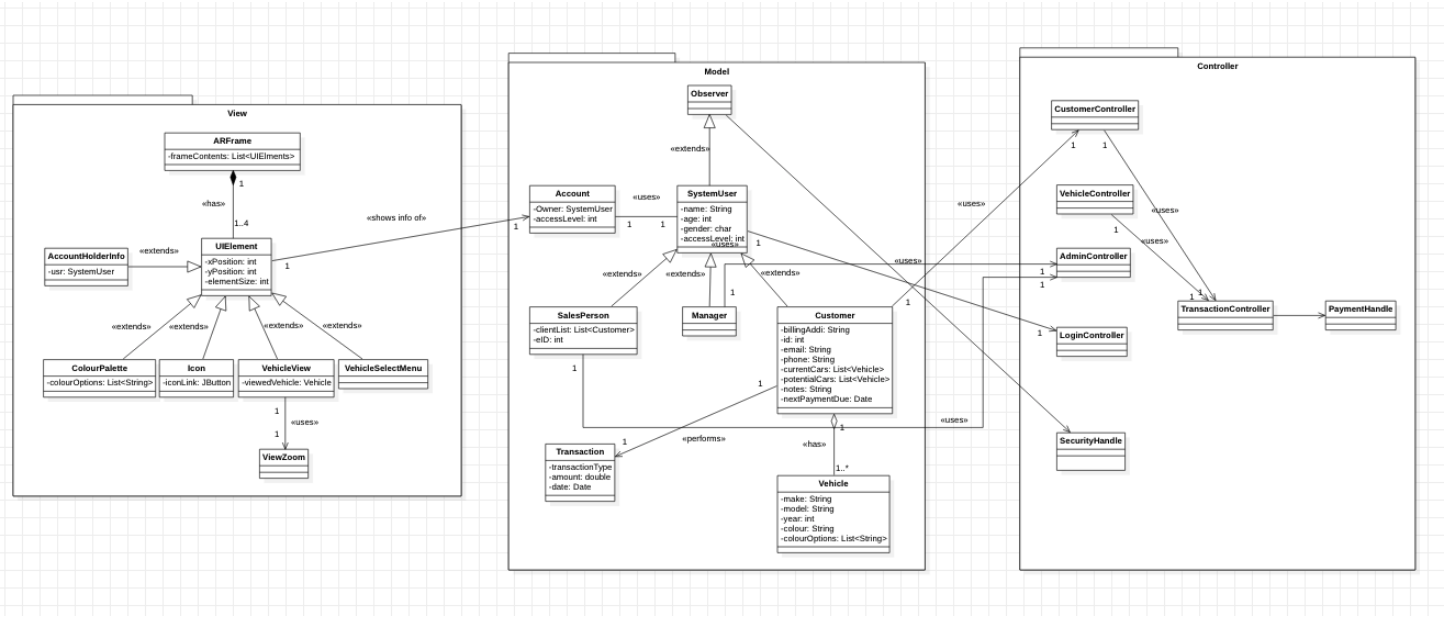
In figure 2b there is a UML Activity Diagram, which shows the main possible “problems” which may arise. The first is that the exterior color is not compatible with the interior color or the trim. This problem is similar to what occurs for trim choice and interior color choice. Secondly, it shows that the customers choices may reflect a price point which is too high for their budget. As such the diagram shows how to correct for this type of obstacle. This will be the basis of recovering a sale rather than the customer saying “no” to a vehicle purcs

7 Appendix C: Entity Relationship Models



(Figure 3a: ER Diagram)

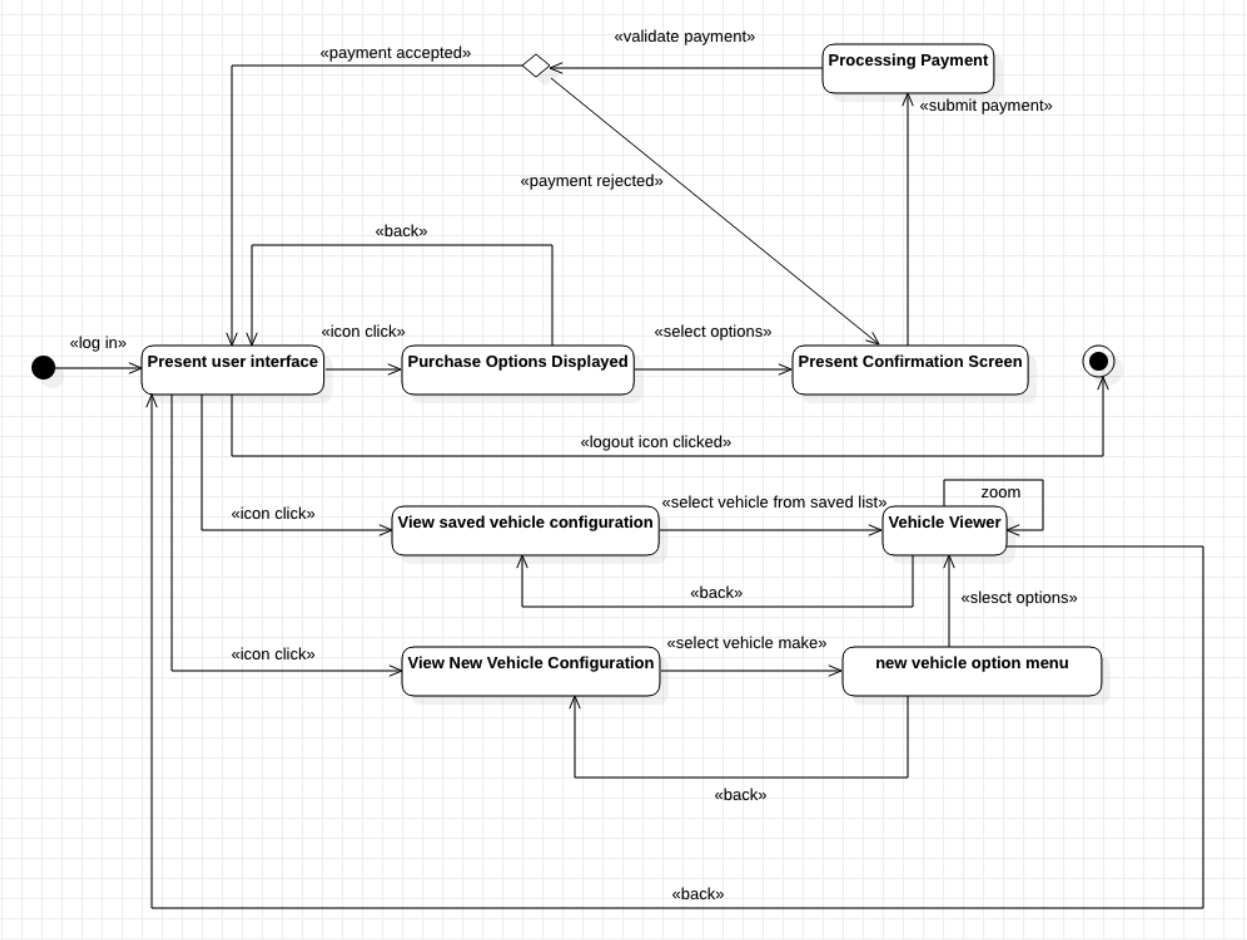
Figure 3a shows a basic ER diagram for the possible implementation of the software's sale system. In it there is a naturally shared link around the vehicle, with which each of the other entities has a relationship. Each class has its own primary key, and the dealership has an attribute Owner ID which is a foreign key belonging to the salesperson Sales ID. Otherwise the system is simple therefore it has a very basic structure.



(Figure 3b: UML Class Diagram)

The architecture chosen follows a model-view-controller format. Each module is responsible for specific functionalities of the system. The model package involves all business logic and backend functionality unrelated to data management). The view package is responsible for the gui of the system. The controller handles database queries for sending and receiving data. The controller package also involves several other helper classes to follow the single responsibility principle.

8 Appendix D: Behavioural Modelling



(Figure 4a: UML State Chart)

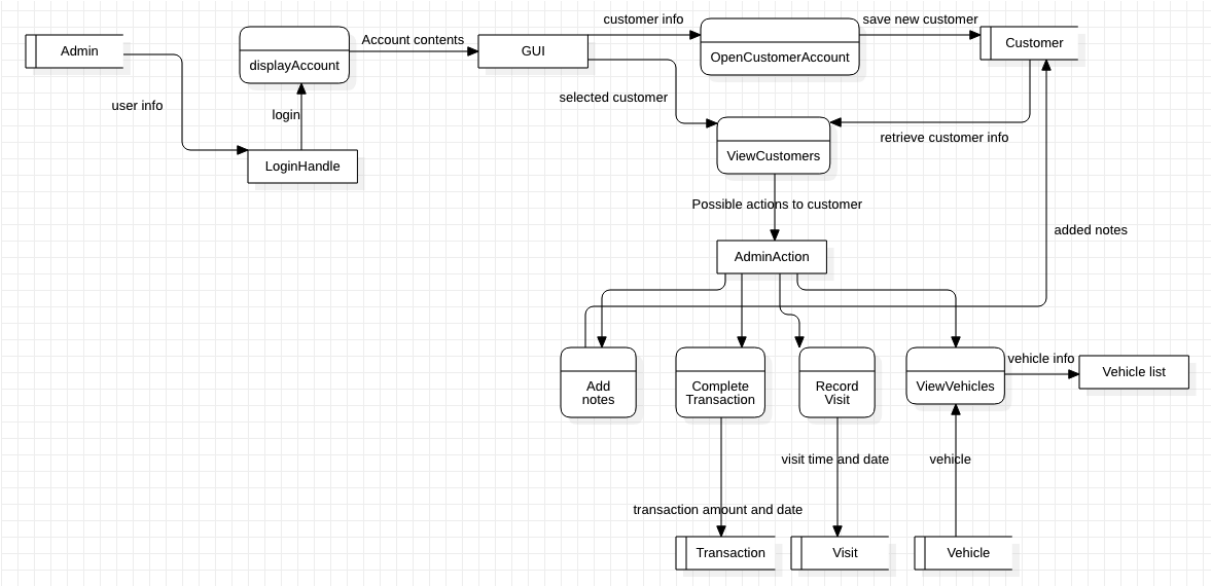
The state diagram shown in figure 4a describes some of the high level states and events of the system. Generally a state transition is triggered by some form of click event using icons (which relate to their specific functionality).

Current Mode	Event	New Mode
Present User Interface	Click purchase icon Click saved icon Click new icon	Purchase Options Displayed View Saved Vehicle Config View new Vehicle Config
Purchase Options Displayed	Select payment options	Present Confirmation Screen
Present Confirmation Screen	Submit payment	Processing Payment
Processing Payment	Payment accepted Payment rejected	Present User Interface Present Confirmation Screen
View Saved Vehicle Config	Select vehicle	Vehicle Viewer
View new Vehicle Config	Select new vehicle	New vehicle options menu
Vehicle Viewer	Zoom in Zoom out Back click	Vehicle Viewer Vehicle Viewer View Saved Vehicle Config
New vehicle options menu	Select vehicle options Back click	Vehicle Viewer View new Vehicle Config

(Figure 4b: SCR Mode Transition Table)

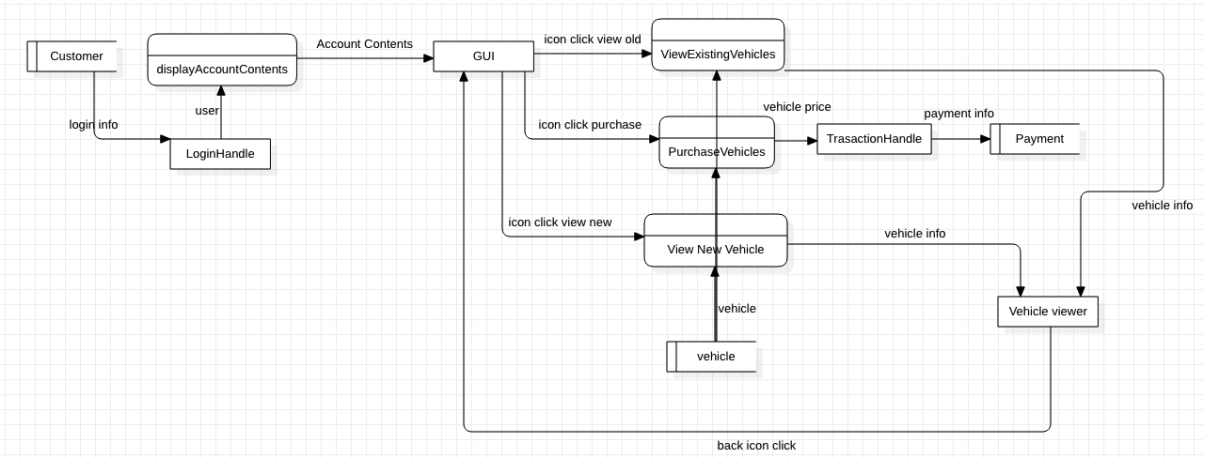
The purpose of the mode transition table is to associate states with their next state using events. At any given state, an event can occur causing a state transition. The next state of the system is entirely dependent on the event that occurred during the system in the previous state.

9 Appendix E: Architecture and Functionality



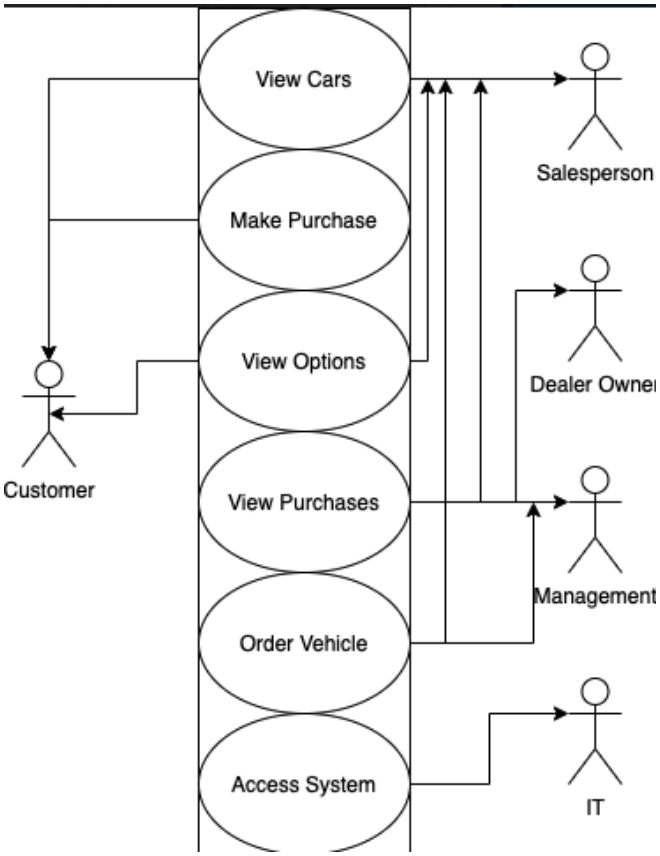
(Figure 5a: Admin DFD Diagram)

Figure 5a describes the flow of data from the point of view of a salesperson or manager using the system. A simple scenario could be: the admin logs into their account. The admin is presented with a friendly user interface. The admin chooses to view their customer list. The system must retrieve the customer info associated with the specific salesperson. Once the admin selects a customer, the admin chooses to view the customer's vehicle list. The system retrieves the vehicle list associated with the selected customer and the admin can view the customer's vehicle history.



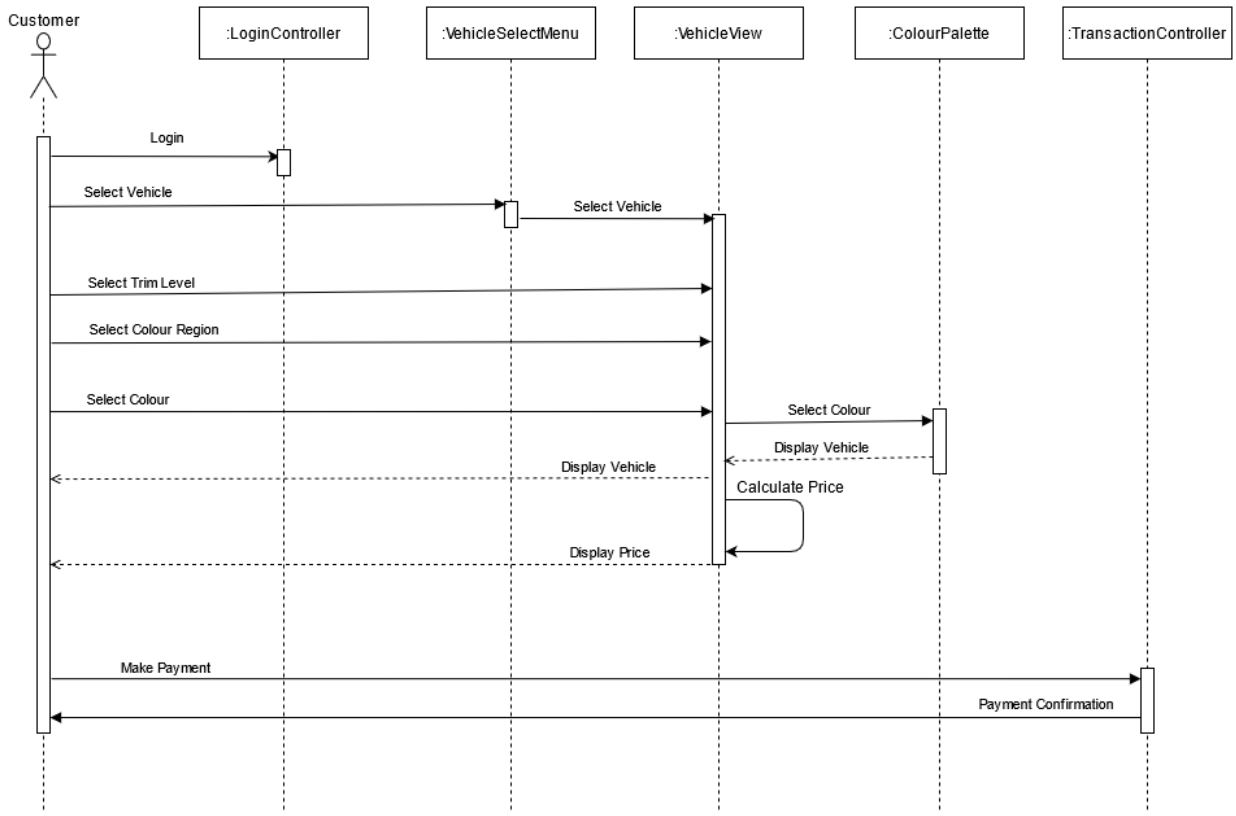
(Figure 5b: Customer DFD Diagram)

Figure 5b describes the flow of data from the point of view of a customer using the system. A simple scenario could be: the customer logs into their account. The customer is presented with a friendly user interface. The customer chooses to view favorited vehicle configurations, the system sends a request to the data store and retrieves the data vehicles associated with that customer. The customer can then select a vehicle to view and the vehicle is sent to the vehicle viewer external object for viewing.



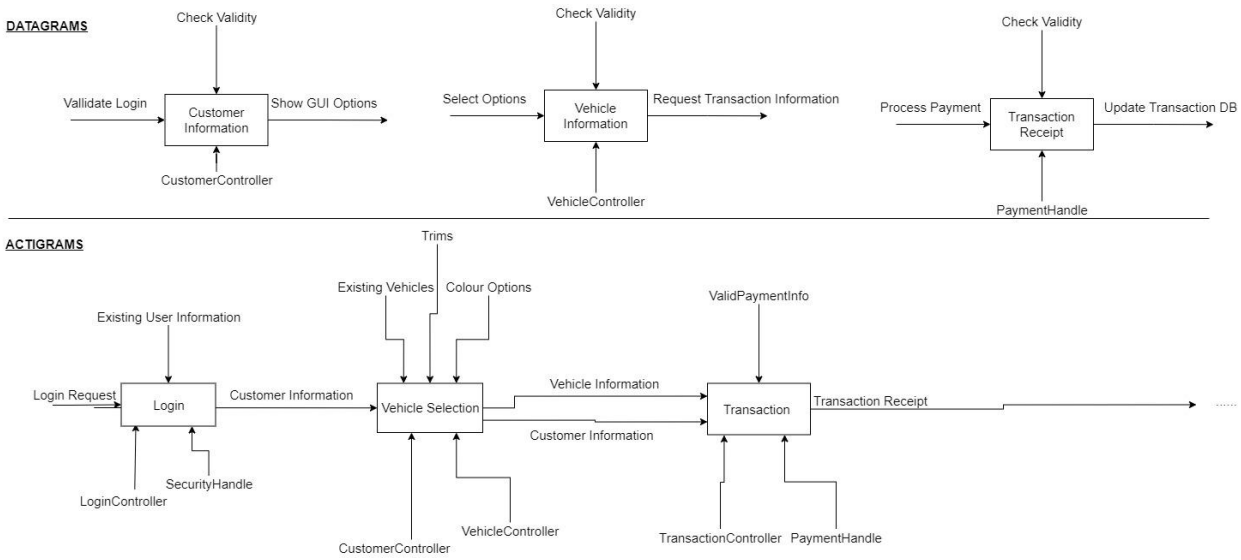
(Figure 5c: UML Use Case Diagram)

The UML Use Case Diagram is a method to show the typical user interaction with the overall system. In our case, our main user is the customer which we placed on the left to show the importance. Each user class is shown with it's actions and relationship to the system, which appear in the middle. Although there is some overlap each class is distinct.

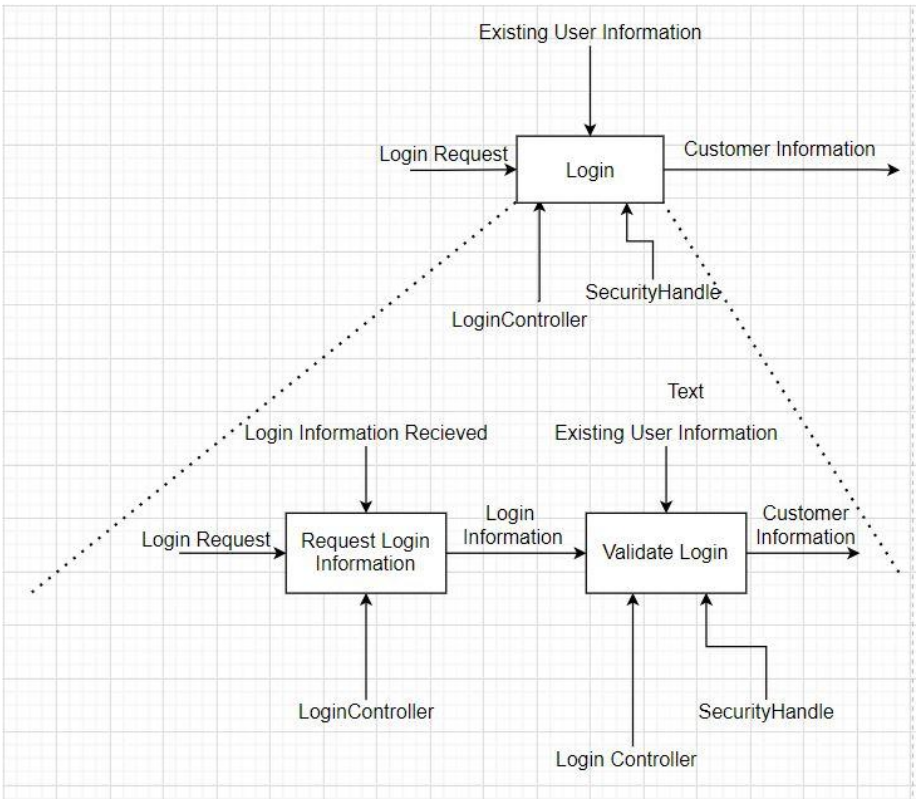


(Figure 5d: UML Sequence Diagram)

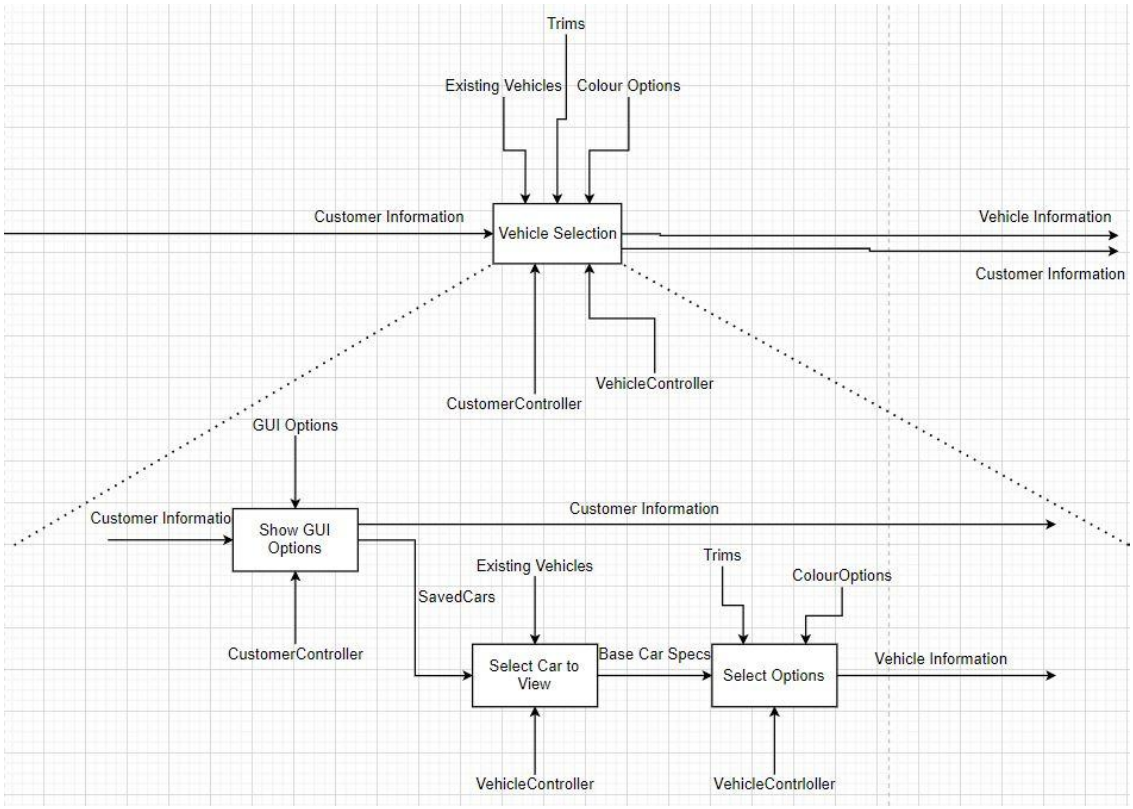
The UML Sequence Diagram shows the sequence of interactions in the system for a use case scenario. The above diagram shows the use case of a customer selecting a vehicle and purchasing it. The user is displayed on the left of the diagram, and the entities that are being used in the system are listed to the right of the user with the interactions in the use case between each entity.



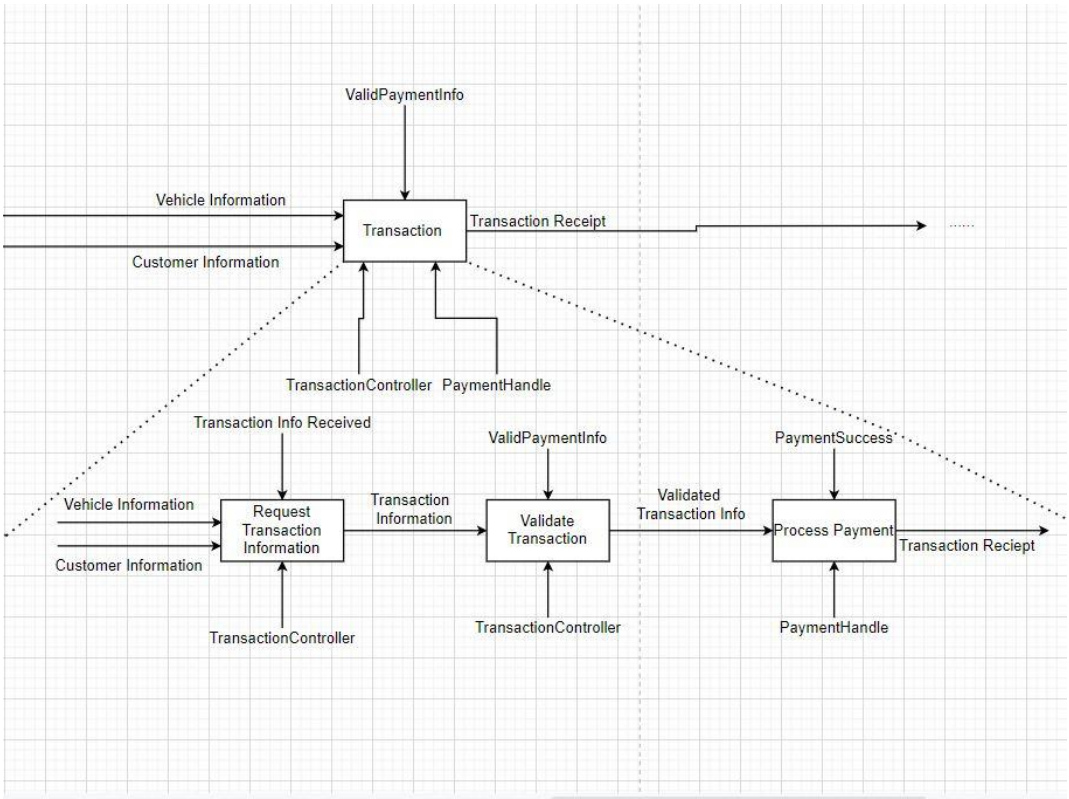
(Figure 5e: SADT Diagram)



(Figure 5f: SADT Login Sub-Diagram)



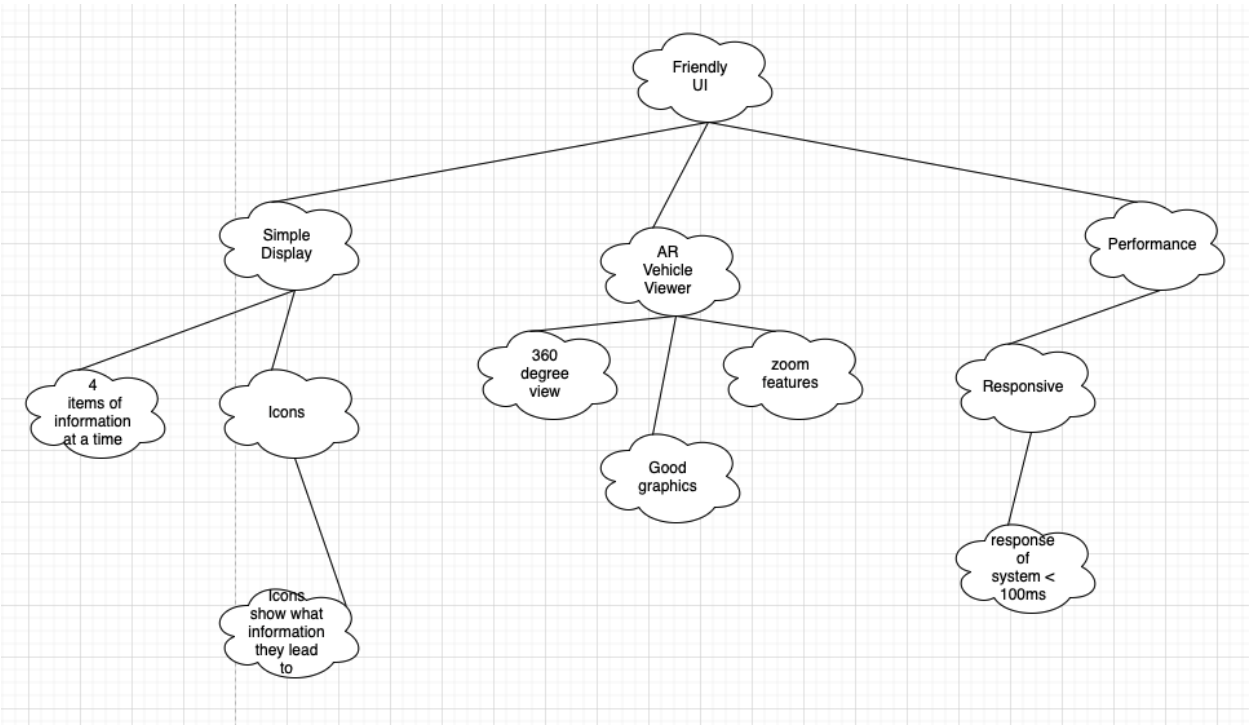
(Figure 5g: SADT Vehicle Selection Sub-Diagram)



(Figure 5h: SADT Transaction Sub-Diagram)

Figures 5e, 5g, 5g, and 5h are part of the SADT representation of the system where the customer begins using the app, selects a vehicle, and decides to purchase the vehicle.
The above SADT diagram ensures that a flow of data is associated with activities and that data is used by an activity, as is standard for SADT diagrams. The diagram depicts a hierarchical view of a certain case, with each sublayer expanding on the depth of the previous layer.

10 Appendix F: Goal Modelling



(Figure 6a: Goal Model Diagram)

The above figure shows the updated stakeholder goals of the system after new relevant information is gathered. Figures found in appendix B can give additional information into the stakeholder goals and organizational dependencies.

11 Appendix G: Logged Interview Notes

Interview 1 (Naomi, Senior sales person at the dealership)

William's Notes:

- Senior salesperson at a dealership, using system to help sell cars
- Keeps track of customer name, age, gender, billing address, contact info, id that is generated by dealership, existing car if known, model, brand year colour, cars they are looking at, brand model year, colour,
- Keeps track of financing and payments
- Which salesperson is dealing with customer, auto-generated 10 digit id numbers to keep track of sales person
- No notes on customer accessibility location
- Sales associates are logged in on their account and the customer does not have to make an account to use the system at that point. Senior management creates records of customers
- Salesperson who is dealing with customer should have good access to the customer's info, limited access so no changing info, only adding
- Specific customers are connected to specific salesperson
- Information is gathered when customer begins using dealership
- Everything in system should be reasonably accessible, basic customer info,
- Should be used on desktop or tablet, having ability to use tablet is nice
- Each car only has 2 colour areas, 5 exterior 3 interior, 1 changed every year
- Looking to expand system in future to include functional features
- Keep system open to updating in the future
- Just wants system to keep track of info, and to let customer keep track of what they want the car to look like
- Ability to keep notes on customer visit

Youssef's Notes:

- Keep track of customer info
- Help customer choose interior exterior colour
- 360 degree view
- Keep track of customer name, age, gender, billing address, phone, email, auto generated 20 digit id,
- Keep track of current car and details
- Keep track of cars viewed model, year colour
- Car prices discounts and why they get them
- Method of financing
- Customer visit history
- Which sales person is dealing with the customer
- Keep track of sales person (10 digit id)
- Accounts along with customer info

- Easy for customer to use
- Maybe admin and user accounts
- Account creation should come from the company side (maybe they give account info)
- Ability to modify accounts
- Admin constrained access unless customer need to be taken over
- Salesperson - customer relationship
- Info gathering starts when the customer starts interacting with them
- Easy navigation
- Automobile history/overview
- Desktop and tablet (not too picky) tablet very convenient
- 5 exterior 3 interior and can be changed to follow
- Possible expansion in the future
- System should be expandable
- Maybe keep track of visit notes

Interview 2 (Ali, Software UI Designer) Monday 1:35 - 1:45

Jacob's Notes:

- Help design system to make it easy to use
- Has some functional and non function requirements for users
- Graphic Display with colour palettes
- Paint selected colour on to interior or exterior of automobile
- Displays specific car model
- Visual display of interior AND exterior
    - Combine this in a way as if the customer was standing next to the actual automobile
- Unsure about platforms
- Doesn't know about forms or payment methods
- Graphically, "do better than what you can already find on the internet"
- Use bold fonts to attract user attention (limit use of this)
- Only show 4 items of information, find additional information on other pages
- If using icons, relate them to functionalities
- Record selected customer into customer record

Harrison's notes:

- Graphic displays of colour palettes
- Paint automobile models using colour palettes
- Displays specific automobile model
- Shows interior and exterior view in one view (3d or VR maybe)
- Must ask CADA stakeholders about platform
- Intuitive interface to replace old interface to improve upon bad interface

- Features such as zoom functions to improve UI
- 3D walkaround of vehicle would be good
- Non Function req: Display no more than 4 items of info on each page to minimize load
- Use points but not too many, make it simple
- Make graphic interface simple, with only necessary information, must ask CADA stakeholder for what qualifies as necessary information
- Options to get more information maybe if wanted
- Use icons to link information so to not add clutter to screen
- Icons to reflect info that will be linked to, icons should be related to their functionalities
- Record selected colour and specs of car into customer history

Jeff's Notes:

- User Interface / Accessibility Expert
- GUI of color palettes
- Specific model will be displayed
- Display no more than 4 items in any one view
- Small bullet points
- Minimal text
- Icon based
- Touch based interface is up to us

Interview 3 (Nusrat, Software UI/UX Designer) Tuesday 12:10 - 12:20

Youssef's notes:

- Role: domain expert UI again
- Using graphical colour palettes,
- Customer chooses colour for specific model
- Displays interior and exterior at the same time
- Scale and first person views of the interior exterior
- Icons or text for quick links to other features
- Icons relevant to information of that icon
- Important information on screen but not too much at a time
- A customer will finalize colours and these choices will be logged in the database
- Front end, backend, and database retrievals should have a performance of at least 100ms (efficient database retrievals)
- 5 records
- Icons no specification
- Web based or standalone need to find out

Harrison's notes:

- Graphically represent the vehicles after selecting colours
- View of both interior and exterior required

- See all possible views/angles
- Icons used to link relevant information
- Keep it simple
- Basically you should be able to use the app without needing to know anything about it
- When a customer finalizes their colour choices for a vehicle the vehicle preferences are gonna be recorded.
- UI should be compatible regardless of platform
- All interactions within the app should be less than 100ms; 100ms> load times
- Don't flood the page with information. Keep clutter to a minimum
- Make sure no more than 4 or 5 pieces of information displayed at the same time

William's Notes:

- Domain expert in ux/ui design
- Use graphical colour palettes
- Interior and exterior examples of chosen colour will be graphically visualized to customer
- Customer must be able to see all possible views of car
- Use icons, text for other features, icons should be relevant to information it is used for
- When customer finalizes colour for interior or exterior it should be saved in the database
- Part of larger program
- When designing system, interaction of ui with back end should be fast enough
    - Ex. When accessing customer records should take less than 100ms
- No other timing related restrictions
- Should not take longer than 100ms for any interaction
- No specific requirements for information arrangement or icon arrangement
- No more than 5 pieces of info per page

Interview 4 (Lida, Senior Salesperson at CADA) Wednesday 1:35 - 1:45

- **Ask about payment**

Additional info:

- Lida role: customer behaviour (sales)
- Keep customer records
- Different access levels and privileges for sales people
- Privileges determine read write functions to certain records
- Software process to handle payment

Jacob's Notes:

- Not sure about interface
- Should save, name, age, gender, billing address, contact information, customer id, info about customer's desire, payment schedules, customers purchase history
- Save brand, model, interior, and exterior colours
- Only accessible in the dealership
- Physical brochure doesn't help customer visualize colours as well
- Selection of colour combo needs to be automatically recorded into customer record
- Owner of dealership and sales managers have full access to system (though can't modify customer profile)
- Payment status, can be down payment, …
- Payment is done through dealership
- Full program designed from scratch
- Customers should be able to use program easily
- Not sure about training staff to use app

William's Notes:

- Any changes of identity of the customer will be flagged for security
- Only accessible in the dealership
- No issues with brochure except customer not being able to visualize colours on car
- Add one colour to each of exterior and interior each year
- Three levels of access, full access, limited access and customer access?
- Selection of colour choices must be automatically recorded into customers record
- Owners and managers have full access, cannot modify customer goals
- Limited access can add info to customers and access their info
- Constrained access can access their own info and colour options
- Program is designed from scratch
- Should be easy to use, customers and staff should not have problems using it
- VR might provide advantage but not sure
- No different levels of user accessibility at this point
- Save brand model interior and exterior colours, and name of sales associate for each sale
- No timing requirements for app
-

Harrison's Notes:

- Accessible at dealer only
- Add on colours to each thing based on yearly trends
- Different levels of access depending on user
- Three different access levels
- Automatic recording of customer inputs from app for colour choices
- Management cannot modify customers

- Payment could be down payment etc. through the dealership
- Designing full program from scratch
- Easy to use for everyone
- VR is a maybe
- No different users right now but it's a possibility later
- Save brand, model, year, all colours. Save under ten-digit and the name of the sales associate associated with the sale.

Jeff’s Notes

- Age name, gender, Customer id, address, desires, payment schedule, payment options
- Security for the customer details
- At the dealership only
- The issue with the brochure is the inability to see the different color combos together
- Three different access for Management (cannot change the goals and wants of the customer), sales (only access to the sales data and client data, they can add but not change information about the client), and customer (only have access to their own information and the color options)
- Payment timing, duration, amounts, financing, payment methods
- Importance is primarily an ease of use and efficiency